4.14 Noise and Vibration

This section describes the existing sound levels and ground-borne vibration associated with current operations at the Navajo Mine, FCPP, and of the subject transmission lines and evaluates the potential impacts of the Proposed Action and alternatives to this baseline. The following provides definitions of noise and vibration and describes the measurements associated with each.

4.14.1 Fundamentals of Acoustics

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. When sound becomes excessive or unwanted, it is referred to as noise. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual.

Sound (noise) levels are measured and quantified with several metrics. All of them use the logarithmic decibel (dB) scale with 0 dB roughly equal to the threshold of human hearing. A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a 50-dB sound is added to another 50-dB sound, the total is only a 3-dB increase (to 53 dB). Thus, every 3-dB change in sound levels represents a doubling or halving of sound energy. Related to this is the fact that a less-than-3-dB change in sound levels is imperceptible to the human ear.

The frequency of sound is a measure of the pressure fluctuations per second, measured in Hz. Most sounds do not consist of a single frequency, but consist of a broad band of frequencies differing in level. The characterization of sound level magnitude with respect to frequency is the sound spectrum. Many rating methods exist to analyze sound of different spectra. One rating method is called A-weighting (there are also B- and C-weighting filters). The A-weighted scale (dBA) most closely approximates how the human ear responds to sound at various frequencies by progressively deemphasizing frequency components below 1,000 Hz and above 6,300 Hz and reflects the relative decreased sensitivity of humans to both low and extremely high frequencies (Federal Highway Administration [FHWA] 2006). Table 4.14-1 lists typical sound levels from representative sources.

Table 4.14-1 Typical Noise Levels (measured at distance a person would typically be from the source)

Typical Noise Source	Sound Level (dBA)
Grand Canyon at Night (no roads, birds, wind)	10
Computer	37-45
Refrigerator	40-43
Typical Living Room	40
Forced Hot Air Heating System	42-52
Microwave	55-59
Normal Conversation	55-65
Clothes Dryer	56-58
Dishwasher	63-66
Clothes Washer	65-70
Phone	66-75
Push Reel Mower	68-72
Hairdryer	80-95

Typical Noise Source	Sound Level (dBA)
Vacuum Cleaner	84-89
Leaf Blower	95-105
Circular Saw	100-104
Maximum Output of a Stereo	100-110
Jet Fly-over at 1,000 Feet	110

Source: Noise Pollution Clearinghouse 2012.

The duration of noise and the time period at which it occurs are important factors in determining the impact of noise on sensitive receptors. Several methods are used for describing variable sounds including the equivalent level (L_{eq}), the maximum level (L_{max}), and the percent-exceeded levels. These metrics are derived from a large number of moment-to-moment A-weighted sound level measurements. Some common metrics reported in community noise monitoring studies are described below:

- L_{eq}, the equivalent level, can describe any series of noise events of arbitrary duration, although the most common averaging period is hourly. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events and L_{eq} is the common energy-equivalent sound/noise descriptor.
- L_{max} is the maximum sound level during a given time. L_{max} is typically due to discrete, identifiable events such as an airplane overflight, car or truck passing by, or a dog barking.
- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when no obvious nearby intermittent noise sources occur.
- L_{50} is the median sound level in dBA exceeded 50 percent of the time during the measurement period.
- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.

In determining the daily measure of community noise, it is important to account for the difference in human response to daytime and nighttime noise. Noise is more disturbing at night than during the day, and noise indices have been developed to account for the varying duration of noise events over time as well as community response to them. The Day-Night Average Level (L_{dn}) is such an index. L_{dn} represents the 24-hour A-weighted equivalent sound level with a 10-dB penalty added to the “nighttime” hourly noise levels between 10:00 pm and 7:00 am. Because of the time-of-day penalties associated with the L_{dn} index, the L_{eq} for a continuously operating sound source during a 24-hour period will be numerically less. Noise is also more disturbing the closer a receptor is to the source; noise levels decrease by 6 dB as the distance from its source doubles (FHWA 2011).

4.14.2 Fundamentals of Vibration

Ground-borne vibration consists of waves transmitted through solid material. Several types of wave motions exist in solids, unlike air, including compressional, shear, torsional, and bending. The solid medium can be excited by forces, moments, or pressure fields. Ground-borne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be composed of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hz. Most environmental vibrations consist of a composite, or “spectrum” of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most ground-borne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz.

Ambient and source vibration information for this study are expressed in terms of the peak particle velocity (PPV) in inches per second (in/sec). PPV is used to measure vibration through a solid surface. When a vibration is measured, the point at which the measurement takes place can be considered to have a particle velocity. This particle vibration will take place in three dimensions (x, y, and z) and will usually end up back where it started. The PPV is the maximum velocity that is recorded during a particular event.

Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though risk of actual structural damage is very low. In high noise environments, which are more prevalent where ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud air-borne environmental noise causing induced vibration in exterior doors and windows.

Construction and mining activities can cause vibration that varies in intensity depending on several factors. The use of pile driving, vibratory compaction equipment, and blasting typically generates the highest construction- and mining-related ground-borne vibration levels. Because of the impulsive nature of such activities, the use of PPV has been routinely used to measure and assess ground-borne vibration from construction and mining activities (Jones and Stokes 2004). Specifically, OSMRE uses the PPV descriptor because it correlates well with damage or complaints (OSMRE 1986).

The two primary concerns with project-induced vibration, the potential to damage a structure and the potential to annoy people, are evaluated against different vibration limits. Studies have shown that the threshold of perception for the average person is a PPV in the range of 0.2 to 0.3 millimeter per second (0.008 to 0.012 in/sec). Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Vibration damage to buildings can be classified as cosmetic only, such as minor cracking of building elements, or may increase to the level of structural damage, which could threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary whether the vibrations are short-duration single events, such as from blasting, or continuous or repeated vibration events, such as from railroads or rail transit. The safe vibration limit from blasting is typically in the range of 2 in/sec, while the safe limit from continuous vibrations is typically 0.2 in/sec to prevent architectural damage to buildings (Jones and Stokes 2004). Construction-induced vibration that can be detrimental to a building is very rare and has only been observed in instances where the structure is in a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The reaction of humans and effects on buildings from continuous levels of vibration is shown in Table 4.14-2. However, annoyance is a subjective measure, and vibrations may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Table 4.14-2 Reaction of People and Damage to Buildings Resources from Continuous Vibration Levels

Vibration Level, PPV (in/sec)	Human Reaction	Effect of Buildings
0.006 to 0.019	Threshold of perception: Possibility of intrusion	Vibration unlikely to cause damage of any type.
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected.
0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings.
0.20	Vibrations annoying to people in buildings	Threshold at which a risk of "architectural" damage exists to normal dwellings such as plastered walls or ceilings.
0.40 to 0.60	Vibrations considered unpleasant by people subjected to continuous vibrations	Vibration at this level would cause "architectural" damage and possibly minor structural damage.

Source: Jones and Stokes 2004.

Noise and air-borne vibration perceived during blasting is the result of an air blast. An air blast is a pressure disturbance that travels through the air like any other sound, and it is quantified in the same manner as any noise event. Because of the impulsive nature of the blast, it is commonly referred to as an "overpressure" (a temporary increase in air pressure over the standard atmospheric pressure). Generally, air blasts are of short duration, usually 2 to 10 seconds. Because the air blast contains mostly low frequencies (typically less than 250 Hz), it is often felt rather than heard. The overpressure (and resultant noise) is a function of the source strength (charge weight), weather conditions, and distance to the receiver. Factors that affect ground vibration transmission include explosive composition, charge weight and delays, distance, depth of burial of the charge, and geologic formations. Air overpressure transmission is also affected by intensity, terrain features (e.g., trees, foliage, and other screening), orientation of the blast face, atmospheric conditions, temperature gradients, and wind direction and velocity.

4.14.3 Regulatory Compliance Framework

Federal, tribal, state, and local regulations and policies are established to limit noise exposure at noise sensitive land uses. Regulations vary widely among different jurisdictions throughout the country, with some states and counties having very restrictive noise ordinances and others having no regulations on noise. Noise regulations from all levels of government that may apply to the Project are described below.

4.14.3.1 Federal Regulations

Noise Control Act of 1972

The EPA, pursuant to the Noise Control Act of 1972, established guidelines for acceptable noise levels for sensitive receivers such as residential areas, schools, and hospitals. The levels set forth are 55-dBA L_{dn} for outdoor use areas and 45-dBA L_{dn} for indoor use areas, and a maximum level of 70-dBA L_{dn} is identified for all areas to prevent hearing loss (EPA 1974). These levels provide guidance for local jurisdictions, but do not have regulatory enforceability. In the absence of applicable noise limits, the EPA levels can be used to assess the acceptability of project-related noise.

