3.23 NOISE

This section addresses the potential noise impacts on the human environment and alternatives from the construction, operations, and decommissioning of the Proposed Action. The effect of construction and operation noise on wildlife is discussed in Sections 3.10 – General Wildlife and Fish and Section 3.11 – Special Status Wildlife and Fish Species. The effect of transmission line audible noise is also discussed in Section 3.21 – Electrical Environment.

The BLM's Preferred Routes for each segment of the Project are listed below. Where applicable, the preferred route identified by another federal agency or a county or state government is also noted.

- **Segment 1W:** The BLM's Preferred Route is the Proposed Route (Figure A-2). This route is also the State of Wyoming's preferred route.
- **Segment 2:** The BLM's Preferred Route is the Proposed Route (Figure A-3). This route is also the State of Wyoming's preferred route.
- **Segment 3:** The BLM's Preferred Route is the Proposed Route, including 3A (Figure A-4). This route is also the State of Wyoming's preferred route.
- **Segment 4:** The BLM's Preferred Route is the Proposed Route (Figures A-5 and A-6) except within the Caribou-Targhee NF. The portion of this route in Wyoming is also the State of Wyoming's preferred route. The Forest Service's preferred route is the Proposed Route within the NF incorporating Alternative 4G (Figure A-6).
- **Segment 5:** The BLM's Preferred Route is the Proposed Route incorporating Alternatives 5B and 5E, assuming that WECC reliability issues associated with 5E are resolved (Figure A-7). Power County's preferred route is the Proposed Route incorporating Alternatives 5C and 5E (Figure A-7).
- **Segment 6:** The BLM's Preferred Route is the proposal to upgrade the line voltage from 345 kV to 500 kV (Figure A-8).
- **Segment 7:** The BLM's Preferred Route is the Proposed Route incorporating Alternatives 7B, 7C, 7D, and 7G (Figure A-9). The Proposed Route in the East Hills and Alternative 7G will be microsited to avoid sage-grouse PPH. Power and Cassia Counties' preferred route is Alternative 7K (Figure A-9).
- **Segment 8:** The BLM's Preferred Route is the Proposed Route incorporating Alternative 8B (Figure A-10). This is also IDANG's preferred route.
- **Segment 9:** The BLM's Preferred Route is the Proposed Route incorporating Alternative 9E, which was revised to avoid PPH and the community of Murphy (Figure A-11). Owyhee County's preferred route is Alternative 9D (Figure A-11).
- **Segment 10:** The BLM's Preferred Route is the Proposed Route (Figure A-12).

3.23.1 Affected Environment

The following subsections include a discussion of the Analysis Area considered for environmental impacts by the Project, the issues that have driven the analysis and the

existing conditions across the Proposed Route and Route Alternatives in Wyoming and Idaho.[1]

3.23.1.1 Analysis Area

The Analysis Area included potential noise sensitive areas (NSAs) including residences, schools and day care facilities, hospitals, long-term care facilities, places of worship, libraries, and parks and recreational areas specifically known for their solitude and tranquility such as wilderness areas. Generally, the Analysis Area extended 1,000 feet from the proposed edge of the ROW, or from the boundary fence of the substations.

3.23.1.2 Issues Related to Noise

The following noise-related issues were identified by the public during the public scoping (Tetra Tech 2009) and comments on the Draft EIS, were raised by federal and state agencies during scoping and agency discussions, or are issues that must be considered as stipulated in law or regulation.

- Exposure of persons to or generation of noise levels in excess of standards as established within existing regulations, ordinances, and standards;
- Substantial temporary or permanent increase in ambient noise levels in the Project vicinity above levels existing prior to Project construction and operation; and
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

3.23.1.3 Regulatory Framework

A review of existing federal, state, county, and local noise regulations, ordinances, and guidelines was conducted and used to establish significance criteria for assessing Project compliance at identified noise sensitive areas (e.g., residences, schools, hospitals). The Project acoustic study area traverses two states, numerous counties, and four municipalities. With exception of the United States Occupational Safety and Health Administration regulations that describe worker health and safety limits for noise exposure, there are no other overarching federal or state noise regulations or requirements specific to this Project or to transmission line operation in Idaho or Wyoming. Furthermore, there are no standardized regulatory impact criteria for the assessment of construction noise and vibration directly applicable to this Project. If new dBA limitations and hours of operation are developed as a part of the special use permitting process and found to be applicable to the Project, the Project would address these requirements at that time. The regulatory framework at the federal, state, and local levels is presented below.

<u>Federal</u>

The USEPA has developed widely accepted recommendations for long-term exposure to environmental noise with the goal of protecting public health and safety. Noise guidelines for similar linear construction projects have been developed by the U.S. Department of Transportation (USDOT).

[1] The Project no longer has a route in Nevada.

U.S. Environmental Protection Agency

In 1974, the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA 1974). This report represents the only published study that includes a large database of community reaction to noise to which a proposed project can be readily compared. This publication evaluates the effects of environmental noise with respect to health and safety, and provides information for state and local governments to use in developing their own ambient noise standards.

For outdoor residential areas and other locations in which "quiet" is a basis for use, the recommended USEPA guideline is an L_{dn} of 55 dBA. Provided that Project operations meet this criterion, adjacent NSAs would regard the noise levels as generally acceptable. The USEPA also suggests an L_{eq} of 70 dBA (24-hour) limit to avoid adverse effects on public health and safety at publicly accessible property lines or extents of work areas where extended public exposure is possible. The USEPA criteria are summarized in Table 3.23-1, which identifies levels of environmental noise below which there is no evidence that the general population would be at risk to USEPA identified health effects.

