III.21 NOISE AND VIBRATION

This chapter describes the affected environment for noise and noise-related laws and regulations that govern renewable energy development and operation within the Desert Renewable Energy Conservation Plan (DRECP) area. Most jurisdictions have developed noise standards and thresholds to control and mitigate noise impacts on human populations; however, none of the following agencies has adopted specific thresholds to determine noise impacts to terrestrial noise-sensitive species. See Chapter III.7, Biological Resources, for a discussion of the regulations that govern sensitive species within the DRECP area.

Appendix R1.21 provides supporting information for this chapter including maps of the communities and cities within the DRECP area.

III.21.1 Regulatory Setting

III.21.1.1 Federal

III.21.1.1.1 Noise Control Act

The Noise Control Act of 1972 and its subsequent amendments in the Quiet Communities Act of 1978 (42 United States Code [U.S.C.] 4901 et seq.) delegate authority to the states to regulate environmental noise and directs government agencies to ensure compliance with local community noise statutes and regulations.

III.21.1.1.2 Federal Aviation Administration Standards

The Federal Aviation Administration establishes 65 decibel (dB) community noise equivalent level (CNEL) as the noise standard for aircraft noise (Federal Aviation Administration Regulation Part 150, Section 150.21).

III.21.1.1.3 Federal Highway Administration Standards

Federal Highway Administration (FHWA) standards preempt county standards for federally funded road construction projects (23 Code of Federal Regulations [CFR] 772.19). The FHWA establishes specific noise standards for different land use categories in federal highway projects.

III.21.1.1.4 Federal Railroad Administration Standards

Impact assessment methods outlined in Federal Railroad Administration standards recommend consideration of adjacent land use categories, existing ambient conditions, and future exposure levels. For a federally funded rail project, the Federal Railroad Administration standards preempt county standards.

III.21.1.1.5 Federal Transit Administration Standards

The Federal Transit Administration provides comprehensive guidance and detailed impact criteria. For federally funded mass transit projects, the Federal Transit Administration standards preempt county standards.

III.21.1.2 State

III.21.1.2.1 California Noise Control Act

The California Legislature has determined that excessive noise is a serious hazard to the public health and welfare and that exposure to high levels of noise can cause physiological, psychological, and economic damage. It has further determined that there is continuous and increasing bombardment of noise in urban, suburban, and rural areas (California Health and Safety Code, Section 46000 et seq.). The California Noise Control Act states that the State of California bears the responsibility to protect the health and welfare of its residents through the control, prevention, and abatement of noise. State policy is to provide an environment free of noise that could jeopardize their health and welfare.

III.21.1.3 Local

The DRECP and all its alternatives cover areas located within Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties. The county boundaries in relation to the DRECP area are shown in Volume I, Figure I.0-1.

III.21.1.3.1 Imperial County

The Noise Element in the Imperial County General Plan (1996) provides information to determine land use policies that protect noise-sensitive land uses and develop and enforce a local noise ordinance. The Noise Element of the Imperial County General Plan includes a program to incorporate noise issues into the land use planning process, with the goals of protecting the public from noise intrusion and discouraging development of noise generating activities near noise-sensitive land uses.

III.21.1.3.1.1 Noise Standards for Geothermal/Alternative Energy and Transmission

Although there are no specific noise standards in the Geothermal/Alternative Energy and Transmission Element (2006) of the Imperial County General Plan, the plan states that general and specific land use standards will be followed to minimize adverse noise impacts to sensitive receptors. For a definition of sensitive receptors, see Section III.21.3.1.

III.21.1.3.2 Inyo County

The goal of the Noise Element of the Inyo County General Plan (1982) is to restrict the exposure of sensitive receptors to excessive levels of ambient noise through policies and regulations. The county boundaries in relation to the DRECP area are shown in Figure I.0-1.

III.21.1.3.2.1 Noise Standards for Wind Energy Conversion Systems

Inyo County has various standards that cover small wind energy conversion systems (WECS) that are modified, expanded, installed, operated, or constructed in the unincorporated part of Inyo County.

Inyo County Code (Section 18.79.100[E][2]) states, "Any noise resulting from the system shall not exceed 60 dBA (A-weighted dB) at, but outside of, the closest neighboring inhabited dwelling. Noise limits may exceed these limits during temporary, short-term events such as wind storms and utility outages." See Section III.21.2.1 for an explanation of noise measurement fundamentals.

III.21.1.3.2.2 Noise Standards for Geothermal Resource Development

Inyo County Code Section 19.24.030 states:

> Each operator shall limit the continuous generation of wide band noise to that required. The level may be exceeded by 10% for any one occurrence if the noise is intermittent and during daylight hours. The noise levels shall be measured at the parcel boundary.
>
> Sound pressure levels shall be measured at the parcel boundary and shall be measured with a sound level meter and associated octave band analyzer conforming to standards prescribed by the United States of America Standards Institute.