U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development (HUD) has also established guidelines for acceptable noise levels for sensitive receivers such as residential areas, schools, and hospitals (24 CFR

51). HUD's noise levels include a two-pronged guidance, one for the desirable noise level and the other for the maximum acceptable noise level. The desirable noise level established by HUD conforms to the EPA guidance of 55-dBA L_{dn} for outdoor use areas of residential land uses and 45-dBA L_{dn} for indoor areas of residential land uses. The secondary HUD standard establishes a maximum acceptable noise level of 65-dBA L_{dn} for outdoor use areas of residential areas.

Mine Safety and Health Administration

MSHA regulates noise levels in mining environments (30 CFR 62), similar to Occupational Safety and Health Administration's (OSHA's) regulation of noise levels in industrial environments. Both agencies are under the US Department of Labor. MSHA regulations require that the time-averaged noise level of any work environment be limited to 90 dBA for any 8-hour period. Hearing protection can be used to bring the miner's noise exposure down to the permissible exposure level. Work environments exceeding 85 dBA for an 8-hour period require a hearing conservation program for workers. At no time should a miner be exposed to a noise level exceeding 115 dBA.

Applicable Vibration Regulations

OSMRE regulates ground-borne vibrations and air blasts from blasting activities at mining operations (30 CFR 816.67), including requirements for seismographic recording during each blast. Maximum allowable air blasts and ground-borne vibrations are specified for nearby vibration-sensitive buildings, including dwellings, public buildings, schools, churches, community buildings, and institutional buildings. Allowable air blasts are limited to a maximum of 129 flat-response or linear decibels (dBL) at 6 Hz or lower and 133 dBL at 2 Hz or lower. Allowable ground-borne vibration levels are weighted based on distance from the blasting site, with maximum PPV of 1.25 in/sec PPV_{max} at distances of 0 to 300 feet, 1.00 in/sec PPV_{max} at distances of 301 to 5,000 feet, and 0.75 in/sec PPV_{max} at distances of 5,001 feet and beyond. An alternative blasting level criterion (Blasting Level Chart) uses the ground-vibration limits to determine maximum allowable ground vibration if seismograph records include both particle velocity and vibration-frequency levels (Figure 4.14-1).

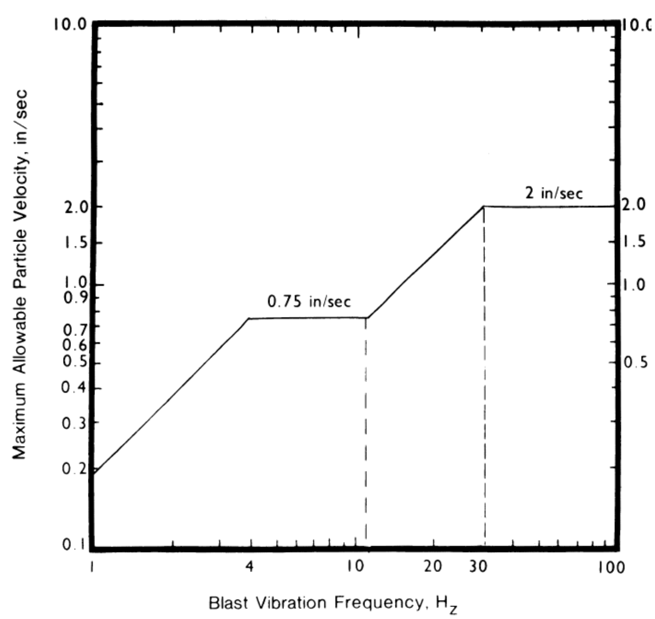

Figure 4.14-1 OSMRE Alternative Blasting Level Criteria (Source: 30 CFR 816.67)

4.14.3.2 Navajo Tribal Regulations

The Navajo Nation does not have any noise regulations or requirements that would be applicable to noise or vibration generated by the Project.

4.14.3.3 New Mexico State Regulations

The State of New Mexico does not have jurisdiction on the Navajo Nation, so any statewide noise or vibration regulations would not apply to the Project components within those boundaries. There are no New Mexico State noise or vibration regulations applicable to the transmission line portion of the Project.

4.14.3.4 Local Regulations

San Juan County, Apache County, Navajo County, and Coconino County do not have any noise regulations or ordinances that would be applicable to noise or vibration generated by the Project.

4.14.4 Affected Environment Pre-2014

4.14.4.1 Navajo Mine

Ambient Noise Levels

A series of noise measurements was conducted on February 23 and 24, 2011, with additional measurements conducted from January 17 to 21, 2012, to characterize typical noise levels generated by various mining activities, as well as to document ambient noise levels in and around the various areas of the mine. Noise circulation can be influenced by wind, temperature, cloud cover, fog, topography, and man-made barriers such as buildings and other structures. Generally, noise levels decrease as the distance increases between a source and a receiver. However, the direction in which the sound waves travel can be altered by weather conditions, which may result in varying noise levels at the same location at different times. For example, cloud cover tends to bend sound waves downward toward the ground, which can increase the sound heard by a receiver. Inversions, which occur when the air temperature increases as altitude increases, slow the atmospheric adsorption of the noise waves and may cause a noise to sound louder. Wind is another factor that generally causes sound waves to bend in the direction it flows and increase noise levels. These differing conditions provide an example of how weather may alter the circulation of sound waves such that the same noise sources may be perceived differently at a receptor depending on the weather at the time. Accordingly, the noise measurements collected around the various areas of the mine serve to represent noise levels that may be perceived under typical weather conditions rather than the full range of noise that may be perceived under more extreme weather environments.

Noise measurements were conducted in accordance with American National Standards Institute S12.91993 (R2008), the standard for environmental noise measurements. A total of 14 separate noise measurements were collected in February 2011, ranging in duration from 10 to 70 minutes, with 14 additional measurements collected in January 2012, ranging in duration from 10 minutes to 9 hours. Tables 4.14-3 and 4.14-4 present the results of the noise measurements. Noise measurement locations are shown graphically on Figure 4.14-2.

Table 4.14-3 Ambient Noise Measurements in the Navajo Mine Lease Area from February 2011

ID Number	Description of Location and Predominant Noise Source	Approximate Distance to Noise Source (feet)	Average Noise Level (dBA L_{eq})	Peak Noise Level (dBA L_{max})
1	Area IV South – Residence (peak noise is vehicle passby)	14,000	46	72
2	Area III - Dozers on coal stockpile	350	46	56
3	Area III - Lowe Ramp 1 - water trucks, haul trucks, and bottom dump trucks	100	66	77
4	Area III - Dragline #1 with D11 dozer in distance	770	56	63
5	Area III - Scrapers, water trucks on stockpile	45	69	74
6	Area III - Dixon Ramp 2 - D11 dozers (2)	370	66	74
7	Area III - In Dixon Pit – dragline with D11 dozer	730	62	69
8	Area III - Prestrip 63 – East – haul trucks – empty	75	67	79
8	Area III - Prestrip 63 – East – haul trucks – fully loaded	200	67	80
9	Prestrip 63 – West – haul trucks – fully loaded	75	72	84
9	Area III - Prestrip 63 – West – haul trucks – empty	200	72	77
10	Area I - Coal plant with power plant in distance	300	61	64
11	East of Area III - Near residence (peak noise is mining vehicle passby)	8,000	44	65
12	Area III - High wall by Lower Pit – dozers and dragline	770	62	72
13	Northwest of Area IV North - Near residence – no audible noise sources	4,500	33	36
14	Area III - Near blasting area in Lower Pit, Strip 59 – warning sirens	300	54	67
14	Area III - Near blasting area in Lower Pit, Strip 59 – blast	300	66	94

Source: HDR Engineering, Inc. 2012.

Table 4.14-4 Ambient Noise Measurements in the Navajo Mine Lease Area from January 2012

ID Number	Description of Location and Predominant Noise Source	Approximate Distance to Noise Source (feet)	Average Noise Level (dBA L_{eq})	Peak Noise Level (dBA L_{max})
ST-1	Area IV South – ambient	NA	35	50
ST-2	Area V – ambient	NA	34	55
ST-3	Area II – Yazzie Overlook – coal shot	250	74	109
ST-4	Area III – Dixon Pit – overburden drilling	250	71	87
ST-5	Area III – Dixon Pit – overburden blast	300	73	113
ST-6	Area II – Shop complex ready line – drill truck and crane truck	40	65	81
ST-7	Area II – Along rail line – passing coal train	50	65	88
ST-8	Area III – Top soil removal – dozer, end dumps	300	62	79
ST-9	Area III – Dixon Pit - dragline	500	61	81
ST-10	Area III – Lowe Stockpile – dozers and loaders	150	62	71
ST-11	Area III – Low Ramp 2 – occasional haul trucks	75	35	55
ST-12	Area III – Dixon Pit – coal shot	400	47	76
LT-1	Area I – Coal plant near power plant	700	54	78
LT-2	Area III – Large cast shot in Lowe Pit	700	49	81

Source: HDR Engineering, Inc. 2012.