Table 3.23-1. Summary of USEPA Noise Levels

Location	Level	Effect
All public accessible areas with prolonged exposure	70 dBA $L_{eq\ (24h)}$	Safety/hearing loss concerns
Outdoor at residential structure and other noise sensitive areas (NSAs) where a large amount of time is spent	55 dBA L_{dn}	Protection against annoyance and activity interference
Outdoor areas where limited amounts of time are spent, i.e., park areas, school yards, golf courses, etc.	55 dBA $L_{eq\ (24h)}$	
Indoor residential areas	45 dBA L_{dn}	
Indoor non-residential areas	45 dBA $L_{eq\ (24h)}$	

L_{eq} – equivalent sound level
dBA – A-weighted decibel

U.S. Department of Transportation

The USDOT has identified criteria for the assessment of short- and long-term construction activities for both stationary and mobile projects, and specifically for linear projects. The Federal Highway Administration recommends abatement of construction noise that exceeds maximum levels at NSAs. These Project construction noise criteria take into account the diurnal pattern of construction activities, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. While these criteria were not developed to specifically address construction noise impact for power transmission line projects, the guidelines shown in Table 3.23-2 provide reasonable criteria for noise assessment. If these criteria are exceeded, adverse community reaction may result.

Table 3.23-2 Summary of USDOT Short Duration Construction Noise Guidelines

Location	Daytime	Nighttime
Short Duration Noise Guidelines		
NSAs (Residences)	90 dBA $L_{eq\ (1h)}$	80 dBA $L_{eq\ (1h)}$
Commercial	100 dBA $L_{eq\ (1h)}$	100 dBA $L_{eq\ (1h)}$
Industrial	100 dBA $L_{eq\ (1h)}$	100 dBA $L_{eq\ (1h)}$
Moderate Duration Noise Guidelines		
NSAs (Residences)	80 dBA $L_{eq\ (8h)}$	70 dBA $L_{eq\ (8h)}$
Commercial	85 dBA $L_{eq\ (8h)}$	85 dBA $L_{eq\ (8h)}$
Industrial	90 dBA $L_{eq\ (8h)}$	90 dBA $L_{eq\ (8h)}$

L_{eq} – equivalent sound level
dBA – A-weighted decibel

The USDOT has also established guidelines for vibration levels for estimating the potential for vibration impacts from construction activities. These criteria are reported in peak particle velocity for describing the threshold for damage. Annoyance or interference with vibration-sensitive equipment is typically reported in velocity decibels referenced to 1 micro-inch per second. Typical levels from construction do not have the potential for any structural damage. Specific construction activities, such as pile driving and blasting, may produce vibration levels that have the potential to damage vibration-sensitive structures if performed within 100 feet of the structure. The USDOT recommends that the maximum peak particle velocity levels remain below 0.2 inch per second at the nearest structures. Vibration levels above 0.2 inch per second have the potential to cause architectural damage to normal dwellings. The USDOT also states that vibration levels above 0.015 inch per second may be perceptible to people. Table 3.23-3 summarizes the levels of vibration and the usual effect on people and buildings.

Table 3.23-3. Summary of Vibration Impact Guidelines

Effects on Humans	Effects on Buildings	Vibration Level (ppv) inch/sec
Imperceptible	No effect	<0.005
Barely perceptible	No effect	0.005 to 0.015
Level at which continuous vibrations begin to annoy in buildings	No effect	0.02 to 0.05
Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for damage to weak or sensitive structures	0.12 to 0.2
Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls.	0.2 to 1.0
Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicate that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.	1.0 to 2.0
Vibration is unpleasant	Potential for architectural damage and possible minor structural damage	>3.0

ppv – peak particle velocity

State

The States of Wyoming and Idaho do not have environmental noise regulations with numerical decibel limits directly applicable to the Project. The only noise regulations or

statutes provided by the WDEQ and the IDEQ are related to noise nuisance complaints and are not applicable to the proposed Project.

County and Local Ordinances and Bylaws

Of the numerous counties crossed by the Proposed Route and Route Alternatives, two have relevant noise ordinances, with the remaining counties relying instead upon the state noise nuisance regulations. Ordinances and standards for the two counties are described in Table 3.23-4. County noise ordinances, where they exist, are focused on permanent site development, which would include substations and transmission line operations only. Typically, daytime construction is exempt from local noise ordinances and standards. However, nighttime construction noise may also be subject to regulatory requirements or noise nuisance clauses enforceable under state or local penal code. The Proposed Route would cross two cities, the city of Cokeville in Lincoln County, Wyoming, and the city of Downey in Bannock County, Idaho. Alternative 8B (which is part of the BLM's Preferred Route) would cross two cities: the city of Kuna in Ada County, Idaho, and the city of Melba in Canyon County, Idaho. In addition, the Proposed Route would cross the unincorporated community of Murphy in Owyhee County, Idaho, as would Alternatives 9E (revised), 9G, and 9H. The City of Kuna has noise abatement ordinances applicable to highway construction.

