4.10 NOISE

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This section summarizes the existing and future ambient noise environment in the vicinity of the project site, evaluates the potential impacts of the project and future site development on the noise environment, as well as the impacts on the project site, once developed, of the existing and future noise environment. Noise mitigation measures are provided, as appropriate.

SETTING

Methodology

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, consideration of noise exposure has become an integral part of land use planning and environmental assessments.

Sound is measured in decibels (dB). Zero dB corresponds roughly to the threshold of hearing. Although decibels can describe the purely physical intensity of sound, they cannot accurately describe sound as perceived by the human ear. The pitch or frequency of a sound must be taken into account when measuring human response to sound since the human ear can only hear sounds within a limited frequency range. For this reason, a frequency-dependent weighting system must be employed whenever sound is measured. These measurements are generally reported in A-weighted decibels (dBA). Decibels and other technical terms are defined in Table 4.10-1. Typical A-weighted noise levels measured in the environment and in industry are shown in Table 4.10-2 for different noise types.

The effects of noise on people can be grouped into three general categories: 1) subjective effects of annoyance, nuisance, and dissatisfaction; 2) interference with such activities as speech and sleeping; and 3) physiological effects, such as hearing loss.

An important method for determining a person's subjective reaction to a new noise is by comparing it to ambient (existing) conditions. The following statements describe the general effects of noise on people:

- A change of one dBA cannot typically be perceived, except in carefully controlled laboratory experiments;
- A three dBA change is considered a just-perceivable difference;
- A minimum of five dBA change is required before any noticeable change in community response is expected;

- A ten dBA change is subjectively heard as approximately a doubling in loudness, and would be expected to cause an adverse change in community response.

Attenuation of noise over distance can be calculated using the inverse square law. Noise levels at a known distance from point sources are reduced by six dBA for every doubling of that distance. Noise levels at a known distance from line sources (e.g., freeways) decrease three dBA for every doubling of the distance. Greater decreases in noise levels may result due to the presence of intervening structures.

Because the decibel scale is logarithmic, two sound sources do not combine in a simple linear fashion, i.e. doubling, but rather combine logarithmically. For example, if two identical sound sources produced sound levels of 80 dBA, the combined sound source level would be 83 dBA.

TABLE 4.10-1: **Definitions of Acoustical Terms**

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period, generally one hour.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 to 10:00 PM and after addition of 10 decibels to sound levels during the night between 10:00 PM and 7:00 AM
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Sources: Beranek, 1988; DHS, 1977.

TABLE 4.10-2: **Typical Sound Levels Measured in the Environment and Industry**

At a Given Distance from Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	140		
Civil defense siren (100')	130		
Jet takeoff (200')	120		Pain threshold
	110	Rock music concert	
Pile driver (50')	100		Very loud
Ambulance siren (100')			
	90	Boiler room	
Freight cars (50')		Printing press plant	
Pneumatic drill (50')	80	In kitchen with garbage disposal running	
Freeway (100')			
	70		Moderately loud
Vacuum cleaner (10')	60	Data processing center	
		Department store	
Light traffic (100')	50	Private business office	
Large transformer (200')			
	40		Quiet
Soft whisper (5')	30	Quiet bedroom	
	20	Recording studio	
	10		Threshold of hearing
	0		

Source: Peterson and Gross, 1974.

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others due to the amount of noise exposure and the type of activity involved. Sensitive receptors include residential areas, schools, playgrounds, childcare centers, convalescent homes, retirement homes, and rehabilitation centers. These sensitive receptors are generally more sensitive to noise than are commercial and industrial land uses. No schools, hospitals, daycare centers, or retirement homes are located within one mile of the project site. The nearest sensitive receptors to the project site are two residential areas adjacent to the project site's northern boundary; one area is to the north adjacent to Currey Road and the other area is adjacent to the northeast corner of the project site.

Existing Noise Environment

In November 2001, the existing noise levels at the project site were measured by Bollard and Brennan, Inc., an acoustical consulting firm engaged by the applicant (Bollard and Brennan, Inc., 2001). Bollard and Brennan used the noise measurements to describe the existing noise environment and to identify potential noise-related land use conflicts related to the site development. Bollard and Brennan used the Federal Highway Administration Highway Traffic Noise Prediction Model to evaluate the existing and future (using traffic predictions for the year 2010) traffic noise from each roadway both with and without the project. The report is available for review at the City of Dixon Community Development Department and forms the basis for the analysis in this section.