III.21.1.3.3 Kern County

The Kern County General Plan (2009) Noise Element set a goal to protect Kern County residents from excessive noise and to ensure that moderate levels of noise are not exceeded. This goal is achieved through policies and regulations.

III.21.1.3.3.1 Wind Energy Combining District

Kern County promotes the use of wind-driven generators for energy recovery and uses alternatives to fossil-fuel-generated electrical power in suitable areas of the county. Kern County also promotes safeguards to ensure the health, safety, and welfare of its residents. The county has specific policies that govern noise from wind energy projects.

The Kern County Municipal Code, Section 19.64.140(J) states:

> Where a residence, school, church, public library or other sensitive or highly sensitive land use, as identified in the noise element of the county General Plan, is located within one mile in a prevailing downwind direction or within one-half mile in any other direction of a project's exterior boundary, an acoustical analysis shall be prepared by a qualified acoustical consultant prior to the issuance of any building permit. The consultant and the resulting report shall be subject to review and approval by the Kern county health department. The report shall address any potential impacts on sensitive or highly sensitive land uses.
>
> In addition, the acoustical report shall demonstrate that the proposed development shall comply with the following criteria:
>
> 1. Audible noise due to wind turbine operations shall not be created which causes the exterior noise level to exceed 45 dBA for more than five minutes out of any one hour time period (also referred to as L8.3[1]) or to exceed 50 dBA for any period of time when measured within 50 feet of any existing residence, school, hospital, church, or public library.
> 2. Low-frequency noise or infrasound from wind turbine operations shall not be created which causes the exterior noise level to exceed the following limits when measured within 50 feet of any existing residence, school, hospital, church or public library:

One-Third Octave Band Center Frequency (Hertz)	Sound Pressure Level (dB)
2 to 1	70 (each band)
20	68
25	67
31.5	65

[1] L8.3 is the noise level equaled or exceeded 8.3% of the specified time period (e.g., 5 minutes per hour): it is generally similar in level to the Leq.

One-Third Octave Band Center Frequency (Hertz)	Sound Pressure Level (dB)
40	62
50	60
63	57
80	55
100	52
125	50

3. In the event audible noise due to wind turbine operations contains a steady pure tone, such as a whine, screech or hum, the standards for audible noise set forth in subparagraph (1) of this subsection shall be reduced by five dBA. A pure tone is defined to exist if the one-third octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by five dBA for center frequencies of 500 [hertz (Hz)] and above, by eight dBA for center frequencies between 160 Hz and 400 Hz, or by 15 dBA for center frequencies less than or equal to 125 Hz.
4. In the event the audible noise due to wind turbine operations contains repetitive impulsive sounds, the standards for audible noise set forth in subparagraph (1) of this subsection shall be reduced by five dBA.
5. In the event the audible noise due to wind turbine operations contains both a pure tone and repetitive impulsive sounds, the standards for audible noise set forth in subparagraph (1) of this subsection shall be reduced by a total of five dBA.
6. In the event the ambient noise level (exclusive of the development in question) exceeds one of the standards given above, the applicable standard shall be adjusted so as to equal the ambient noise level. For audible noise, the ambient noise level shall be expressed in terms of the highest whole number sound pressure level in dBA which is exceeded for no more than five minutes per hour (L8.3). For low-frequency noise or infrasound, the ambient noise level shall be expressed in terms of the equivalent level (L_{eq}) for the one-third octave band in question, rounded to the nearest whole decibel. Ambient noise levels shall be measured within 50 feet of potentially affected existing residences, schools, hospitals, churches or public libraries. Ambient noise level measurement techniques shall employ all practical means of reducing the effects of wind-generated noise at the microphone. Ambient noise level measurements may be performed when wind velocities at the

proposed project site are sufficient to allow wind turbine operation, provided that the wind velocity does not exceed 30 mph at the ambient noise measurement location.

7. Any noise level falling between two whole decibels shall be the lower of the two.
8. In the event that noise levels, resulting from a proposed development, exceed the criteria listed above, a waiver to said levels may be granted by the planning director provided that the following has been accomplished:
   a. Written consent from the affected property owners has been obtained stating that they are aware of the proposed development and the noise limitations imposed by this code, and that consent is granted to allow noise levels to exceed the maximum limits allowed;
   b. A permanent noise impact easement has been recorded in the County Hall of Records which describes the benefited and burdened properties and which advises all subsequent owners of the burdened property that noise levels in excess of those permitted by this code may exist on or at the burdened property.

III.21.1.3.4 Los Angeles County

The Los Angeles County General Plan Noise Element (1974) states that county policy establishes acceptable noise standards that are consistent with health and quality-of-life goals. County policy also employs effective techniques of noise abatement through such means as building codes, noise, sub-divisions, and zoning ordinances. Los Angeles County has therefore established various noise standards within its municipal code.