Table 3.23-4. Applicable County Noise Ordinances and Standards

County	Ordinances and Standards	Description
Franklin, ID	Franklin County Development Code	Operating developments can generate a maximum of 70 dBA at the property boundary in commercial/industrial areas and either 50 dBA (10:00 p.m. to 7:00 a.m.) or 60 dBA (7:00 a.m. 10:00 p.m.) in residential areas. Temporary construction noise is exempt from this standard during the daytime hours of 7:00 a.m. to 10:00 p.m.
Sweetwater, WY	Sweetwater County Nuisance Regulations	Operating developments can generate a maximum of 70 dBA at the property boundary in commercial/industrial areas and 60 dBA in residential areas. Temporary construction noise is exempt from this standard during daytime the hours of 7:00 a.m. to 10:00 p.m.

dBA – A-weighted decibel

3.23.1.4 Methods

Sound is described as a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Sound energy is characterized by the properties of sound waves, which include frequency, wave length, period, amplitude, and velocity. Noise is highly subjective and defined as unwanted sound. It is largely dependent on the magnitude or intensity of noise, the duration of the Project, the proximity of noise-sensitive land use to noise source, and the time of day the noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

The range of frequencies that humans hear can span from 20 to 20,000 Hz; however, humans have varying sensitivities to noise at different frequencies, even though the energy content is the same. The amplitude of a sound wave is measured in terms of its sound pressure level where a logarithmic decibel scale is used. To reflect the sensitivity of the human ear across the audio spectrum, the sound pressure level readings are based on the "A-weighted scale", which is a standard weighting system that accounts

for human hearing response. The measurements used for the "A-weighted scale" are decibels, and are designated as dBA.

To take into account sound fluctuations, environmental noise is commonly described in terms of equivalent sound level (L_{eq}). The L_{eq} value, conventionally expressed in dBA, is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level, over a specified time, which has the same acoustic energy as the actual varying sound levels over that same time. Another common noise descriptor used when assessing environmental noise is the day-night sound level (L_{dn}), which is calculated by averaging the 24-hour hourly L_{eq} levels at a given location and adding 10 dB to noise emitted during the nighttime period (10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of people to noises that occur at night. The L_{max} is the maximum instantaneous sound level as measured during a specified time period. It can also be used to quantify the time-varying maximum instantaneous sound pressure level (as generated by equipment or an activity) or a manufacturer maximum source emission level.

The analysis conducted for activities associated with construction and operation of the proposed Project was evaluated using criteria and guidelines discussed in the previous section. The analysis methods included determining a critical distance from Project construction and operations for both the Proposed Route and Route Alternatives, where an NSA may experience received sound levels in excess of the selected criteria. Critical distances vary greatly depending on what Project activity is being considered. For instance, during the construction phase, heightened received sound levels would result from use of heavy equipment and helicopters, whereas noise associated with transmission line operation (termed corona discharge) would be substantially lower. Critical distances were also assessed for operation of the new Project electrical substations. Transformers generally are the major sources of audible noise within a substation. In all cases, after analysis of impacts was complete and where impacts were identified, Proponent-proposed measures to reduce impacts were reviewed for sufficiency. Where those measures were determined to be insufficient, additional measures were identified.

3.23.1.5 Existing Conditions

A wide range of noise settings occur within the Project acoustic area. Variations in acoustic environment are due in part to existing land uses, population density, and proximity to transportation corridors. Elevated existing ambient noise levels in the region occur near major transportation corridors (i.e., I-84, I-86, I-15, and I-80) and in areas with higher population densities (i.e., Casper, Boise, Pocatello, and Twin Falls). There are also 22 rural airstrips and small airports (6 public and 24 private), located within 1 mile of the proposed and alternative routes, which also contribute to ambient noise levels in both surrounding urban and rural areas. The unincorporated areas and communities that would intersect the proposed transmission line are predominantly open land or rural in nature, and have comparatively lower ambient sound levels. Ambient noise levels are also expected to be low in BLM-managed and NFS lands and other open areas. These lands range from very quiet with natural sounds such as birds, insects, and wind dominating to noisy in localized areas during periods of off-road

recreational use, shooting, oil and gas extraction/production/transportation, and other outdoor activities.

3.23.2 Direct and Indirect Effects

This section is organized to present construction, operation, and decommissioning effects from the proposed Project. Route Alternatives are analyzed in detail in Section 3.23.2.3.

EPMs are presented in detail within this section only if it is the first time they have been discussed in Chapter 3; all other measures are referenced or summarized. A comprehensive list of all EPMs, and the land ownerships to which they apply, can be found in Table 2.7-1 of Chapter 2.

Plan Amendments

Proposed amendments to BLM RMPs and MFPs are summarized in Table 2.2-1 of Chapter 2, while BLM plan amendments associated with other routes are summarized in Table 2.2-2. BLM plan amendments are discussed in detail in Appendices F-1 and G-1. Proposed amendments to Forest Plans are summarized in Table 2.2-3 of Chapter 2 and discussed in detail in Appendices F-2 and G-2. Amendments are needed to permit the Project to cross various areas of BLM-managed land and NFS lands. Effects described for areas requiring an amendment in order for the Project to be built would only occur if the amendment were approved. Amendments that alter land management designations could change future use of these areas. No amendments specific to noise are proposed for the Project and no impacts to noise resulting from approving the amendments beyond the impacts of the Project are anticipated.

3.23.2.1 No Action Alternative

Under the No Action Alternative, the BLM would not issue a ROW grant to the Proponents of Gateway West and the Project would not be constructed across federal lands. No land management plans would be amended to allow for the construction of this Project. No Project-related impacts from noise would occur; however, impacts would continue as a result of natural events (such as fire, drought, and severe weather) as well as from existing developments within the Analysis Area and from other projects, including wind farms, mining, agricultural, or other competing land uses. The demand for electricity, especially for renewable energy, would continue to grow in the Proponents' service territories. If the No Action Alternative is implemented, the demand for transmission services, as described in Section 1.3, Proponents' Objectives for the Project, would not be met with this Project and the area would have to turn to other proposals to meet the transmission demand. Under the No Action Alternative, impacts similar to those described below may occur due to new transmission lines built to meet the increasing demand in place of this Project.

3.23.2.2 Effects Common to All Action Alternatives

Construction

Construction of Project transmission lines would be completed in five stages: site access and preparation; installation of structure foundations; erecting of support

structures; stringing of conductors, shield wire and fiber optic ground wire; and cleanup and site reclamation. Transmission line construction would occur as a series of sequential events distributed over several miles along the Project route at any one time. Twelve substations would be constructed or modified.