Note:

NA – not applicable

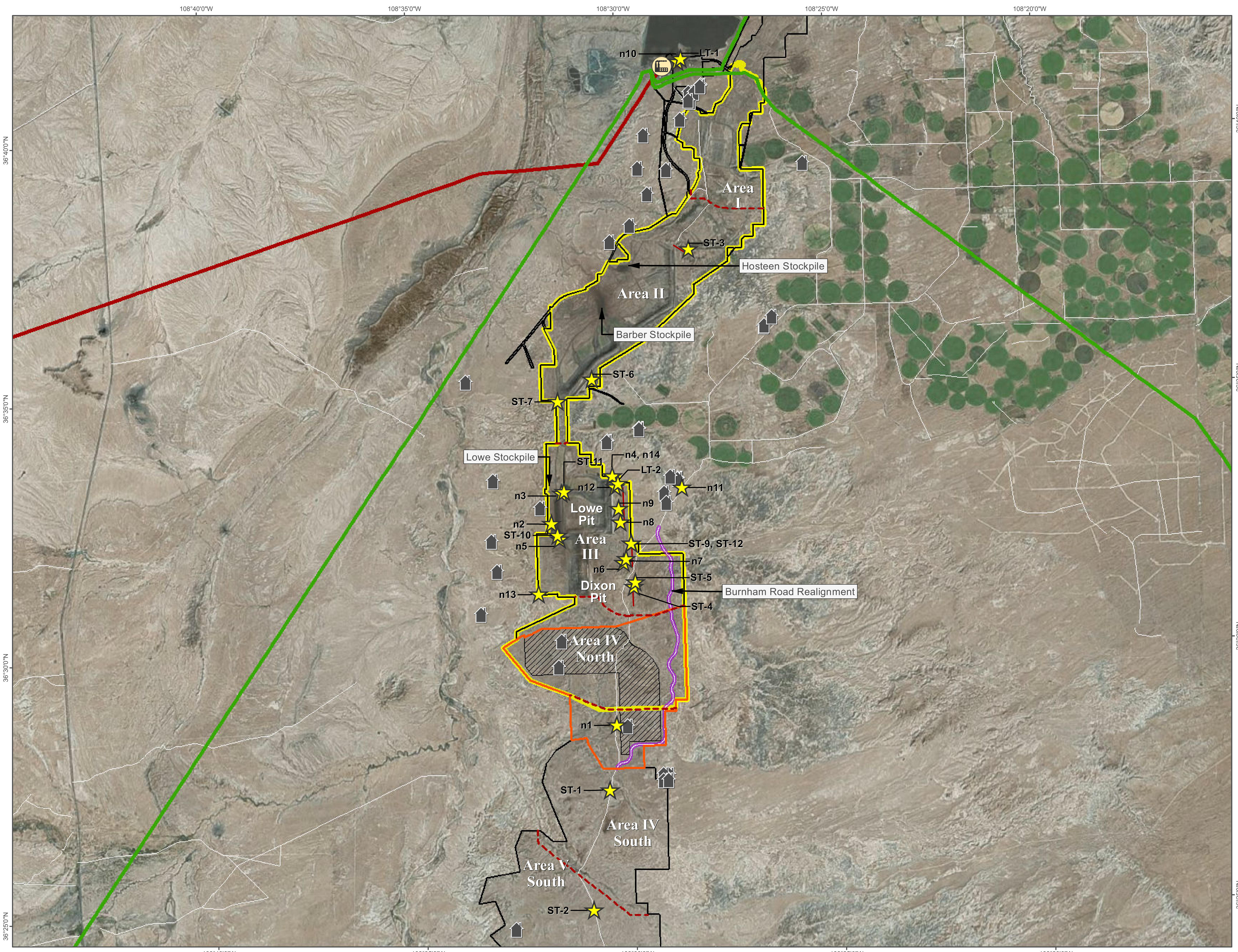

Figure 4.14-2

Noise Sampling Locations & Area Residences

PROJECT FACILITIES

Four Corners Power Plant

NOISE SAMPLING FEATURES

Residences

Noise Sampling Locations

Blasting during 2012 measurements

PROJECT BOUNDARIES

Navajo Mine Resource Areas

Navajo Mine Lease Area and ROWs

Navajo Mine SMCRA Permit Boundary

Proposed Pinabete SMCRA Permit Boundary

Development Area

TRANSMISSION LINES

345kV

500kV

N

0 1 2 4

Scale in Miles

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Vibration Measurements

As required by OSMRE blasting regulations, BNCC routinely measured vibration levels during blasting operations to ensure that air blasts and ground-borne vibrations are within allowable levels. A chart from a typical blast is provided as Figure 4.14-3 (BNCC 2010). Blasts are typically audible for about 2 seconds. The blast shown on Figure 4.14-3 occurred on July 26, 2010, along Strip 61 in Lowe Pit and represents an average blast routinely occurring at the mine. The seismograph was located at the nearest residence, approximately 5,539 feet from the blasting area. As shown in the chart, the maximum air blast was measured at 112 dBL and the maximum ground-borne vibration was measured at 0.18 in/sec PPV_{max}. Both of these measurements were within OSMRE-allowable levels.

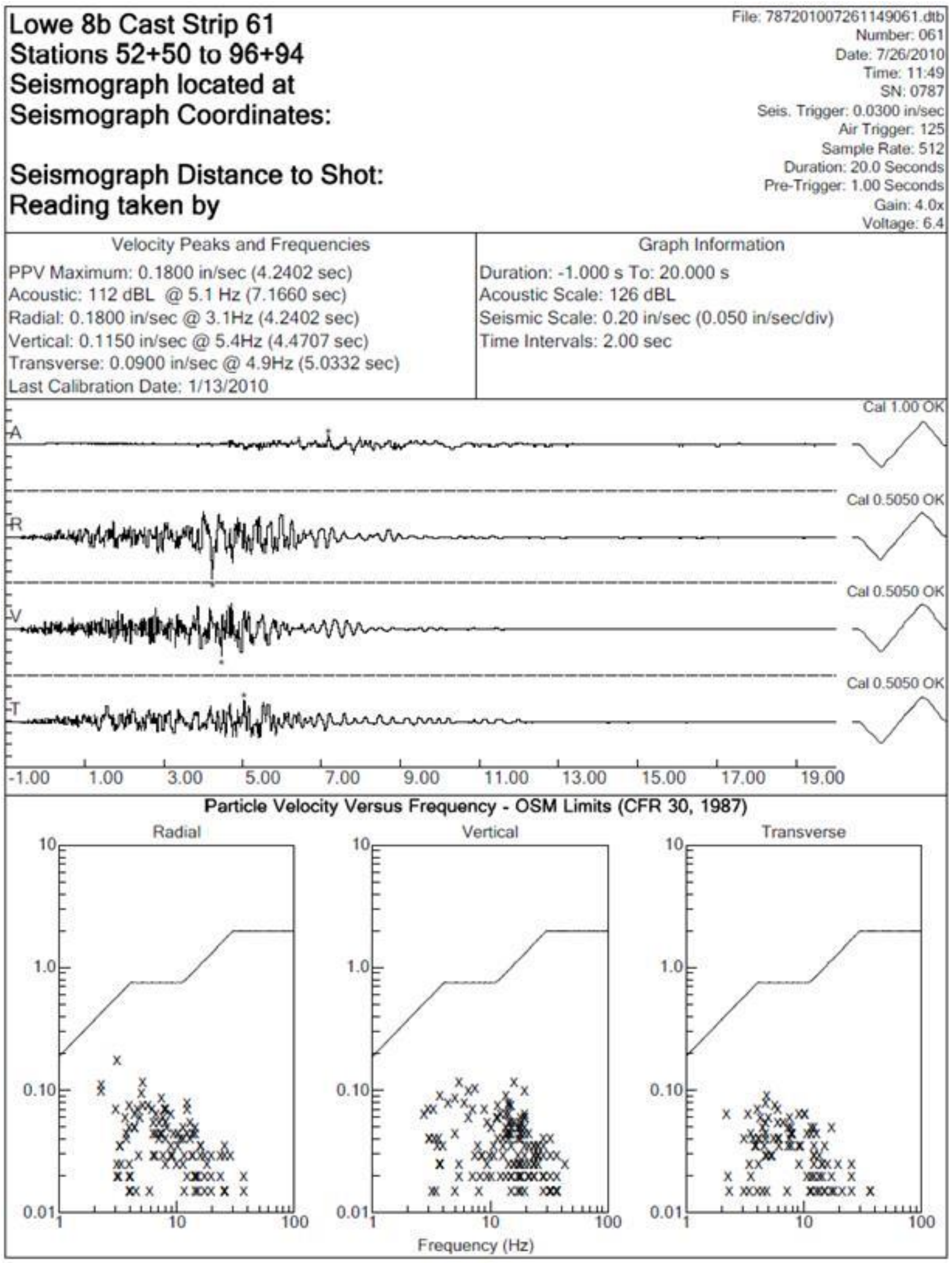

Figure 4.14-3 Typical Vibration Measurement at Residence 5,539 Feet from Blasting Area during Blasting Activities– Area IV North (Source: BNCC 2010)

Prior to initiating mining activities in Area IV North, ambient noise measurements were conducted near a residence just south of the southern boundary of Area IV North (Site 1), with another measurement conducted near a residence just to the northwest of the northern boundary of Area IV North (Site 13). The average noise levels during these measurements ranged from 33 to 46 dBA L_{eq}, with a maximum noise level ranging from 36 to 72 dBA L_{max}. The high maximum noise level during one of the measurements was caused by a pickup truck passing closely by on the adjacent unpaved road. Excluding the truck, noise levels during both measurements were similar and at the low end of the stated range.