III.21.1.3.5 Mono County

The goal of the Noise Element of the Mono County General Plan (2010) is to maintain existing ambient noise levels that preserve the county's quiet, rural atmosphere. This is achieved through policies in both the General Plan Noise Element and the county code (Chapter 10.16 [1983]). This code provides property line noise-level limits, interior noise limits, and exclusions and provisions for various noise sources. The ordinance does not contain any specific regulation for renewable energy projects such as wind farms.

III.21.1.3.6 Riverside County

The Riverside County General Plan Noise Element (2008) includes policies and standards to protect public health and welfare from noise impacts.

III.21.1.3.6.1 Wind Energy Conversion Systems

Wind energy conversion systems (WECS), or wind turbines, harness the energy from strong gusts of wind. Many wind turbines now operate in portions of the Coachella Valley and San Gorgonio Pass, within Riverside County. To avoid noise and ground-borne vibration in neighboring developed areas, the Wind Implementation Monitoring Program, designed and implemented by Riverside County, is enforced.

In addition, the Riverside County Municipal Code, Section 17.224 states:

a. A commercial WECS permit shall not be granted unless the applicant demonstrates that the proposed WECS or WECS array complies with the setbacks requiring no acoustical studies as set forth in subsection (L)(1)(b) of this section, or that the projected WECS noise level will comply with the noise standards as set forth in subsection L (1)(c) of this section. The projected WECS noise level is the level of noise projected to be produced by all commercial WECS proposed under the permit application and shall be calculated in accordance with the technical specifications and criteria adopted pursuant to subsection (L) (3) of this section. A variance from this property development standard may be granted pursuant to the provisions of Chapter 17.196 WECS array setbacks requiring no acoustical studies. WECS arrays with 10 or fewer WECS (comprised of WECS designed in accordance with proven good engineering practices) set back where each WECS in the array [is] 2,000 feet or more from the nearest receptor as set forth in subsection (L)(1)(e) of this section, shall be permitted without an acoustical study.

b. WECS arrays with more than 10 WECS (comprised of WECS designed in accordance with proven good engineering practices) can qualify for this condition if each WECS in the array is set back 3,000 feet or greater. WECS designed with the following characteristics shall be deemed in accordance with proven good engineering practices: at least three blades; upwind rotor; no furling; tapered and twisted blades; airfoils designed to stall softly (defined in technical specifications and criteria adopted pursuant to subsection (L)(3) of this section. WECS arrays approved under this subsection shall have noise standards as set forth in subsection (L)(1)(c) of this section.

c. Noise Standards. The projected WECS noise level to each receptor (as set forth in subsection L (1)(e) of this section) shall be at or below 55 dB(A) weighted (unless at setback distances as set forth in subsection (L)(1)(b) of this section, are adhered to).

d. The noise standard set forth in subsection (L)(1)(c) of this section, shall be reduced by five dB(A) where it is projected that pure tone noise will be generated. A pure tone shall exist if the one-third octave band sound pressure level in the bandwidth of the tone exceeds the arithmetic average of the sound pressure levels on the two contiguous one-third octave bands by five dB for center frequencies of 500 Hz and above, and eight dB for center frequencies between 160 and 400 Hz, and by 15 dB for center frequencies less than or equal to 125 Hz.

    i. Receptor (the point of measurement) for the calculation of the WECS noise level projected pursuant to subsection (L)(1)(a) of this section shall be determined as follows:

    ii. Existing structures in the vicinity of the commercial WECS project property which are actually used as a habitable dwelling, hospital, school, library or nursing home shall be identified.

e. The point of measurement shall be a point 10 feet from the outer wall, or equivalent distance, from the WECS being measured to any habitable dwelling, hospital, school, library or nursing home.

f. Low Frequency Noise Criteria. Where acoustical studies are required, and the WECS are not designed in accordance with proven good engineering practices as defined in subsection (L)(1)(b) of this section, the low frequency noise shall not exceed the following at a receptor: 75 dB(C) weighted (5 to 100 hertz) or Predicted C(PC) for nonimpulsive WECS. 67 dB(C) weighted (5 to 100 hertz) or PC for impulsive WECS (as defined in technical specification and criteria adopted pursuant to subsection (L)(3) of this section). WECS array low frequency impacts shall be calculated in accordance with technical specifications and criteria adopted pursuant to subsection (L)(3) of this section.

III.21.1.3.7 San Bernardino County

The purpose of the Noise Element of the County of San Bernardino General Plan (2007) is to limit the exposure of the community to excessive noise levels. This is achieved through both policies and regulations.

III.21.1.3.8 San Diego County

III.21.1.3.8.1 San Diego County General Plan Noise Element

The purpose of the Noise Element of the San Diego County General Plan (2011) is to limit the exposure of the community to excessive noise levels. It incorporates noise exposure criteria into land use planning to reduce future conflicts between noise and land use. This is achieved by specifying acceptable noise exposure ranges for various land uses throughout the county. The county uses Noise Compatibility Guidelines to determine the compatibility of noise and land use when evaluating proposed development projects.