The Project construction phase would produce noise as heavy equipment would be required to build the proposed transmission line routes and electrical substations. Short-term use of equipment such as backhoes, cranes, front-end loaders, bulldozers, graders, excavators, compressors, generators, and various trucks would be needed for mobilizing crew, transporting and use of materials, line work, and site clearing and preparation. Use of drill rigs, large augers, and rock drills would be required for the poured-in-place foundations at each tower location. It is not expected that pile driving would be needed during construction. Spur roads and access roads would require use of earthmoving equipment such as bulldozers and graders. Construction noise is usually made up of intermittent peaks and continuous lower levels of noise from equipment cycling through use. Noise levels associated with individual pieces of equipment would generally range between 70 and 90 dBA (USDOT 2006). Maximum instantaneous construction noise levels would range from 80 to 90 dBA at 50 feet from any work site. Table 3.23-5 provides typical noise level data for construction equipment potentially used during Project construction of the transmission line and electrical substations.

Noise would be generated along the Project route, access roads, structure sites, wire-pulling/splicing sites, multipurpose yards, maintenance areas, fly yards, and substation sites. Additional noise sources may include commuting workers, and trucks and helicopters moving material to and from the work sites.

The noise impacts at NSAs from construction would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound source and NSA. All of these factors are expected to vary regularly throughout the construction period, making the calculation of a specific received sound level value at each NSA location difficult. The critical distances corresponding to the USEPA noise guidelines and other criteria developed by the Project to assess construction noise impacts were calculated. Sound generation was modeled according to the grouping of construction equipment provided in Table 3.23-5. The results of the modeling determined the distance from the construction site where sound levels would attenuate to the criteria levels. These distances included the following:

- A critical distance of 407 feet corresponding to the USEPA 70 dBA $L_{eq\ (24h)}$ guideline, and
- A critical distance of 280 feet corresponding to the USDOT 80 dBA $L_{eq\ (8h)}$ guideline.

Thus, NSAs situated within these critical distances may experience a short-term impact as a result of Project construction noise. While Project construction would generate unavoidable noise impacts at some NSAs, impacts would be temporary and intermittent.

Table 3.23-5. Typical Noise Levels from Construction Equipment

Equipment Type	Measured L_{max} Noise Level at 50 feet (dBA)
Crane	88
Backhoe	85
Pan Loader	87
Bulldozer	89
Fuel Truck	88
Water Truck	88
Grader	85
Roller	80
Mechanic Truck	88
Flat Bed Truck	88
Dump Truck	88
Tractor	80
Concrete Truck	86
Concrete Pump	82
Front End Loader	83
Scraper	87
Air Compressor	82
Average Construction Site	85

Construction activities at the substations could last from several weeks to several months on an intermittent schedule. Construction equipment would be operated on an as-needed basis during this period and activities would occur for limited lengths of daytime hours at a specific location to minimize impacts at NSAs. In addition, the majority of construction activities would occur away from population centers; therefore, the potential for the Project to result in a substantial temporary or periodic increase in ambient noise levels in the acoustic environment surrounding the Project would be low. The Proponents would comply with all established noise ordinances and suggested noise guidelines; therefore, the potential for adverse noise impacts at NSAs resulting from Project construction would be minimized. The subsequent sections discuss specific construction techniques that the Project may use, including blasting and rock breaking, implosive devices during conductor stringing, and helicopter operations.

The following EPMs would be implemented during construction and would substantially reduce impact in the vicinity of NSAs:

NOISE-1 Identify and provide a public liaison person before and during construction to respond to concerns of neighboring receptors, including residents, about noise construction disturbance.

NOISE-2 Establish a toll-free telephone number for receiving questions or complaints during construction and develop procedures for responding to callers.

Blasting and Rock Breaking

Modern blasting techniques include electronically controlled ignition of multiple small explosive charges in an area of rock 8/1000ths of a second apart resulting in a total event duration of approximately 3/10ths of a second. The detonations are timed so that the energy from individual detonations destructively interferes with each other, which is called wave canceling. As a result, very little of the kinetic energy is wasted as ground

vibration and audible noise. Impulse (instantaneous) noise from blasts could reach up to 140 dBA at the blast location or over 90 dBA for NSAs within 500 feet.

Blasting may be required during Project construction if hard rock is encountered that cannot be loosened or fractured by other means. Blasting locations would not be identified until an investigative geotechnical survey study area is conducted during the detailed design. However, areas where blasting may potentially take place have been identified on a geologic basis. As described in Section 3.14 – Geologic Hazards, areas of shallow bedrock exist along the Proposed Route and Route Alternatives. Depth to bedrock varies considerably along the routes, ranging from 1 to 4 feet below ground to greater than 12 feet below ground. Table 3.23-6 shows the number of NSAs along the Proposed Route and Route Alternatives that are located in areas of shallow bedrock and therefore may potentially be subjected to blasting during Project construction. The number of potentially impacted NSAs is directly related to the critical distance determined from the blasting criteria described in Section 3.23.1.3. These distances include the following:

- A critical distance of 131 feet corresponding to the USDOT vibration threshold for the potential for minor architectural damage, and
- A critical distance of 377 feet corresponding to the USDOT vibration threshold for annoyance.

Though noise generated during blasting can cause concern among nearby NSAs, blasting is a relatively short duration event compared to rock removal methods such as using track rig drills, rock breakers, jack hammers, rotary percussion drills, core barrels, and/or rotary rock drills. The Proponents intend to prepare a site-specific Blasting Plan prior to construction that covers blasting procedures, use of qualified blasters, site control and protection measures, and compensation for repair of damage (see EPMs BLA-1 through BLA-5 in Table 2.7-1 in Chapter 2 and in Appendix B).