Area IV South

Currently, no mining activities occur in Area IV South, and only a few scattered residences are present. No predominant noise sources exist in the area, and noise from the active mining areas in Area III is not readily audible in Area IV South. Two noise measurements were conducted in Area IV South, including the one referenced above as being just south of the southern boundary of Area IV North. That measurement (Site 1 with the pickup truck passing by) averaged 46-dBA L_{eq} with a maximum noise level of 72-dBA L_{max}. The other noise measurement in Area IV South (Site ST-1) averaged 35-dBA L_{eq} with a maximum noise level of 50-dBA L_{max}.

Outside Lease Boundary

One additional noise measurement was conducted over a mile to the east of the lease boundary outside Area III, near some residences. No predominant noise sources exist in the area and noise from the active mining areas in Area III was barely audible. Noise levels during this measurement (Site 11) averaged 44-dBA L_{eq}, with a maximum noise level of 65-dBA L_{max}. The higher average and maximum noise levels during the measurement were caused by a pickup truck passing by on the adjacent unpaved road. Excluding the truck, noise levels during the measurement were similar to those measured in Area V.

Sensitive Receptors

Some land uses are more sensitive to noise levels than others due to the amount of noise exposure (in terms of both time and insulation from noise) and the types of activities typically involved. Residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, and parks and outdoor recreation areas are more sensitive to noise than are commercial and industrial land uses. Workers at industrial and mining facilities are generally not included in discussions of noise-sensitive receptors, but are covered under worker protection programs, such as OSHA or MSHA regulations for noise exposure.

Four residences are within 0.5 mile (800 meters) of the Pinabete SMCRA Permit Area. Of these four residences, three are located within the Pinabete SMCRA Permit Area boundary. MMCo has completed relocations of two of these residents out of the proposed mining area. MMCo has an agreement in place with the third residence to relocate in advance of mining operations in Area IV South. Several other isolated single-family residences are in the vicinity of the proposed mining disturbance zone of Area IV North, the nearest of which is about 4,500 feet (1,370 meters) away. Three residences are within 1 mile (1,600 meters) of the edge of the disturbance area. The closest residence which would not be relocated is 4,500 feet away (refer to Figure 4.14-2). The noise observed at this location was measured at 46-dBA L_{eq} and 72-dBA L_{max} with the peak noise associated with a truck passing by in proximity to the residence. Four additional residences lie within 1 mile of the mining disturbance of Area III. The nearest structure is approximately 3,880 feet north of Area III. Noise observed near this residence at Noise Monitoring Site No. 2 (see Table 4.14-3) was measured at 46 dBA L_{eq} with L_{max} at 56 dBA associated with dozers on Lowe Stockpile.

4.14.4.2 Four Corners Power Plant

Ambient Noise Levels

Primary noise sources in the area of the FCPP include the coal plant generating units, rail line, pump house, ash storage and processing equipment and appurtenances, and other associated facilities. Previous long-term noise levels measured approximately 700 feet from the coal plant, corresponding to the edge of the facility boundary, (Site LT-1) averaged 54-dBA L_{eq} with a maximum noise level of 78-dBA L_{max}, while a short-term noise measurement approximately 300 feet from the coal plant (Site 10) averaged 61-dBA L_{eq} with a maximum noise level of 64-dBA L (DOI and BIA 2007).

Sensitive Receptors

The FCPP generating units are located more than 1/2 mile from any sensitive land uses such as schools, hospitals, and convalescence homes. The nearest sensitive receptors are homes located greater than 1 mile from the FCPP. Noise from the FCPP is not detectable at this distance.

4.14.4.3 Transmission Lines

Ambient Noise Levels

The existing transmission system consists of seven transmission lines, the ROW renewals for four of which are connected actions, ranging in voltage from 230 to 500 kV transmitted from the FCPP to Arizona, New Mexico, and Texas. Two types of noise are often associated with transmission lines, including noise from the transmission lines and towers, and noise from activities for routine inspection and maintenance of the facilities. The noise generated by routine maintenance is generally negligible. Transmission line noise, which includes corona, insulator, and Aeolian noise, can be generated throughout the transmission line route and is, therefore, more likely to affect sensitive receptors. Corona noise is the most common noise associated with transmission lines and is heard as a crackling or hissing sound. Corona is the breakdown of air into charged particles caused by the electrical field at the surface of conductors. This type of noise varies with both weather and voltage of the line, and most often occurs in conditions of heavy rain and humidity (typically >80 percent). An electric field surrounds power lines and causes implosion of ionized water droplets in the air, which produces sound. During relatively dry conditions, corona noise typically results in continuous levels of 40 to 50 dBA in close proximity to the transmission line, such as at the edge of the ROW (California Public Utilities Commission [CPUC] 2009). In many locations, this noise level is similar to ambient noise conditions in the environment. During wet or high humidity conditions, corona noise levels typically increase. Depending on conditions, wet-weather corona noise levels could increase to 50 to 60 dBA and could increase to over 60 dBA under some conditions (CPUC 2009). Insulator noise is similar to corona noise but is not dependent on weather. It is caused by dirty, nicked, or cracked insulators, and is mainly a problem with older ceramic or glass insulators. New polymer insulators minimize this type of noise. Aeolian noise is caused by wind blowing through the conductors and/or structures. This type of noise is usually infrequent and depends on wind velocity and direction. Wind must blow steadily and perpendicularly to the lines to set up an Aeolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the line (CPUC 2009). Existing noise along the transmission lines is expected to be similar to those measured at Sites ST-2 and ST-11 ranging from 34- to 44-dBA L_{eq} with a L_{max} of 65 dBA associated with maintenance activities (i.e., pickup trucks accessing the transmission lines from unpaved roads).

Sensitive Receptors

Numerous residences and other sensitive receptors, including parks, and schools, are located in close proximity (within 1/2 mile) to the transmission line ROWs. Because approximately 391 miles of transmission lines are being evaluated in this analysis, it is impractical to list each sensitive receptor along these lines. However, none of the sound levels produced by the transmission line-associated activities described above would be incompatible with these receptors.

4.14.5 Changes to Noise and Vibration Affected Environment Post-2014

Two completed Federal Actions have been incorporated into the baseline for this analysis: (1) the EPA has made its ruling with respect to BART to control air emissions; and (2) OSMRE has approved the SMCRA permit transfer from BNCC to NTEC (Section 2.4). These completed Federal Actions are considered part of the environmental baseline to which the impacts of continuing operations and the Proposed Actions are compared in the following Section. Neither of these completed Federal Actions would change the affected environment for noise and vibration.

4.14.6 Environmental Consequences

The EPA guideline for acceptable noise levels for sensitive receivers uses the 24-hour noise metric and sets a noise level of 55 dBA L_{dn} as the acceptable limit for outdoor use areas (EPA 1974). Because no other enforceable noise standards apply to the Project, the EPA-acceptable noise levels are used as the criteria for evaluating Project noise impacts.

The methodology for evaluating potential noise impacts from mining activities from the Project is based on the procedures of ISO 9613-2:1996, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*. This international standard procedure is widely used for propagation and evaluation of environmental noise over distances and is the basis for calculation protocols in numerous computer models, including CadnaA and SoundPLAN. The calculation used for the analysis presented in the DEIS used spreadsheet-based calculations based on the ISO 9613-2:1996 standard. The procedure essentially involved determining the maximum noise levels during the various stages of mining activities, based on noise data from equipment manufacturers, the FHWA's database of construction equipment noise levels (FHWA 2006), and field measurements around the existing mining areas, and then propagating those maximum noise levels from the area of activity to the nearest residential dwellings.