The Noise Compatibility Guidelines cover different levels of compatibility and are flexible enough to apply to a range of projects and environments. For example, a commercial project would be evaluated differently from a residential project in a rural area or from a mixed-use project in a more densely developed area of the county.

A land use located in an area identified as "acceptable" would indicate that standard construction methods would attenuate exterior noise to an acceptable indoor noise level, and that people could carry out outdoor activities with minimal noise interference. Land uses that fall into a "conditionally acceptable" noise environment should have an acoustical study that considers the type of noise source, the sensitivity of the noise receptor, and the degree to which the noise source may interfere with sleep, speech, or other activities. For land uses indicated as "conditionally acceptable," structures must be able to attenuate the exterior noise to the indoor noise level, as required in the noise standards. For land uses where exterior noise levels fall within the "unacceptable" range, new construction should generally not be developed.

III.21.1.3.8.2 County of San Diego Noise Ordinance

In addition to the San Diego County General Plan Noise Element (2011), the county adopted community noise control standards in its County Noise Abatement and Control Ordinance (County Code of Regulatory Ordinances, Title 3, Division 6, Chapter 4). These standards provide guidance for implementing the county's noise policies and ordinance in San Diego County's CEQA Guidelines for Determining Significance for Noise. This ordinance defines limits for excessive noise and sets noise-level limits for land uses. San Diego County's California Environmental Quality Act (CEQA) Guidelines provide guidance for the use of the General Plan Noise Element and the County Noise Abatement and Control Ordinance when considering the environmental impacts of noise exposure to high noise levels.

III.21.2 Noise and Vibration Fundamentals

III.21.2.1 Noise Fundamentals

Sound can be defined as air pressure variations that the ear detects. Vibration is the transmission of "sound" waves through solids or liquids.

Sound is caused by minute pressure variations in the air—both above and below static atmospheric pressure—that are sensed by the human ear. The number of these minute pressure variations, measured over time, is the frequency of the sound. Excessively high noise levels can cause physical and psychological damage.

Sound pressures are measured and reported in units of dB. The dB is a ratio of pressures. Because the dB is logarithmic, sound levels are not cumulative through simple arithmetic. Two equal noise levels will combine logarithmically to increase the noise level by 3 dB.

Noise is defined as any undesirable sound that interferes with normal activities, or that in some way reduces environmental quality. Determining whether a sound is undesirable often depends on a receiver's activity and the time of day. For most people, some usual consequences of noise include interference with speech and other communication, distractions at home and at work, disturbance of rest and sleep, and the disruption of recreational pursuits. The long-term effects of noise can be widespread and include both psychological and physiological effects.

Noise can be of special concern to residents, particularly during evening and nighttime hours. New stationary noise sources, such as wind or thermal turbine generators, can impact nearby communities. Loud noise levels can also potentially impact special-status biological species such as nesting songbirds.

The most common frequency-weighting used for assessment of noise in the ambient environment is A-weighting. A-weighting is a frequency correction that often correlates well with a subjective human response to noise.

The noise at any given location is a function of the noise produced by the source, the propagation path between the source and the receiver, and the sensitivity of the receiver. To reduce noise levels to a sensitive receptor, the only available options are to reduce the noise of the source, interrupt the propagation path between the source and the receiver, or increase the distance between the source and the receiver. The propagation path is simply the path the sound travels between its source and the receiver.

The actual impact of noise is not its loudness alone. The time of day when noise occurs and the duration of the noise are also important factors. Most noise that lasts longer than a few seconds is also variable in its intensity. Therefore, a variety of metrics are used to address sound and noise levels. Sound varies from instant to instant. To describe sound and noise levels, it is necessary to consider the time over which it occurs. The L_{eq} is the equivalent steady-state sound level, in a stated period of time, which contains the same acoustical energy as the time-varying sound level during the same period.

Other measures used in the consideration of noise include the CNEL, the sound exposure level, the maximum noise level (L_{max}), and the level exceeded in a given amount of time (L_N).

While people and other species respond differently to specific noise situations, the overall response is primarily determined by these three elements of evaluation: sound pressure levels, the duration of those levels, and the time of day of the exposure.

The most obvious factor affecting noise levels is the distance from a noise source to a receiver. The manner in which noise weakens over distance depends on:

- Geometric spreading from point and line sources.
- Ground absorption.
- Atmospheric effects and refraction.
- Shielding by natural and man-made features, noise barriers, diffraction, and reflection.

Sound from a small localized source (approximating a "point" source) such as a piece of construction equipment, a wind turbine, or a transformer, radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level decreases or drops off at a rate of 6 dBA for each doubling of the distance (6 dBA/DD).

The repeated movement of multiple sources of the sound appears to emanate from a line (line source) rather than a point when viewed over some time interval. Noise from a line source, such as traffic on a roadway, travels away from the source in a cylindrical pattern, which drops off at a rate of 3 dBA/DD.