Implosive Devices

Compression or implosive devices are used to make connections between conductors, which is the current industry-preferred method in contrast to previously used conventional hydraulic compression fittings. Use of implosive devices would vary depending on what segment of the transmission line is under construction and the number of conductors per bundle. A three-conductor bundle (see Appendix B, Figure B-3) is used for each phase and there are three phases per 500-kV circuit. At each single-circuit 500-kV dead-end structure and at in line sections where reel ends need to be connected, 18 implosive dead-end sleeves (6 per phase, one for each of the three subconductors on each of the 3 phases, and on each side of the structure) would be required. Additionally, 18 compression or implosive sleeves would be required to fabricate and install the jumpers that connect the conductors from one side of the dead-end structure to the other, for a total of 36 sleeves for each single-circuit dead-end structure. The 230-kV and 345-kV single-circuit lines would require a two conductor bundle. Each 230-kV or 345-kV dead-end structure would require 12 implosive or compression type sleeves to dead-end the conductors and 12 sleeves to fabricate the jumpers, for a total of 24 sleeves at each dead-end structure.

Implo Technologies is a company that manufactures the implosive dead-end and sleeve compression connectors comparable to technologies that would be used during construction. They reported an average sound level measurement between 118 and 122 dBA at an approximate distance of 200 feet. The duration of sound emitted from detonation of an implosive device is short, ranging from approximately 210 to 360 milliseconds. Since the potential for noise "startle" effects at NSAs at these distances exists, the use of implosive devices would be limited to daytime periods.

Helicopter Operations

To allow the construction contractor flexibility in the construction methods that may be used, the Project construction specification would be written to allow the contractor the option of using ground-based or helicopter construction methods, or a combination thereof for single-circuit structure erection. In particular, helicopters would be used in areas where access is limited or where there are environmental constraints to accessing the Project area with standard construction vehicles or equipment. Project activities that would be facilitated by helicopters include delivery of construction laborers, equipment and materials to structure sites, structure placement (except tubular steel poles), hardware installation, and wire stringing operations. When helicopter construction methods are employed, activities would be based at a fly yard, which is a Project-material staging area. The fly yards would be approximately 10 to 15 acres and would be sited at locations to permit a maximum fly time of 4 to 8 minutes to reach structure locations, typically at about 5-mile intervals.

Helicopters generally fly at low altitudes; therefore, potential temporary increases to ambient sound levels would occur in the area where helicopters are operating as well as along their flight path. Typically, helicopters may generate noise levels of 89 to 99 dBA at 50 feet when in flight at 200 feet. Light-duty helicopters would also be used during the stringing phase of construction. It is anticipated that helicopter stringing activities would proceed at a rate of approximately 2,000 feet per day using 4-hour days. Light-duty helicopters would generate noise levels of approximately 80 dBA at 200 feet.

Worst-case sound emissions generated from helicopter use during Project construction were assessed along the proposed transmission line route by segment. Under the Proposed Action developed by the Proponents, helicopter operations would be a contractor option for all segments. The critical distances where noise impacts were assessed for helicopter noise include the following:

- A critical distance of 90 feet corresponding to the USDOT 90 dBA $L_{eq\ (1h)}$ guideline for short-term construction activities,
- A critical distance of 280 feet corresponding to the USDOT 80 dBA $L_{eq\ (8h)}$ guideline for moderate-term construction activities, and
- A critical distance of 890 feet corresponding to the USEPA 70 dBA $L_{eq\ (24h)}$ guideline for public accessible areas with prolonged exposure.

At any one location along the Proposed Route and Route Alternatives, helicopter operations would occur for short periods several times per day. Therefore, the USDOT 90 dBA one-hour $L_{eq\ (1h)}$ is the most appropriate criteria to assess the potential for

adverse noise impacts. Operations would be limited to daytime working hours only and would be short-term. Therefore, short-term construction noise impacts from helicopter operations would be minor.

Operations

Transmission Line

Transmission lines have the potential to emit environmental noise under certain operating and environmental conditions. Transmission line noise (also called corona noise) is caused by the partial electrical breakdown of the insulating properties of air around the electrical conductors and overhead power lines (see Section 3.21 – Electrical Environment). When audible, corona-generated noise is often described as a raspy hum or buzz. Corona noise is primarily affected by weather and (to a lesser degree) by altitude and temperature. Audible corona noise from transmission lines occurs primarily in foul weather. Foul weather is a weather condition when there is precipitation or high humidity present that can cause the transmission-line conductors to be wet. Fog is not a form of precipitation, but it may cause conductors to be wet. Dry snow is a form of precipitation, but it may not cause the conductors to be wet (EPRI 1982). The water drops on the conductors act as electric field concentrators and produce a large number of corona discharges, each of them creating a burst of noise. During fair weather conditions, corona occurs only at scratches or other imperfections in the conductor surface or where dust has settled on the line. These limited sources are such that the corona activity is minimal and the audible noise generated is very low. Generally, the fair-weather audible noise of transmission lines cannot be distinguished from ambient noise at the edge of the ROW. Corona activity increases with increasing altitude and with increasing voltage in the line, but is generally not affected by system loading.

Sound levels emitted from transmission lines are related to line voltage. Audible noise calculations for the Project transmission lines were performed using the BPA's CAFE program and are presented in Section 3.21 – Electrical Environment. Developed by the DOE and BPA, CAFE algorithms have been validated and used by engineers and scientists for many years to calculate the expected levels of audible noise produced by transmission lines. The inputs to the model include line voltage, load flow (current), altitude, meteorological conditions, the physical dimensions of the line, conductor diameter, spacing, and height of the conductors and receivers above ground level. The BPA method of calculating audible noise from transmission lines is based on long-term statistical data collected from operating and test transmission lines. This method calculates the L_{50} noise level during rainy conditions of 1 mm/hr. Long-term measurements show that L_{50} audible noise levels occur at this rain rate.