Subsequent to the screening-level spreadsheet model, more detailed noise modeling was performed to refine certain portions of the noise assessment by more accurately representing the equipment locations and range of motion, operational times, and spectral characteristics of the equipment. While the previous method used for the analysis is standardly-applied to these conditions, it relies on conservative (maximum noise level) assumptions. Accordingly, the CadnaA environmental noise software based on ISO 9613 was used to more accurately model the complex combination of mining noise sources operating over wide areas in varying terrain. This model incorporates detailed environmental and operational data to estimate noise (HDR Engineering, Inc. 2014). Two models were prepared: one model for mining equipment and second model for blasting noise (blasting is very short in duration and much louder than the other noise sources and was, therefore, modeled on its own).

Vibration impacts for this analysis are described based on the OSMRE Blasting Performance Standards contained in 30 CFR 816.61-68 (OSMRE 1986). A chart of the Blasting Criteria Level from the regulations is contained in Figure 4.14-1. To ensure that no adverse impacts occur from blasting operations, NTEC would use the scaled-distance equation contained in the regulations to determine the allowable charge weight of explosives. The scaled-distance equation includes a factor of safety to ensure that the maximum PPV is not exceeded. Seismic monitoring would be needed if the scaled-distance equation showed that the maximum PPV may be exceeded for a certain blast.

The methodology for evaluating potential vibration impacts relies on existing seismic monitoring provided by NTEC, along with standard vibration propagation rates to calculate potential vibration levels at the nearest residential dwellings to the planned blasting areas.

Thresholds of Significance

Impacts for noise are based on the 24-hour L_{dn} noise metric for activities that are performed during daytime and nighttime hours. As defined in Section 4.14.2, the 24-hour L_{dn} noise metric is an overall noise level incorporating noise over an entire 24-hour period and includes a 10-dBA nighttime penalty for noise occurring between 10 pm and 7 am. Conversely, the 1-hour L_{eq} noise metric is an average over a shorter time period and does not include any penalties for nighttime noise. Thresholds used to evaluate potential noise and/or vibration impacts are based on applicable criteria; noise or vibration impacts would be considered major if:

- Hourly sound levels from construction or mining activities reached 90 dBA at residences. No Federal, state, or local guidelines exist for construction noise or noise generated by mining operations. However, the Federal Transit Administration (FTA) has published a guideline that specifically addresses issues of community noise. This guideline recommends that hourly sound levels of 90 dBA at residential uses from construction noise, including pile driving, would be considered a major impact (FTA 2006). This metric is also applied to noise generated during mining operations.
- Vibration from short-term construction or long-term blasting activities at the mine would exceed 0.2 in/sec PPV at residential structures based on FTA guidelines.
- The 24-hour L_{dn} of 55 dBA were exceeded at residences. No Federal, state, or local guidelines regulate property line limits of power plants. However, the EPA (1974) guideline recommends that noise levels of 55-dBA L_{dn} at residential land use be considered a major impact. This threshold differs from the hourly FTA (2006) threshold because this threshold is averaged over 24 hours.

4.14.6.1 Alternative A – Proposed Action

Navajo Mine

Noise levels and noise impacts from the Proposed Action are directly related to the operation of facilities and the number and types of heavy equipment being used for the specific activity. During the mining process, noise could be generated from a number of activities and equipment used. The typical mining steps utilized by NTEC are:

1. Vegetation removal (where it exists)
2. Topdressing removal (where it exists)
3. Drilling and blasting of overburden
4. Overburden removal using draglines and occasionally truck/shovel or truck/loader fleets
5. Drilling and blasting of the uncovered coal
6. Coal removal using front-end loaders and bottom-dump coal haul trucks
7. Drilling and blasting of interburden
8. Interburden removal using draglines and occasionally truck/loader fleets or dozers
9. Repeating Steps 5 through 8 for each mineable coal seam

The FHWA (2006) maintains the most comprehensive database of construction and heavy equipment source noise. The database was created in conjunction with the EPA and is widely used for highway and non-highway projects.

Table 4.14-5 lists equipment noise source data and the quantity of equipment to be used in the Navajo Mine SMCRA Permit Area and likely for the Pinabete SMCRA Permit Area. The acoustical usage factor is the percentage of time that the equipment is typically in use over a given period of time. Noise levels are determined based on the L_{eq}, which is calculated from the L_{max} and the acoustical usage factor using the following equation (FTA 2006):

$$L_{eq} = L_{max} + 10 \log_{(\text{usage factor})}$$

These data were compared with, and are consistent with, field measurements throughout the Navajo Mine (HDR Engineering, Inc. 2012). Though not all equipment used in the existing Navajo Mine SMCRA Permit Area would be used for the Pinabete SMCRA Permit Area, this table identifies the maximum number of each piece of equipment that would be expected to be used.

Table 4.14-5 Equipment Source Noise and Quantity in the Pinabete SMCRA Permit Area

Equipment	Peak Noise Level at 50 Feet (dBA L_{max})	Acoustical Usage Factor (%)	Quantity
Draglines	87	40	3
Overburden Drills	81	20	3
Coal Drills	81	20	2
Track Dozers	82	40	13
Rubber Tire Dozers	82	40	2
Front-end Loaders, Large	79	40	7
Front-end Loaders, Small	79	40	4
Graders	85	40	6
Scrapers	84	40	3
Coal Haul Trucks	76	40	5
End Dump Haul Trucks	76	40	7
Mix Trucks	79	40	2
Water Trucks	76	40	4
Cable Reels	75	20	2
Locomotives (electric)	78	50	4
Rail Cars	65	50	42
Stemming Trucks	75	40	1

Source: FHWA 2006, OSMRE 2012a, HDR Engineering, Inc. 2012.

For the development of the CadnaA noise model (HDR Engineering, Inc. 2014), the equipment usage was further refined for each mining activity with quantities and operational times as detailed in Table 4.14-6. Table 4.14-7 lists the vehicle and train data applied to the haul road and railroad line sources. All activities were conservatively modeled simultaneously to calculate cumulative noise levels of the entire mining operation, but in reality some activities do not occur daily. For example, vegetation and topdressing removal operations typically only occur once per quarter as the topdressing material is present.

Table 4.14-6 Area Source Input Data

Source	Quantity	Daytime (7 AM to 10 PM) Operating Time (Hour)	Nighttime (10 PM to 7 AM) Operating Time (Hour)
Activity 1: Vegetation and Topdressing Removal			
Dozer	1	8.0	9.0
Scraper	3	8.0	0.0
Grader	1	8.0	4.5
Wheel Loader	1	10.0	8.0
End Dump	2	10.0	8.0
Water Truck	1	8.0	4.5
Activity 2: Pre-Strip			
Dozer	2	10.0	5.5
Wheel Loader	2	15.0	9.0
End Dump	5	15.0	9.0
Water Truck	1	7.5	4.5
Grader	1	6.6	4.0
Activity 3: Overburden/Interburden Drilling for Blasting			
OVB Drill Rig	2	15.0	9.0
Activity 4 North: Overburden/Interburden Removal			
Dozer	3	10.0	5.5
Dragline	1	15.0	9.0
Activity 4 South: Overburden/Interburden Removal			
Dozer	3	10.0	5.5
Dragline	1	15.0	9.0
Activity 5: Coal Drilling for Blasting			
Coal Drill	1	11.0	6.5
Activity 6: Coal Removal			
Wheel Loader	1	15.0	9.0
Kress Hauler	3	15.0	9.0
Grader	1	8.0	4.0
Water Truck	1	7.5	4.5
Activity 7: Regrade			
Dozer	2	15.0	0.0
Wheel Loader	1	15.0	0.0
End Dump	2	15.0	0.0
Activity 8: Revegetation – Topdressing			
Scraper	3	15.0	0.0
Grader	2	7.5	4.5
Kress Hauler	2	15.0	9.0

Source	Quantity	Daytime (7 AM to 10 PM) Operating Time (Hour)	Nighttime (10 PM to 7 AM) Operating Time (Hour)
Activity 9: Train Loading			
Wheel Loader	2	15.0	9.0
Rubber Tired Dozer	1	15.0	9.0
Kress Hauler	3	15.0	9.0

Source: HDR Engineering, Inc. 2014.

Table 4.14-7 Line Source Input Data.

Source	Speed (mph)	Daytime (7 AM to 10 PM) Operating Time (Hour)	Nighttime (10 PM to 7 AM) Operating Time (Hour)
Haul Road Transportation			
Kress Hauler	45	6.0	5.8
End Dump	45	4.1	4.2
Water Truck	45	1.6	1.6
Light Duty Vehicle	45	4.4	4.4
Utility Truck	45	0.7	0.7
Crew Van	45	0.5	0.4
Railroad Transportation			
Locomotive	10/30	2.4	2.7
Railcars	10/30	25.2	28.0

Source: HDR Engineering, Inc. 2014.