The existing noise at the project site is dominated by traffic noise from Interstate 80 and Currey Road. Other sources of traffic noise are Milk Farm Road and SR 113. Bollard and Brennan collected equivalent noise level measurements on-site in 2001 to characterize the existing noise environment. One-hour measurements were collected between 7 AM and 10 PM and ranged from 46.3 to 74.5 dBA;[1] one 24-hour noise level measurement was made at a location relatively close to the freeway and indicated a CNEL of 78.9 dBA.

Under current conditions, about 300 feet of the project site along the Interstate 80 corridor are subject to noise levels in excess of 70 dBA CNEL (Figure 4.10-1). Along Currey Road, a band of about 50 feet from the roadway is subject to noise in excess of 70 dBA CNEL under existing conditions (Figure 4.10-2).

REGULATORY FRAMEWORK

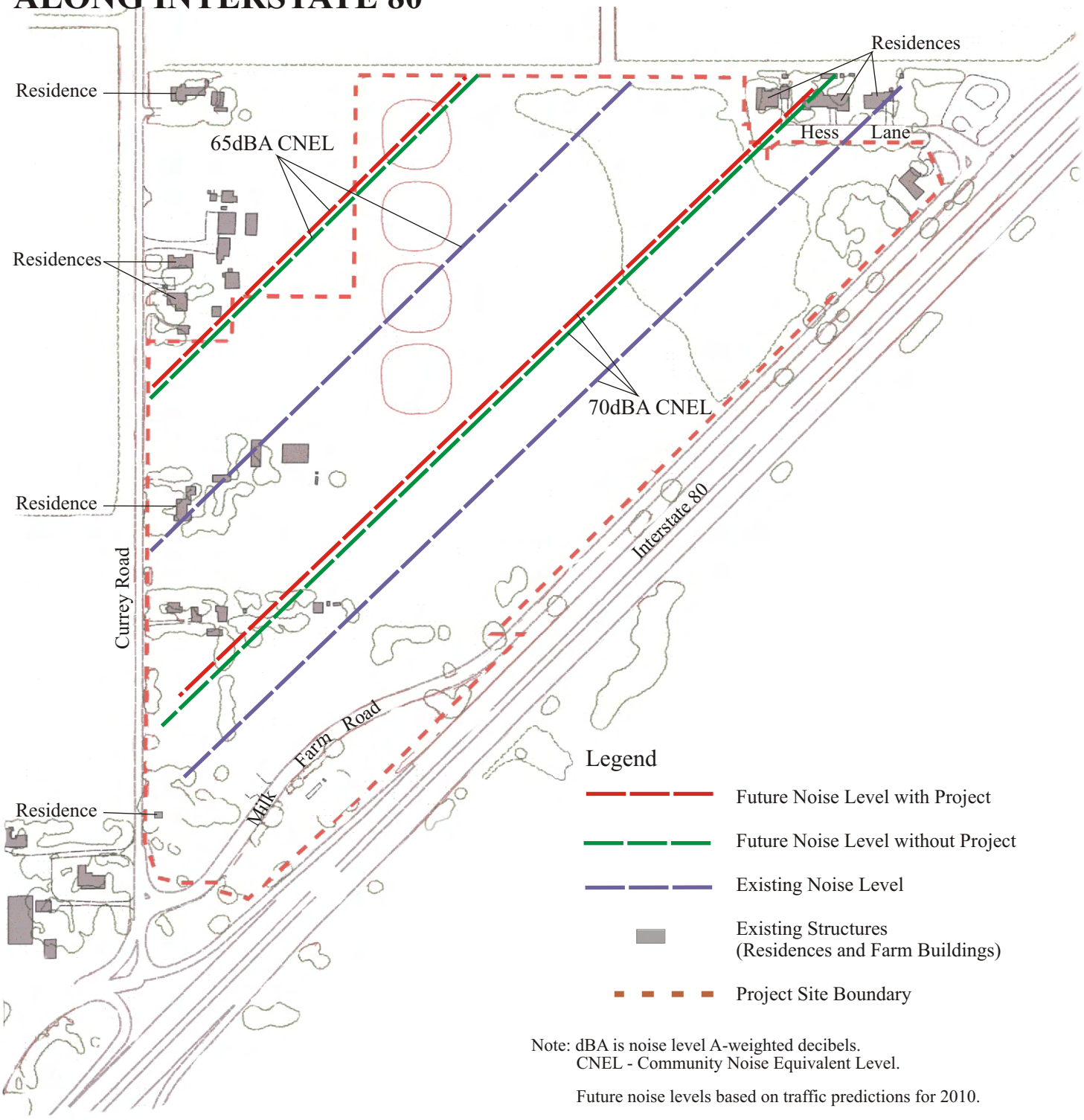
Dixon General Plan Policies

The Dixon General Plan (1993) contains four policies relating to noise in the Natural Environment Element.

[1] The value of 74.5 dBA was the average measured noise level over the 15-hour period while the other values were one-hour measurements taken between 10:18 and 11:36 in the morning.

TRAFFIC NOISE LEVEL CONTOURS ALONG INTERSTATE 80

Figure 4.10-1



Note: dBA is noise level A-weighted decibels.
CNEL - Community Noise Equivalent Level.

Future noise levels based on traffic predictions for 2010.

Milk Farm
Dixon, California

Source: Bollard & Brennan Inc., 2002.