The drop-off rates presume that the intervening ground between a source and a receiver is reflective, such as hardscape, parking lots, or smooth bodies of water. If there is an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees, an excess ground attenuation value of 1.5 dBA/DD may be added to the hard site drop-off rate. When added to the hard site drop-off rate, this results in an overall drop-off rate of 4.5 dBA/DD for a line source (7.5 dBA/DD for a point source).

In the outdoor environment, the average person perceives a change in noise level as follows (Bolt, Beranek, and Newman 1973, Beranek 1988):

- 3 dBA: barely perceptible
- 5 dBA: readily perceptible
- 10 dBA: perceived as a doubling or halving of noise

Wind speed can bend the path of sound to "focus" it on the downwind side and create a "shadow" on the upwind side of the source. At short distances, the wind has a minor influence on the measured sound level. For long distances, wind effects become measurably greater. Temperature gradients create effects similar to those of wind gradients, except that they are uniform in all directions from the source. On a sunny day with no wind, temperature decreases with altitude, creating a shadow effect for sound. On a clear night, temperature may increase with altitude, focusing sound on the ground surface.

A large object in the path between a noise source and a receiver can significantly attenuate noise levels at a given location. The degree of attenuation depends on the size of the object and the frequencies of the sound levels. Natural terrain features such as hills and dense woods, as well as built features such as buildings and walls, can significantly alter perceived noise levels.

Natural sounds are part of the ambient noise environment. In undeveloped and rural areas the sound of wind flowing through vegetation is often dominant. Wind-induced noise includes broadband turbulent noise and Aeolian noise (tones or whistles that vary in frequency with the wind speed). Turbulent noise is characteristic of any natural or artificial structure, and is therefore not considered a nuisance. It is characteristic of trees and some landforms.

Typical noise levels from various sources within the natural and built environments are shown in Table III.21-1. As this table indicates, noise levels could range from fewer than 40 dBA up to 130 dBA (on a short-term basis) near military airfields.

Table III.21-1
Typical Noise Levels in A-Weighted Decibel Scale

Subjective Impression	dBA	Example Noise Condition or Event
Threshold of hearing	0	—
Barely audible	5–10	—
Very quiet	15–30	Empty recording studio; quiet rural area, winter night, no wind; whisper, quiet library
Quiet	35–45	Quiet suburban area at night; typical rural area daytime background conditions
Moderately noisy	50–65	Typical daytime suburban background conditions; typical urban residential area away from major streets; typical daytime urban mixed-use area conditions, background music, conversation in restaurant; typical daytime busy downtown background conditions
Noisy	70–75	Auto, 35 miles per hour at 20 feet; 300 feet from busy 6-lane freeway; street sweeper at 30 feet; idling locomotive at 50 feet
Very noisy	80–85	2-axle commercial truck, 35 miles per hour at 20 feet; city bus at 30 feet
8-hour workplace limit	90	Heavy truck, 35 miles per hour at 20 feet; leaf blower at 5 feet
Extremely noisy	95	Locomotive horn at 100 feet; subway train at 200 feet

Table III.21-1
Typical Noise Levels in A-Weighted Decibel Scale

Subjective Impression	dBA	Example Noise Condition or Event
Possible building damage	100–120	Outboard motor, jackhammer, snowmobile, motorcycle; emergency vehicle siren at 50 feet, power lawn mower at 3 feet; peak crowd noise pro football game, open stadium; F/A-18 aircraft takeoff with afterburner at 1,600 feet, loud rock concert; Mach 1.1 sonic boom under aircraft at 12,000 feet
Threshold of pain	125–130	F/A-18 aircraft takeoff with afterburner at 470 feet, pneumatic riveter at 4 feet; surface detonation, 30 pounds of TNT at 1,000 feet

Source: Data compiled from various sources.

III.21.2.2 Vibration

Construction activities can create varying degrees of ground vibration, depending upon equipment and construction method. Construction activities that typically generate the most severe vibrations are blasting and impact pile driving.

Three ground-borne vibration impacts are of general concern: (1) human annoyance, (2) interference with vibration-sensitive activities, and (3) damage to buildings. In evaluating ground-borne vibration, two descriptors are widely used:

- The peak particle velocity, measured as a distance per time (such as inch/second), is the maximum peak velocity of the vibration and correlates with the stresses experienced by buildings.
- The vibration velocity level represents a one-second average amplitude of the vibration velocity. It is typically expressed on a log scale in decibels (VdB) just as noise is measured in dB. This descriptor is suitable for evaluating human annoyance because the human body responds to average vibration amplitude.

In the United States, there are no widely adopted standards for acceptable levels of the ground vibration generated by construction, although some jurisdictions have adopted vibration standards. A background vibration velocity level in residential areas is typically 50 VdB or lower, well below the threshold of human perception, which is around 65 VdB (Hanson, et al. 2006). Vibration levels would typically be higher in the immediate vicinity of transportation corridors or construction and demolition sites. Human impact is not usually significant unless the vibration exceeds 70 VdB. For evaluating interference with vibration-sensitive activities, the vibration impact criterion for general assessment is 65 VdB.