The speed limit on roads within the Pinabete SMCRA Permit Area is 45 miles per hour. The average speed of the coal hauling train is 30 miles per hour, but the train slows down to 10 miles per hour at each end of the line (HDR Engineering, Inc. 2014). Blasting occurs as part of activities 3 and 5 listed in Table 4.14-6.

The closest sensitive receptor to the Pinabete SMCRA Permit Area is a private residence located approximately half a mile from the mining operations. Vibration levels from surface mining operations are typically less than 0.10 to 0.20 in/sec at 10 feet from the source. Ground-borne vibration dissipates very rapidly with distance, reducing the typical mining-related vibrations to less than the threshold of 0.2 in/sec (PPV) at a distance greater than 10 feet from the source and to an imperceptible level at about 200 feet from the source—well before reaching the nearest residence a half mile away. Consequently, mining-related vibrations (except for blasting activities) would be less than the threshold of 0.2 in/sec (PPV) at the closest sensitive receptor. Therefore, impacts from ground-borne vibration were evaluated only for blasting activities.

Similarly, because noise levels diminish with increasing distance from the noise-generating activity, noise levels are directly related to the distance to the nearest noise-sensitive receiver or residential home. The nearest residence is approximately 4,500 ft from the edge of the proposed mining disturbance area. All residences within approximately 1 mile of the proposed mining disturbance area were evaluated for noise impacts and vibration impacts from blasting.

Mining Activities

Most activities under the Proposed Action fall under the general category of mining activities, which consist of a progression of activities described in Chapter 2, Current Operations. These activities would use most of the equipment listed in Table 4.14-5. Table 4.14-5 lists the specific equipment for each mining activity with quantities and operational times. The noise evaluation is based on the data in the tables along with the actual ambient noise measurements conducted around the active portions of the Navajo Mine SMCRA Permit Area, which were presented in Tables 4.14-3 and 4.14-4.

The highest noise levels from mining activity would be associated with coal removal, producing an estimated maximum hourly noise level of 84 dBA L_{eq} at 50 feet from operating equipment. Vegetation and topdressing removal activities throughout the disturbance area would also produce an estimated hourly noise level of 82 dBA L_{eq} at 50 feet from the operating equipment. Overburden and interburden removal near the coal seams would produce an estimated hourly noise level of nearly 82 dBA L_{eq} at 50 feet from the operating equipment.

Impacts for noise are based on the 24-hour L_{dn} noise metric for activities that are performed during daytime and nighttime hours. The noise evaluation, therefore, propagated the estimated short-term noise levels to the nearby residences and then calculated the 24-hour L_{dn} noise level. The initial noise evaluation assumed that the estimated noise levels from activities along the coal seams were constant around the clock, but that estimated noise levels from other activities within the disturbance area, such as the vegetation and topdressing removal, were constant for only 12 hours of the day, from 7:00 am to 7:00 pm. The evaluation also assumed an average nighttime noise level of 35 dBA L_{eq}, consistent with the lowest measured ambient noise levels at nearby residences. The subsequent noise evaluation using the CadnaA noise model refines the equipment usage and operational times for each activity.

Although blasting activities cause high instantaneous noise levels measured at 94 dBA L_{max} at 300 feet, or nearly 110 dBA L_{max} at 50 feet from the blast, the duration of the noise is very brief, lasting only a few seconds. Blasting is typically only conducted during the daytime; therefore, nighttime noise standards would not apply to blasting. Nighttime blasting would only occur during emergencies, when safety or equipment hazards would require detonation outside of daytime hours. When averaged over time for either the 1-hour L_{eq} or the 24-hour L_{dn} noise metrics, the influence of blasting activities to the overall noise environment is small.

Table 4.14-8 shows the initial calculated noise levels at each of the surrounding receivers (using a spreadsheet model), which are all residences, including the peak hourly daytime L_{eq} noise level, and the 24-hour L_{dn} noise level. The table also includes a determination of whether the noise level constitutes a noise impact based on the FTA guideline of 90 dBA for hourly noise and EPA guideline of 55 dBA L_{dn} or greater for 24-hour noise levels.

Table 4.14-8 Calculated Noise Levels and Impact Determination at Surrounding Residences for Mining Activities

Receiver Description	Distance and Direction from Permit Area Boundary	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
Removal of Vegetation and Topdressing – Daytime Only Activity				
Nearest Residence – North	4,500 feet west	46.8	53.8	No
Nearest Residence – South	2,745 feet southeast	51.0	58	Yes
Blasting of Overburden, Interburden, and Coal* – Daytime Only Activity				
Nearest Residence – North	4,500 feet west	46.3	53.3	No
Nearest Residence – South	2,745 feet southeast	50.5	57.5	Yes
Drilling and Removal of Overburden and Interburden – Daytime and Nighttime Activity				
Nearest Residence – North	4,500 feet west	54.3	60.7	Yes
Nearest Residence – South	2,745 feet southeast	58.5	64.9	Yes

Receiver Description	Distance and Direction from Permit Area Boundary	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
Removal of Coal – Daytime and Nighttime Activity				
Nearest Residence – North	4,500 feet west	50.6	57.0	Yes
Nearest Residence - South	2,745 feet southeast	54.8	61.3	Yes

Note:

*Instantaneous noise from blasts was measured at 94 dBA Lmax at 300 feet from the blast. This measurement calculates to peak instantaneous noise levels of 70 to 80 dBA Lmax at the residences; however, this noise level would last only a few seconds and quickly dissipate.

At the closest structure (residence approximately 2,745 feet southeast of the Pinabete SMCRA Permit Area), noise level resulting from mining activities shown in Table 4.14-8, would range from 57.5 to 64.9-dBA L_{dn}, which would exceed the impact threshold of 55 dBA L_{dn}. However, this structure has been abandoned for several years and would not be considered a receptor.

In order to refine the above results, a more detailed noise model was developed using CadnaA. This model was used to identify future “snapshots” in time when peak mining noise was expected to occur at the nearest receptors. Mining in these areas is predicted to occur in the years 2018 and 2026. For these “snapshots” in time, the terrain was updated to model the appropriate pit and spoil locations, and the activity locations are adjusted to the appropriate sites. The noise associated with the mining equipment was modeled using moving point area sources to model the equipment range of motion within the designated activity area. In this model, only one receptor was located within the 55 dBA L_{dn} contour for both 2018 and 2026. This receptor is located to the west of the train loading site (mining activity 9), and had a modeled L_{dn} of 59 dBA (re 20 μPa) in both 2018 and 2026. This receptor is reported to be a vacated structure that has been abandoned for many years. As such, this is not considered a noise impact at this receptor. All other receptors are located outside the 55-dBA L_{dn} contour with noise levels estimated between 40 and 55 dBA. The hourly L_{eq} was lower than the L_{dn} at all receptors, and well below the 90 dBA impact threshold. The L_{dn} was higher because of the 10 dBA penalty applied to nighttime noise levels (between 10 pm and 7 am). Therefore, no hourly L_{eq} impacts were predicted from mining equipment for 2018 or 2026 (HDR Engineering, Inc. 2014).

The results of the CadnaA analysis are considered to be more refined than the results presented in Table 4.14-8 and therefore, noise from the mining activities would result in a minor impact to the identified sensitive receptors for the duration of mining activity.

No mitigation is required for noise with the current configuration of mining activity and receptors. However, in the event that operations are within approximately 1/2 mile (2,500 feet) of a receptor during Project activities, OSMRE recommends the following measures be considered to reduce the effect:

- All equipment should be operated and maintained to minimize noise generation. Equipment and vehicles should be kept in good repair and fitted with “manufacturer-recommended” mufflers.
- Portable noise screens or enclosures to provide shielding for high-noise activities or equipment should be used as where practicable. The effectiveness of a barrier depends upon factors such as relative height of the barrier relative to the line-of-sight from the source of the receiver, the distance from the barrier to the source and to the receiver, and the reflections of sound. To be effective, a barrier must block the line-of-sight from the source to the receiver. A properly designed noise barrier can reduce noise as much as 20 dBA.

- Alternate methods of noise shielding are acceptable, if noise monitoring is conducted to verify that the 55-dBA level at the receptor site is achieved.
- Combine noisy operations to occur in the same period. The total noise produced would not be significantly greater than the level produced if the operations were performed separately.

As discussed above, no perceptible impact from ground-borne vibrations would occur from most of the mining activities. The possible exception would be ground-borne vibrations from blasting activities.