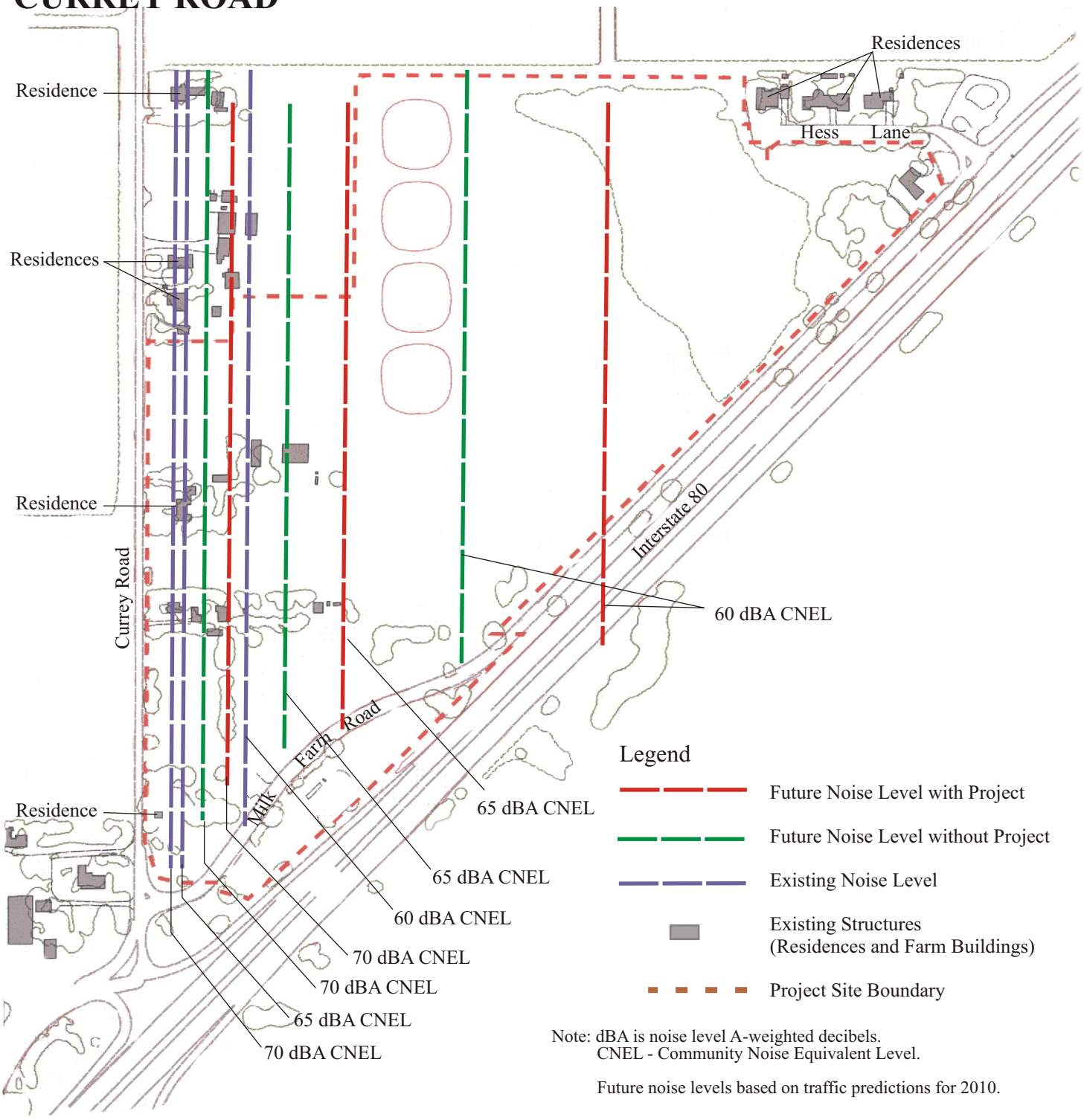
0 400 Feet

BASELINE

Y1263-B0.00017.Fig4.10-1.cdr 5/5/05

TRAFFIC NOISE LEVEL CONTOURS ALONG CURREY ROAD

Figure 4.10-2



Note: dBA is noise level A-weighted decibels.
CNEL - Community Noise Equivalent Level.

Future noise levels based on traffic predictions for 2010.

Milk Farm
Dixon, California

Source: Bollard & Brennan Inc., 2002.

0 400 Feet

BASELINE

Y1263-B0.00017.Fig4.10-2.cdr.5/5/05

Dixon General Plan Policies	Project Consistency
NATURAL ENVIRONMENT	
14: The City shall protect existing noise sources from future noise-sensitive development.	The project is consistent with this policy. Highway commercial and agricultural uses would be adjacent to the Interstate 80 noise corridor. No sensitive uses are proposed.
16: The City shall establish a physical development pattern compatible with the noise environment of Dixon.	Highway commercial and agricultural uses are compatible with the adjacent Interstate 80.
17: The City shall, where feasible, mitigate traffic and other noise to the levels defined in Figure 10 [in the General Plan]. Areas in which noise levels currently exceed or, as a result of future development, will exceed these levels of noise exposure are deemed inappropriate for the development in question.	Future site development would result in site users being exposed to noise levels exceeding those specified in the City General Plan. Mitigation measures have been proposed in this EIR to reduce noise exposures for future site development to acceptable levels.