For residential and institutional land use (primarily daytime use only, such as a school or church), the criteria range from 72 to 80 VdB and from 75 to 83 VdB, respectively, depending on event frequency. For potentially damaging structural effects, vibration damage guidelines for various structural categories are provided (Hanson, et al. 2006). Damage to buildings would occur at much higher levels (0.12 inch/second or higher, or about 90 VdB or higher) than either human annoyance or interference with vibration-sensitive activities.

III.21.3 Noise and Vibration in the DRECP Area

The existing noise and vibration environments within the DRECP area are as varied as the land uses. See Chapter III.11, Land Use and Policies, for a discussion of existing land uses within the DRECP area.

Due to the generally rural, undeveloped nature of most of the DRECP area, ambient noise levels are expected to be relatively low compared with more urbanized areas. Ambient noise level measurements, however, are not available for the entire DRECP area. The acoustic environment is a resource with intrinsic value. It is important as a natural resource, a cultural resource, or both. The relatively low noise levels compared to more urbanized areas are a critical component of the desert character in general and the wilderness characteristics that the desert often supports. This relative quiet is important for wildlife communication, behavior, and other ecological processes. The sense of quiet and the natural soundscape is also important to many recreational users of the desert in general, and to recreational users of wilderness areas in particular. Wilderness areas are discussed further in Section III.18, Outdoor Recreation.

Noise- and vibration-generating activities may include but are not limited to urban environments; construction and development (including existing renewable energy development and other Bureau of Land Management (BLM)-authorized rights-of-way [ROWs]); train movements; recreational activity (such as camping, hiking, hunting, shooting, and off-road vehicles); motorized vehicle traffic on local roadways; military activity and aircraft over flights; military and U.S. Border Patrol helicopters; and mineral exploration and drilling.

III.21.3.1 Sensitive Receptors

Noise-sensitive receptors are areas of human habitation or substantial use where the intrusion of noise or vibration has the potential to adversely impact the occupancy, use, or enjoyment of the environment. Receptors can include residences, schools, hospitals, parks, and places of business requiring low levels of noise.

In addition to human receptors within the DRECP area, sensitive receptors also include wildlife. Noise-sensitive Focus Species within the DRECP area are listed in Table III.21-2. Noisy environments stress wildlife. High noise levels can adversely affect wildlife activities including locating mates, avoiding predators, protecting young, and establishing territories. Studies over the past 40 years into the effects of noise on terrestrial wildlife, however, present conflicting information on the impacts of anthropogenic noise on any given species (Radle 2002, NPS 2011). The conflicting information is largely due to the variety of factors affecting assessment of the impacts. The following factors can affect the determination of impacts: ambient sound level, source level, character of the source, climate, vegetation, topography, and the hearing sensitivity of a species to dominant frequencies from a particular source. As noted in Section III.21.1, there are no specific noise level standards for any Focus Species within the DRECP area.

For the DRECP area, and to be conservative, it is assumed that all communities and cities contain sensitive human receptors and that noise-sensitive wildlife live in all ecoregion subareas. Communities and cities, by DRECP area ecoregion subarea, are discussed in several chapters of this document, including Chapter III.11, Land Use and Policies and Chapter III.20, Visual Resources. Table III.21-3 provides typical noise levels for various environments. Wildlife resources, including noise-sensitive species within the DRECP area, are discussed in detail in Chapter III.7, Biological Resources.

Table III.21-2
Sensitive Biological Resources

Taxa	Common Name	Scientific Name	Noise-Sensitive	Impact Standard
Amphibian/ Reptile	Agassiz's desert tortoise	*Gopherus agassizii*	Not Known	NA
	Arroyo toad	*Anaxyrus (Bufo) californicus*	Yes	NA
	Flat-tailed horned lizard	*Phrynosoma mcallii*	Yes	NA
	Mojave fringe-toed lizard	*Uma scoparia*	Yes	NA
	Tehachapi slender salamander	*Batrachoseps stebbinsi*	Not Known	NA
Bird	Arizona Bell's vireo	*Vireo bellii arizonae*	Yes	NA
	Bendire's thrasher	*Toxostoma bendirei*		NA
	Burrowing owl	*Athene cunicularia*	Yes	NA
	California black rail	*Laterallus jamaicensis coturniculus*		NA
	California condor	*Gymnogyps californianus*		NA
	Elf owl	*Micrathene whitneyi*	Yes	NA
	Gila woodpecker	*Melanerpes uropygialis*	Yes	NA
	Golden eagle	*Aquila chrysaetos*		NA
	Greater sandhill crane	*Grus canadensis tabida*		NA
	Least Bell's vireo	*Vireo bellii pusillus*	Yes	NA