However, NTEC typically uses the scaled-distance equation contained in the OSMRE regulations establishing blasting performance standards to determine the allowable charge weight of explosives to ensure that no adverse vibration impacts occur from blasting operations. The scaled-distance equation includes a factor of safety to ensure that the maximum PPV is not exceeded. Seismic monitoring would be needed if the scaled-distance equation shows that the maximum PPV may be exceeded for a certain blast. With the implementation of these controls and because blasting does not occur at night, noise and ground-borne vibration impacts from blasting operations would be minor.

Transportation of Coal

The Proposed Action would involve using off-highway haul trucks to transport the coal from the Pinabete SMCRA Permit Area along existing haul roads to the coal stockpiles in Area IV. As necessary, coal may be loaded from the Area IV South stockpile onto trucks and hauled to Lowe Stockpile located in Area III. From the Area III stockpile, the coal would be loaded into the railcars and transported to the coal sizing and blending facility next to the FCPP. The noise evaluations for this Project component include both the continued use of the existing rail line and haul roads. The two closest residences are approximately 4,500 feet from the nearest haul roads. As shown in Table 4.14-9, noise levels from coal transportation were initially calculated to be approximately 53.9 dBA L_{dn}, which is below the impact threshold of 55 dBA L_{dn}. Therefore, the analysis indicates that no significance threshold would be exceeded and no adverse noise impacts from coal transportation activities would occur.

Table 4.14-9 Calculated Noise Levels and Impact Determination at Surrounding Residences for Coal Transportation

Receiver Description	Distance and Direction from Haul Roads	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
Operation of Haul Road and Rail Line Extensions – Daytime and Nighttime Activity				
Nearest Residence – North	4,500 feet west	47.5	53.9	No
Nearest Residence – South	4,500 feet southeast	47.5	53.9	No

The results of the CadnaA model confirms the above results with noise levels predicted to be below 55 dBA L_{dn} at all receptors (with the exception of the abandoned structures west of the train loading location (mining activity 9). Therefore, noise from the mining activities would result in minor adverse impacts to all identified sensitive receptors for the duration of mining activity.

As described above, because ground-borne vibration dissipates rapidly with distance from the source and because the nearest residence is approximately 4,500 feet from the edge of the coal transportation area, impacts from ground-borne vibrations from the coal transportation activities would be minor.

Burnham Road Realignment

As part of the Proposed Action, Burnham Road would be realigned further to the east to accommodate the active and proposed mining areas. The noise evaluation of this Project component includes the construction of the realigned Burnham Road.

Only one residence is located within 1 mile of the Burnham Road realignment. Noise level calculations were conducted for this receiver only. As shown in Table 4.14-10, the noise level from the Burnham Road realignment was calculated to be 46.2-dBA L_{dn}, which is below the impact threshold of 55 dBA L_{dn}. Therefore, no major noise impacts from the realignment of Burnham Road would be expected.

Table 4.14-10 Calculated Noise Levels and Impact Determination at Surrounding Residences for Burnham Road Realignment

Receiver Description	Distance and Direction from Burnham Road Realignment	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
Construction of Burnham Road Realignment – Daytime Only Activity				
Nearest Residence – South	2,310 feet south	47.7	46.2	No

Source: OSMRE 2012a.

Because ground-borne vibration dissipates rapidly with distance from the source, typically reaching an imperceptible level at 200 feet from the source, and because the nearest residence is more than 2,300 feet from the Burnham Road realignment area, no major impact would occur from noise or ground-borne vibrations from the construction of the Burnham Road realignment.

Reclamation

Reclamation activities would involve much of the same equipment used during active mining operations described above. Therefore, the noise evaluation for the Project reclamation component was similar to that for the mining activities component. Reclamation consists of backfilling and grading, replacement of topdressing, revegetation, and reclamation monitoring. As shown in Table 4.14-11, noise levels from reclamation activities were initially calculated to range from 54.0 to 58.2 dBA L_{dn} at the nearest structures. A noise level of 58.2 L_{dn} at the nearest residence would exceed the impact threshold of 55 dBA L_{dn}. However, these structures are not occupied and are not receptors.

Table 4.14-11 Calculated Noise Levels and Impact Determination at Surrounding Residences for Reclamation Activities

Receiver Description	Distance and Direction from Permit Area	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
All Reclamation Activities – Daytime Only Activity				
Nearest Residence – North	4,500 feet west	47.0	54.0	No
Nearest Residence – South	2,745 feet southeast	51.2	58.2	Yes

The CadnaA model was subsequently developed in order to refine the results of the initial noise model. In CadnaA model, only one receptor was located within the 55 dBA L_{dn} contour for both 2018 and 2026. This receptor is located to the west of the train loading site (mining activity 9), and had a modeled L_{dn} of 59 dBA (re 20 μPa) in both 2018 and 2026. This receptor is reported to be a vacated structure that has been abandoned for many years. As such, this is not considered a noise impact at this receptor. All other receptors are located outside the 55-dBA L_{dn} contour with noise levels estimated between 40 and 55 dBA. The hourly L_{eq} was lower than the L_{dn} at all receptors, and well below the 90 dBA impact threshold. The L_{dn} was higher because of the 10 dBA penalty applied to nighttime noise levels (between 10 pm and 7 am). Therefore, no hourly L_{eq} impacts were predicted from mining equipment for 2018 or 2026 (HDR Engineering, Inc. 2014).

Therefore, noise from reclamation activities are not considered to result in adverse impacts to any identified sensitive receptors for the duration of mining activity.

The same measures recommended above for mining activities are recommended to further reduce noise levels during reclamation, if there are sensitive receptors within 2,500 feet of the activity.

Four Corners Power Plant

If the lease is amended, then APS would proceed with installing emission reduction equipment on Units 4 and 5; expanding the DFADAs within the existing FCPP Lease Area boundaries; and continuing operation of the independent switchyard and transmission lines. Primary noise sources in the area of the FCPP include the coal plant, rail line, pump house, and other associated facilities. Previous long-term noise levels measured approximately 700 feet from the coal plant (Site LT-1) averaged 54-dBA L_{eq} with a maximum noise level of 78-dBA L_{max}, while a short-term noise measurement approximately 300 feet from the coal plant (Site 10) averaged 61-dBA L_{eq} with a maximum noise level of 64-dBA L (DOI and BIA 2007). The nearest sensitive receptors are homes located greater than 1 mile from the FCPP. Noise from the FCPP is not detectable at this distance.

Expanding the DFADAs within the existing power plant boundaries would have no substantial effect on noise in the area. In addition, the future DFADAs are located further from nearby sensitive receptors than the existing DFADAs. As such, noise impacts from power plant operation would be minor.

Installation of the “hot side/high dust” SCRs between the boiler economizer and secondary air preheater on Units 4 and 5 would likely involve the installation of SCR component ductwork, construction of an ammonia loading and storage facility, installation of piping and electrical runs, erection of structural steel, and tie-in to the plant. The installation of the SCRs within the existing power plant would likely require the limited use of hand tools, power tools, and crane, which would not result in major increases in noise level in the area while Units 4 and 5 are operating. The shutdown of Units 4 and 5 during tie-in would temporarily decrease noise in the area. Therefore, noise impacts from installation of the SCRs would be minor.

Ground- and air-borne-induced vibration from the power plant operation does not affect the local area. As such, no vibration impacts would occur from the power plant operation.

Transmission Lines

No changes to noise produced by routine and other maintenance activities are expected with the continued transmission system operation. As such, no noise impacts would occur from continued operation and maintenance of the transmission system.

No vibration impacts would result from continued operation of the transmission lines.

4.14.6.2 Alternative B – Navajo Mine Extension Project

Navajo Mine

Under Alternative B, OSMRE would renew the existing Navajo Mine SMCRA Permit and approve an alternative plan for the Navajo Mine to only include mining within Area IV South. Under this alternative, NTEC would seek a 5,412-acre SMCRA permit and proposed mining disturbance in approximately 4,998 acres. Mining would commence with the construction of a new boxcut near the western lease boundary and progress eastward in north-south orientated striplines. The mining block would be divided into a North Pit and a South Pit. NTEC would operate two draglines, one in each stripline. After the coal is exposed by the stripping operation, it would either be drilled and blasted or ripped by dozers before mining. Once the coal is broken up it would be mined by front-end loaders and haul trucks. Coal would be transported to a field coal stockpile on the western permit boundary, prior to being transported 8.4 miles to Lowe Stockpile in Area III via primary haul roads.

One structure is located within the boundaries of Area IV South, approximately 2,000 feet from the proposed mining pit and topdressing stockpile and approximately 500 feet from the haul road. Under Alternative B, impacts to sensitive receptors would remain materially the same as described for the Proposed Action for the mining and reclamation activities and for the operation of the FCPP and transmission system. Transportation of coal along the adjacent haul road would result in greater noise levels at the nearby residences.