Using the results of the audible noise analysis and standard sound propagation modeling, the number of potentially impacted NSAs were determined based on the following critical distances, corresponding to the 55 L_{dn} USEPA guideline criteria protective of health and human welfare (see Table 3.23-6).

Table 3.23-6. Critical Distances by Project Transmission Line Voltage

Line Voltage/Structure	Critical Distance 55 L_{dn} dBA USEPA Guideline (feet)
230-kV Single Circuit	63
345-kV Single Circuit	117
500-kV Single Circuit	213

Substations

Typical equipment that would be installed at the Project substations would include circuit breakers, switches, bus supports, controls, reactors and series capacitors, and transformers. The principal noise sources in the substations are the transformers. The Project includes the expansion and/or modification of substation facilities at the Dave Johnston Power Plant, Heward, Windstar, Shirley Basin, Midpoint, Hemingway, Populus and Borah Substations as well as the proposed new substations Aeolus, Anticline, and Cedar Hill. Only the Aeolus, Anticline, Populus, and Borah Substations would have transformers.

Transformer noise would propagate and attenuate at different rates depending on the transformer size, voltage rating, and design. Transformer noise is principally a result of core vibration and is a function of the surface area, whether the transformer is air-filled or oil-filled, and the power rating. In addition to core vibration noise, transformer cooling fans and oil pumps at larger transformer stations generate broadband noise, but are limited to periods when additional cooling is required. The fan noise is relatively low and is generally considered secondary to the core vibration noise source. For purposes of estimating potential impacts, it was assumed that each new substation included 500-kV transformers rated at 78 dBA by the National Electrical Manufacturers Association. The actual number of transformers and actual National Electrical Manufacturers Association rating would be confirmed during final Project design. The following EPM would be followed during operations and would substantially reduce impact in the vicinity of NSAs:

NOISE-3 Implement and maintain a noise complaint review process to deal with residents' or other potential queries and complaints as they arise. Such complaints would be logged and investigated on an individual basis to facilitate resolution of the issue of concern.

Decommissioning

Decommissioning noise impacts would be generally shorter term and lower than construction impacts. For instance, no blasting or rock breaking would be required.

3.23.2.3 Comparison of Alternatives by Segment

Construction

Table 3.23-7 shows the number of potentially impacted receptors that may exceed the USDOT and USEPA guidelines for helicopter construction, general construction, and blasting in areas with shallow bedrock at substations and along the proposed transmission line route and alternatives.

Table 3.23-7. Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives

Segment Number	Proposed Route and Alternatives	Length	Number of NSAs and Distance from Centerline for General and Helicopter Construction (feet)				Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet)	Number of NSAs within Blasting Vibration Annoyance Zone (377 feet)
			90	280	407	890		
1W	Segment 1W(a) Preferred/Proposed – Total Length	73.8	–	2	6	12	–	2
	Segment 1W(a) Preferred/Proposed - Comparison portion for Alternative 1W(a)-B	16.5	–	1	3	7	–	1
	Alternative 1W(a)-B	20.9	–	1	2	7	–	1
	Segment 1W(c) Preferred/Proposed – Total Length	73.6	2	7	18	41	2	10
2	Segment 2 Preferred/Proposed – Total Length	91.9	–	–	–	1	–	–
	Preferred/Proposed - Comparison portion for Alternative 2A	16.8	–	–	–	1	–	–
	Preferred/Proposed – Comparison portion for Alternative 2B	12.5	–	–	–	1	–	–
	Alternative 2B	12.2	–	1	2	7	–	1
4	Segment 4 Preferred/Proposed – Total Length	197.6	–	–	–	9	–	–
	Preferred/Proposed – Comparison portion for Alts. 4B–F	85.2	–	–	–	2	–	–
	Alternative 4B	100.2	–	–	–	–	–	–
	Alternative 4C	101.6	–	–	1	2	–	1
	Alternative 4D	100.8	–	–	–	–	–	–
	Alternative 4E	102.2	–	–	1	2	–	1
	Alternative 4F	87.5	–	–	1	4	–	1
	Preferred/Proposed – Comparison portion for Alt 4G	2.3	-	-	-	-	-	-
	Alternative 4G	2.6	-	-	-	-	-	-

Table 3.23-7. Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives (continued)