Table III.21-2
Sensitive Biological Resources

Taxa	Common Name	Scientific Name	Noise-Sensitive	Impact Standard
	Mountain plover	*Charadrius montanus*	Yes	NA
	Swainson's hawk	*Buteo swainsoni*		NA
	Tricolored blackbird	*Agelaius tricolor*		NA
	Western yellow billed cuckoo	*Coccyzus americanus occidentalis*		NA
	Willow flycatcher (including southwestern)	*Empidonax traillii* (including *extimus*)		NA
	Yuma clapper rail	*Rallus longirostris yumanensis*		NA
Fish	Desert pupfish	*Cyprinodon macularius*	Not Known	NA
	Mohave tui chub	*Siphateles [Gila] bicolor mohavensis*	Not Known	NA
	Owens pupfish	*Cyprinodon radiosus*	Not Known	NA
	Owens tui chub	*Siphateles [Gila] bicolor snyderi*	Not Known	NA
Mammal	Bighorn sheep (Peninsular Ranges distinct population segment (DPS) and Nelson's)	*Ovis canadensis nelsoni*	Not Known	NA
	Burro deer	*Odocoileus hemionus eremicus*	Not Known	NA
	California leaf-nosed bat	*Macrotus californicus*	Yes	NA
	Desert kit fox	*Vulpes macrotis arsipus*	Not Known	NA
	Mohave ground squirrel	*Spermophilus [Xerospermophilus] mohavensis*	Not Known	NA
	Mohave River vole	*Microtus californicus mohavensis*	Not Known	NA
	Pallid bat	*Antrozous pallidus*	Not Known	NA
	Townsend's big-eared bat	*Corynorhinus townsendii*	Yes	NA

Table III.21-3
Typical Noise Levels in A-Weighted Decibel Scale

Environment	Noise Level
Carrier Flight Deck	140
	130
	120
Rock Music Concert or Inside Subway Station (New York)	110
	100
Boiler Room or Printing Press Plant	90
Higher Limit of Urban Ambient Sound	80
	70
Data Processing Center or Department Store	60
Large Business Office or Quiet Urban Daytime	50
Quiet Urban Nighttime	40
Library and Bedroom at Night, Quiet Rural Nighttime or Secluded Wilderness	30
Broadcast and Recording Studio	20
	10
	0

III.21.4 Sensitive Receptors by Ecoregion Subarea

This section, organized by ecoregion subarea, describes sensitive receptors for human and wildlife communities throughout the DRECP area.

III.21.4.1 Cadiz Valley and Chocolate Mountains Ecoregion Subarea

Communities and cities found within the Cadiz Valley and Chocolate Mountains ecoregion subarea are shown in Appendix R1, Figure R1.21-1. This ecoregion subarea includes Palo Verde, Ripley, East Blythe, Blythe, Ehrenberg (immediately adjacent to the ecoregion subarea boundary), Desert Center, Midland, Rice, Vidal, Big River, Parker, Bluewater, Vidal Junction, and Chubbuck. Wildlife resources within the Cadiz Valley and Chocolate Mountains ecoregion subarea are discussed in Chapter III.7, Sections III.7.5 and III.7.6.

III.21.4.2 Imperial Borrego Valley Ecoregion Subarea

Communities and cities found within the Imperial Borrego Valley ecoregion subarea are shown in Figure R1.21-2 and include Yuma (immediately adjacent to the ecoregion subarea boundary), Andrade, Ogilby, Holtville, Calexico, Heber, El Centro, Imperial, Seeley, Plaster City, Coyote Wells, Ocotillo, Brawley, Glamis, Westmorland, Calipatria, Niland, and Borrego

Springs. Wildlife resources within the Imperial Borrego Valley ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.3 Kingston and Funeral Mountains Ecoregion Subarea

Communities and cities found within the Kingston and Funeral Mountains ecoregion subarea shown in Figure R1.21-3 and include Kingston, Cima, Ivanpah, Nipton, Tecopa, and Shoshone. Wildlife resources within the Kingston and Funeral Mountains ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.4 Mojave and Silurian Valley Ecoregion Subarea

Communities and cities found within the Mojave and Silurian Valley ecoregion subarea include Newberry Springs, Daggett, Yermo, Afton, Crucero, Red Mountain, and Johannesburg (see Figure R1.21-4). Wildlife resources within the Mojave and Silurian Valley ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.5 Owens River Valley Ecoregion Subarea

Communities and cities found within the Owens River Valley ecoregion subarea include Little Lake, Haiwee, Olancha, Cartago, Bartlett, Keeler, Lone Pine, Owenyo, and Independence (see Figure R1.21-5). Wildlife resources within the Owens River Valley ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.6 Panamint Death Valley Ecoregion Subarea

Communities and cities found within the Panamint Death Valley ecoregion subarea include Searles, Westend, Trona, Searles Valley, and Death Valley (see Figure R1.21-6). Wildlife resources within the Kingston and Funeral Mountains ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.7 Pinto Lucerne Valley and Eastern Slopes Ecoregion Subarea