Specifically, the closest residence within the Area IV South boundary is approximately 500 feet from the nearest haul roads. As shown in Table 4.14-12, noise levels from coal transportation were calculated to be approximately 73.0 dBA L_{dn}, which is above the impact threshold of 55 dBA L_{dn}. Therefore, the analysis indicates that the significance threshold would be exceeded and adverse impacts from coal transportation activities would occur.

Table 4.14-12 Calculated Noise Levels and Impact Determination at Surrounding Residences for Coal Transportation – Alternative B

Receiver Description	Distance and Direction from Haul Roads	Hourly Noise Level (dBA L_{eq})	24-Hour Noise Level (dBA L_{dn})	Above Significance Threshold (55 dBA L_{dn})
Operation of Haul Road and Rail Line Extensions - Daytime and Nighttime Activity				
Nearest Residence	500 feet east	66.6	73.0	Yes

As such, noise from the transportation of coal along the designated haul road would result in long-term adverse impacts at this residence for the duration of mining activity in the nearby area. The same measures to reduce noise impacts as described for the Proposed Action are recommended.

Four Corners Power Plant

Under Alternative B, The BIA would approve the lease amendment for FCPP, and FCPP would operate as described under the Proposed Action, with the same noise-related impacts described above.

Transmission Lines

Under Alternative B, the transmission line ROWs would be approved, and they would continue to be operated and maintained as described under the Proposed Action, with the same noise-related impacts described above.

4.14.6.3 Alternative C – Alternative Pinabete Mine Plan

Navajo Mine

Under Alternative C, OSMRE would disapprove the Pinabete SMCRA Permit application and NTEC would seek approval from OSMRE for a new 10,094 acre SMCRA Permit Area, and proposed mining disturbance in approximately 6,492 acres. Mining would be located in both Area IV North and Area IV South, as described for the Proposed Action. Mining activities in Area IV North would continue existing striplines to the south. The Area IV South pit would be located southwest of the Pinabete Arroyo and would require a new boxcut to develop the pit. Once the boxcuts are complete, only two draglines would be needed, one in each pit.

Coal from the Area IV North pit would be hauled directly to the Lowe Stockpile in Area III for a distance of 3.7 miles. A field coal stockpile would be located in Area IV South and coal from the Area IV South pit would be hauled to this stockpile prior to being hauled the 8.4 miles to the Lowe Stockpile. Burnham Road would be realigned as described under the Proposed Action; however, the length of area that would be relocated would be 6.2 miles. In addition, approximately 15.1 miles of primary haul roads and 14.8 miles of ancillary roads would be constructed. In addition, NTEC would construct approximately 15.5 miles of power lines extending the existing transmission lines from the Navajo Mine Permit Area to the new permit area.

Noise and vibration produced during the construction of the additional power lines, haul roads, and ancillary roads would be similar to those described for the construction of Burnham Road. As such, construction of additional power lines and roads would not materially increase the temporary noise impacts to the residents located east of Area IV South boundary from those described under the Proposed Action. Therefore, noise and vibration impacts to sensitive receptors would remain the same as described for the Proposed Action.

Four Corners Power Plant

Under Alternative C, the BIA would approve the lease amendment for FCPP, and FCPP would operate as described under the Proposed Action, with the same noise-related impacts described above.

Transmission Lines

Under Alternative C, the transmission line ROWs would be approved, and they would continue to be operated and maintained as described under the Proposed Action, with the same potential noise-related impacts as described above.

4.14.6.4 Alternative D – Alternative Ash Disposal Area Configuration

Navajo Mine

Under this alternative, OSMRE would approve the Pinabete SMCRA Permit application and renew the existing Navajo Mine SMCRA Permit. The Navajo Mine would operate as described under the Proposed Action. Impacts would be the same as described for the Proposed Action.

Four Corners Power Plant

Under this alternative, the area of disturbance required for the DFADAs would be 350 acres instead of 385 acres. The 10 percent reduction in surface area of the DFADAs would result in the same noise-related impacts as described for the Proposed Action. All other FCPP components of this alternative are the same as for the Proposed Action. Therefore, impacts would the same as described for the Proposed Action.

Transmission Lines

Under this alternative, the transmission line ROWs would be approved and they would continue to be operated and maintained as described for the Proposed Action. As such, impacts would the same as described for the Proposed Action.

4.14.6.5 Alternative E – No Action Alternative

Navajo Mine

Under the No Action Alternative, the Navajo Mine would close, the Pinabete SMCRA Permit Area (Areas IV North and South) would not be mined, and Burnham Road would not be realigned. Mining in the Navajo Mine SMCRA Permit Area (Areas III and IV North) would stop when the ROD is issued in 2015. Areas I and II, which are also part of the Navajo Mine SMCRA Permit Area, have already been reclaimed and no new mining would occur in these areas. Upon permit expiration, NTEC would begin reclamation activities in Areas III and Areas IV North. Reclamation activities would continue until OSMRE approval that all reclamation requirements have been met. All ancillary buildings and facilities (e.g., communication lines, railroad) would be removed and the land would be reclaimed according to OSMRE regulatory requirements. Accordingly, current noise or vibration levels at residential dwellings around Area IV North or Area IV South would not change. Impacts from existing mining activities have been assessed previously and are not expected to differ appreciably in nature from what is described above; however, the intensity of mining activities would be expected to decrease over time as mineable coal is depleted in Area III.

Four Corners Power Plant

Under the No Action Alternative, APS would shut down Units 4 and 5 in 2016 when the current lease expires and EPA BART rules go into effect. All units as well as the switchyards and facilities would eventually be decommissioned and dismantled. No noise impacts would result from the shutdown of the FCPP.

A decommissioning plan has not yet been prepared by APS. Decommissioning and dismantling activities would need to be coordinated with the Navajo Nation such that the area meets the specific needs of the planned reuse. In addition to the five units, decommissioning and dismantling would include removal of all three switchyards. In general, following shutdown, the units would be prepared for dismantlement, then the buildings and equipment would be dismantled, and the site would be remediated. The timeline for this process is not mandated in regulatory statutes and unknown at this time. Following shutdown of the Units in 2016, workforce at the FCPP would be reduced to just those needed for the decommissioning planning and implementation. APS would decommission all facilities that are not required or permitted to be left behind by the 1960 and 1966 leases. As such, decommissioning and dismantling activities would need to be coordinated with the Navajo Nation so that the area meets the specific needs of any planned reuse.

Decommissioning would require environmental abatement activities in the power block, including removal of environmental and safety hazards (e.g., asbestos, lead paint), and chemicals and oils. All waste generated during this phase would be managed and disposed of in accordance with applicable Federal environmental regulations. Dismantling and demolition would commence following the removal of asbestos, PCB, lead paint, and any other hazardous chemicals. Upon removal of structures and facilities, the structural foundations would be removed to 24 inches below grade, the site profiled to allow for proper drainage, and native vegetation planted as applicable. In addition to the five units, decommissioning and dismantling may also include removal of all three switchyards. The timeline for this process is at the discretion of APS and the Navajo Nation. For noise and vibration, these activities would result in a short-term increase in ambient noise levels until all demolition activity is completed.

Transmission Lines

Under the No Action Alternative, the ROWs for the four subject transmission lines would not be approved. Since the subject lines primarily transmit power from the FCPP, if the FCPP is shut down under the No Action Alternative, the power source for the transmission lines would be removed. The lines would either be decommissioned and dismantled or left in place. As with the FCPP, decommissioning and dismantling activities would need to be considered in a separate NEPA analysis and coordinated with the Navajo Nation and the BLM such that the area meets the specific needs of the planned reuse.

It has not been determined how power will be transported in the case that the FCPP does not continue operation through a Navajo Nation lease. In this case, a new transmission system would be required, which would be subject to a separate NEPA analysis because the transmission system has not yet been developed.

4.14.7 Noise and Vibration Mitigation Measures

The Project Applicants have proposed measures that would be implemented to reduce or eliminate some of the environmental impacts of the Proposed Action. These measures include specific mitigating measures for certain environmental impacts, standard operating procedures that reduce or avoid environmental impacts, and BMPs for specific activities. These are described in Section 3.2.6.14. These measures are part of their application materials and are enforceable through permit or lease conditions. In addition, the Project Applicants must comply with additional protective regulatory requirements including laws, ordinances, regulations, and standards that are enforceable by the responsible agency over that activity. These are described in the Regulatory Compliance Framework Section for each resource category. Where the environmental analysis in this EIS recommends additional protective measures, over and above the applicant proposed measures and regulatory compliance, they are listed below as specific mitigation measures.

The Proposed Action, including the continued operations of Navajo Mine, FCPP, and the transmission lines, would not result in major adverse impacts to noise and vibration. Therefore, no additional mitigation is recommended.