Segment Number	Proposed Route and Alternatives	Length	Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet)				Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet)	Number of NSAs within Blasting Vibration Annoyance Zone (377 feet)
			90	280	407	890		
5	Segment 5 Preferred - Total Length	73.3	–-	4	8	22	–	4
	Segment 5 Proposed - Total Length	55.7	–	2	4	22	–	2
	Proposed – Comparison portion for Alternatives 5A, B	22.3	–	–	–	1	–	–
	Alternative 5A	29.7	–	1	2	5	–	1
	Alternative 5B	40.4	–	2	4	8	–	2
	Proposed – Comparison portion for Alternative 5C	32.9	–	–	–	1	–	–
	Proposed – Comparison portion for Alternative 5D	19.2	–	–	–	9	–	–
	Alternative 5D	17.0	–	2	8	26	–	5
	Proposed – Comparison portion for Alternative 5E	5.8	–	–	–	9	–	–
	Alternative 5E	5.3	–	–	–	2	–	–
6	Segment 6 Preferred/Proposed - Analysis Length	0.5	–	–	–	–	–	–
7	Segment 7 Preferred - Total Length	130.2	–	7	19	42	–	10
	Segment 7 Proposed – Total Length	118.2	–	6	17	35	–	9
	Proposed – Comparison portion for Alternatives 7A, B	35.1	–	1	2	3	–	1
	Alternative 7A	37.7	–	–	–	2	–	–
	Alternative 7B	46.2	–	1	2	5	–	1
	Proposed – Comparison portion for Alternative 7C	20.1	–	–	–	–	–	–
	Alternative 7C	20.3	–	–	–	2	–	–
	Proposed – Comparison portion for Alternative 7D	6.2	–	–	–	–	–	–
	Alternative 7D	6.8	–	–	–	–	–	–
	Proposed - Comparison portion for Alternative 7E	3.8	–	1	2	8	–	1
	Alternative 7E	4.5	–	1	2	5	–	1
	Proposed - Comparison portion for Alternative 7F	10.5	–	1	2	8	–	1
	Alternative 7F	10.8	–	–	–	–	–	–
	Proposed - Comparison portion for Alternative 7G	3.3	–	–	–	–	–	–
	Alternative 7G	3.4	–	1	2	3	–	1
	Proposed - Comparison portion for Alternative 7K	118.2	–	6	17	35	–	9
	Alternative 7K	148.1	–	1	4	9	–	2

Table 3.23-7. Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives (continued)

Segment Number	Proposed Route and Alternatives	Length	Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet)				Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet)	Number of NSAs within Blasting Vibration Annoyance Zone (377 feet)
			90	280	407	890		
8	Segment 8 Preferred – Total Length	132.0	–	35	73	142	11	36
	Segment 8 Proposed – Total Length	131.5	–	4	11	32	–	7
	Proposed – Comparison portion for Alternative 8A	51.9	–	2	6	17	–	4
	Alternative 8A	53.6	2	8	27	67	2	17
	Proposed – Comparison portion for Alternative 8B	45.3	–	1	3	12	–	2
	Alternative 8B	45.8	9	32	65	122	11	31
	Proposed – Comparison portion for Alternative 8C	6.5	–	–	–	–	–	–
	Alternative 8C	6.4	–	–	–	1	–	–
	Proposed – Comparison portion for Alternative 8D	6.9	–	–	–	–	–	–
	Alternative 8D	8.1	–	1	2	3	–	1
	Proposed – Comparison portion for Alternative 8E	7.0	–	–	–	–	–	–
	Alternative 8E	18.3	–	–	–	–	–	–
9	Segment 9 Preferred – Total Length	171.4	–	2	4	14	0	2
	Segment 9 Proposed – Total Length	162.2	1	9	18	37	3	9
	Proposed Comparison portion for Alternative 9A	7.8	–	–	–	–	–	–
	Alternative 9A	7.7	–	–	1	2	–	1
	Proposed Comparison portion for Alternative 9B	49.1	–	–	–	–	–	–
	Alternative 9B	52.3	1	2	3	8	1	1
	Proposed Comparison portion for Alternative 9C	14.4	–	–	–	–	–	–
	Alternative 9C	14.4	1	2	4	8	1	2
	Proposed – Comparison portion for Alts. 9D, F, G, H	57.2	1	7	14	23	3	7
	Alternative 9D	60.1	–	–	–	–	–	–
	Alternative 9F	63.3	–	2	5	10	1	3
	Alternative 9G	57.8	–	–	–	–	–	–
	Alternative 9H	61.0	–	2	5	10	1	3
	Proposed – Comparison portion for Alternative 9E (revised)	61.4	1	7	14	23	3	7
	Alternative 9E (revised)	70.6	–	–	–	–	–	–
10	Segment 10 Preferred/Proposed – Total Length	34.4	2	6	10	25	2	4

Note: A dash means no NSAs present.

The number of potential NSAs at the various construction distance zones is very small. Noise impacts would range from none to a minor inconvenience, given the measures proposed by the Proponents and additional measures identified by the Agencies.

Operations

The permanent noise sources associated with the Project consist of low-level noise due to transmission line corona effects and noise generated from electrical substations, as described in Section 3.23.5.2. Table 3.23-8 lists NSAs in the operations Analysis Area.

Table 3.23-8. Noise Sensitive Areas within Operations Analysis Area of Proposed Route and Route Alternatives

Segment	Proposed Route and Alternatives	Length	NSAs from Centerline of 230-kV Single-Circuit ROW (63 Feet)	NSAs from Centerline of 345-kV Single Circuit ROW (117 feet)	NSAs from Centerline of 500-kV Single Circuit ROW (213 feet)
1W	Segment 1W(a) Preferred/Proposed – Total Length	73.8	–	–	1
	1W(a) Preferred/Proposed - Comparison portion for Alternative 1W(a)-B	16.5	–	–	1
	Alternative 1W(a)-B	20.9	–	–	1
	1W(c) Preferred/Proposed - Total Length	73.6	–		2
2	Segment 2 Preferred/Proposed - Total Length	91.9	–	–	–
	Preferred/Proposed - Comparison portion for Alternative 2A	16.8	–	–	–
	Alternative 2A	16.0	–	–	–
	Preferred/Proposed - Comparison portion for Alternative 2B	12.5	–	–	–
	Alternative 2B	12.2	–	–	–
3	Segment 3 Preferred/Proposed - Total Length	45.9	–	–	–
	Segment 3A Preferred/Proposed - Total Length	5.1	–	–	–
4	Segment 4 Preferred/Proposed - Total Length	197.6	–	–	–
	Preferred/Proposed - Comparison portion for Alternatives 4B, C, D, E, F	85.2	–	–	–
	Alternative 4B	100.2	–	–	–
	Alternative 4C	101.6	–	–	–
	Alternative 4D	100.8	–	–	–
	Alternative 4E	102.2	–	–	–
	Alternative 4F	87.5	–	–	–
	Preferred/Proposed - Comparison portion for Alternative 4G	2.3	-	-	-
	Alternative 4G	2.6	-	-	-