Communities and cities found within the Pinto Lucerne Valley and Eastern Slopes ecoregion subarea include Twentynine Palms, Joshua Tree, Morongo Valley, Lucerne Valley, Apple Valley, Victorville, and Newberry Springs (see Figure R1.21-7). Wildlife resources within the Pinto Lucerne Valley and Eastern Slopes ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.8 Piute Valley and Sacramento Mountains Ecoregion Subarea

Communities and cities found within the Piute Valley and Sacramento Mountains ecoregion subarea include Needles and Topock, which are immediately adjacent to both the DRECP area and the ecoregion subarea boundary (see Figure R1.21-8). Wildlife resources within the Piute Valley and Sacramento Mountains ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.9 Providence and Bullion Mountains Ecoregion Subarea

Communities and cities found within the Providence and Bullion Mountains ecoregion subarea include Cadiz, Amboy, Bagdad, Essex, Fenner, Goffs, and Ludlow (see Figure R1.21-9). Wildlife resources within the Providence and Bullion Mountains ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.4.10 West Mojave and Eastern Slopes Ecoregion Subarea

Communities and cities found within the West Mojave and Eastern Slopes ecoregion subarea are shown on Figure R1.21-10. They include Summit (immediately adjacent to the DRECP area and the ecoregion subarea boundary), Hesperia, Mountain View Acres, Adelanto, Oro Grande, Pearblossom, Littlerock, Acton (immediately adjacent to, but outside the DRECP area and ecoregion subarea boundary), Palmdale, Desert View Highlands, Quartz Hill, Elizabeth Lake, Lake Hughes (immediately adjacent to, but outside the DRECP area and ecoregion subarea boundary), Lancaster, Lake Los Angeles, Helendale Hodge, Daggett, Lenwood, Hinkley, Kramer Junction, Boron, North Edwards, Rosamond, California City, Mojave, Monolith, Tehachapi, Golden Hills, Cantil, Atolia, Saltdale, Garlock, and Ridgecrest. Wildlife resources within the West Mojave and Eastern Slopes ecoregion subarea are discussed in Sections III.7.5 and III.7.6.

III.21.5 Noise and Vibration Environment Outside of DRECP Area

The affected environment outside of the DRECP area is described because of the potential for transmission lines to be required in these areas. Transmission lines could be required in four geographic areas: San Diego County, Los Angeles County, North Palm Springs–Riverside, and the Central Valley.

The federal and state regulatory setting presented in Section III.21.1 encompasses all the transmission corridors outside the DRECP area. Due to the universal nature of noise and vibration fundamentals, the environmental setting presented in Section III.21.2 encompasses all Transmission Outside of DRECP area corridors as well.

A wide range of noise sources and sensitive receptors are found along each Outside of DRECP area corridor. The environmental setting and ambient noise conditions along these corridors vary from rural and undeveloped to highly urban. Ambient noise adjacent to the corridors is lower in rural settings and higher in urban settings, particularly where urban settings include roadways with heavy traffic. Notable noise-sensitive land uses located adjacent to corridors include school facilities, churches, medical facilities, park facilities, recreational lands, cemeteries, and residences.

Each of the four Outside of DRECP area corridors follows existing major 500 kV ROWs. Perceptible noise generated from the construction and operation of transmission infrastructure (including substations) generally falls into the following four broad categories.

1. **Construction.** Recent construction of 500 kV transmission lines and substations within the Outside of DRECP area corridors has caused periodic noise levels ranging from greater than 83 dBA at 50 feet to 52 dBA at approximately 3,200 feet from the source. However, construction noise is short-term and temporary and therefore does not cause a permanent increase in ambient noise levels at receptor locations immediately adjacent to any transmission ROW or substation location.
2. **Operations and Maintenance (O&M) Activities.** O&M activities are similar to construction, except that they are short-term and temporary and do not cause a permanent increase in ambient noise levels at receptor locations immediately adjacent to any transmission ROW or substation location.
3. **Corona Discharge Noise From Transmission Infrastructure and Substations.** The effects of high-voltage transmission lines fall into two broad categories: corona effects and electric field effects. Corona is the ionization of the air at the surface of the energized conductor and suspension hardware, caused by the very high electric field strength at the surface of the metal under certain conditions. The amount of corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductor (or bundle of conductors), the elevation of the line above sea level, the condition of the conductor and hardware, and local weather conditions. Corona typically becomes a design concern for transmission lines at 345 kV and greater, and is less noticeable on lines operated at lower voltages.
4. **Corona generates audible noise during the operation of transmission lines.** The noise is generally described as a crackling, hissing, or humming noise. The noise is most noticeable during rain or fog when the conductor is wet. Background noise at locations beyond the edge of the ROW often masks audible noise from transmission lines, particularly where the line runs near a source of background noise, such as a freeway. During wet weather conditions, the conductor will produce the greatest amount of corona noise. However, during heavy rain the ambient noise generated by the falling raindrops is typically greater than the noise generated by corona.