Table 3.23-8. Noise Sensitive Areas within Operation Analysis Area of Proposed Route and Route Alternatives (continued)

Segment	Proposed Route and Alternatives	Length	NSAs from Centerline of 230-kV Single-Circuit ROW (62.5 Feet)	NSAs from Centerline of 345-kV Single Circuit ROW (117 feet)	NSAs from Centerline of 500-kV Single Circuit ROW (213 feet)
5	Segment 5 Preferred - Total Length	73.3	–	–	3
	Segment 5 Proposed - Total Length	55.7	–	–	1
	Proposed - Comparison portion for Alternatives 5A, B	22.3	–	–	–
	Alternative 5A	29.7	–	–	1
	Alternative 5B	40.4	–	–	2
	Proposed - Comparison portion for Alternative 5C	32.9	–	–	–
	Alternative 5C	26.0	–	–	–
	Proposed - Comparison portion for Alternative 5D	19.2	–	–	–
	Alternative 5D	17.0	–	–	1
	Proposed - Comparison portion for Alternative 5E	5.8	–	–	–
	Alternative 5E	5.3	–	–	–
6	Segment 6 Preferred/Proposed - Analysis Length	0.5	–	–	–
7	Segment 7 Preferred - Total Length	130.2	–	–	4
	Segment 7 Proposed - Total Length	118.2	–	–	5
	Proposed - Comparison portion for Alternatives 7A, B	35.1	–	–	1
	Alternative 7A	37.7	–	–	–
	Alternative 7B	46.2	–	–	–
	Proposed - Comparison portion for Alternative 7C	20.1	–	–	–
	Alternative 7C	20.3	–	–	–
	Proposed - Comparison portion for Alternative 7D	6.2	–	–	–
	Alternative 7D	6.8	–	–	–
	Proposed - Comparison portion for Alternative 7E	3.8	–	–	1
	Alternative 7E	4.5	–	–	1
	Proposed - Comparison portion for Alternative 7F	10.5	–	–	1
	Alternative 7F	10.8	–	–	–
	Proposed - Comparison portion for Alternative 7G	3.3	–	–	–
	Alternative 7G	3.4	–	–	–
	Proposed - Comparison portion for Alternative 7K	118.2	–	–	5
	Alternative 7K	148.1	–	–	–
8	Segment 8 Preferred - Total Length	132.0	5	–	23
	Segment 8 Proposed - Total Length	131.5	–	–	4
	Proposed - Comparison portion for Alternative 8A	51.9	–	–	2

Table 3.23-8. Noise Sensitive Areas within Operation Analysis Area of Proposed Route and Route Alternatives (continued)

Segment	Proposed Route and Alternatives	Length	NSAs from Centerline of 230-kV Single-Circuit ROW (62.5 Feet)	NSAs from Centerline of 345-kV Single Circuit ROW (117 feet)	NSAs from Centerline of 500-kV Single Circuit ROW (213 feet)
8 (cont.)	Alternative 8A	53.6	2	–	4
	Proposed - Comparison portion for Alternative 8B	45.3	–	–	1
	Alternative 8B	45.8	5		20
	Proposed - Comparison portion for Alternative 8C	6.5	–	–	–
	Alternative 8C	6.4	–	–	–
	Proposed - Comparison portion for Alternative 8D	6.9	–	–	–
	Alternative 8D	8.1	–	–	1
	Proposed - Comparison portion for Alternative 8E	7.0	–	–	–
	Alternative 8E	18.3	–	–	–
9	Segment 9 Preferred - Total Length	171.4	–	–	2
	Segment 9 Proposed - Total Length	162.2	–	2	6
	Proposed - Comparison portion for Alternative 9A	7.8	–	–	–
	Alternative 9A	7.7	–	–	–
	Proposed - Comparison portion for Alternative 9B	49.1	–	–	–
	Alternative 9B	52.3	1	1	1
	Proposed - Comparison portion for Alternative 9C	14.4	–	–	–
	Alternative 9C	14.4	1	1	1
	Proposed - Comparison portion for Alternatives 9D, F, G, H	57.2	–	2	4
	Alternative 9D	60.1	–	–	–
	Alternative 9F	63.3	–	1	1
	Alternative 9G	57.8	–	–	–
	Alternative 9H	61.0	–	1	1
	Proposed – Comparison portion for Alternative 9E (revised)	61.4	–	2	4
	Alternative 9E (revised)	70.6	–	–	–
10	Segment 10 Proposed - Total Length	34.4	1	2	3

Note: A dash means no NSAs present.

Noise levels from the nine substation expansions are expected to remain consistent (±3 dB) with existing present equipment noise emission levels. New substations are proposed for the Anticline, Aeolus, and Cedar Hill sites. Each would have circuit breakers, transformers, and other equipment common to substations.

The proposed Anticline Substation would be located within proximity to the existing Jim Bridger Power Plant and substations. There are no NSAs within approximately 29 miles of the proposed substation. No significant new noise would be created as a result of operations at this substation. The closest NSA to the proposed Aeolus Substation is located 3.47 miles north; therefore, no noise impacts would be generated at NSAs as a

result of operations at this substation. The proposed Cedar Hill Substation would be located approximately 20 miles southeast of Twin Falls, Idaho. An area of 54 acres would be developed for substation facilities. The closest NSA is approximately 1,400 feet from the proposed facility fence line. The critical distance corresponding to the USEPA 55 dBA L_{dn} guideline is 330 feet from the substation fence line. There are no NSAs located within the critical distance identified for noise generated during substation operation.