18: The City shall develop buffering standards and procedures to protect residents from freeway/highway traffic and industrial noise. Acoustical design to reduce noise levels will be an important consideration in all projects and developments.	Acoustical design elements have been proposed for future site development to comply with the exposure standards of the City General Plan.
URBAN DEVELOPMENT AND COMMUNITY DESIGN	
22: The City shall ensure that all new development which may be built adjacent to Interstate 80 will either present an attractive appearance or not be visible from the freeway at all. To the greatest extent possible, visual separation between developed areas of Dixon and the freeway corridor will be maintained by vegetation, landscaping, berms and devices other than standard acoustical walls.	Mitigation measures have been included in this EIR to ensure separation of the site from Interstate 80 with means other than standard acoustical walls.

Noise Exposure Standards

The Dixon General Plan includes ranges of acceptable levels of noise exposure for exterior and interior noise based on types of land use. The acceptable levels for exterior noise are "normally acceptable," "conditionally acceptable," "normally unacceptable," and "clearly unacceptable." The interior noise level exposure standard is set at 45 dBA CNEL.

The "normally acceptable" noise level ranges are based on the assumption that buildings are of conventional construction without any special noise insulation. Noise levels may be "conditionally acceptable" provided a detailed analysis of the noise reduction requirements are made and specific noise insulation features are included in building designs. Table 4.10-3 lists the maximum acceptable noise levels.

TABLE 4.10-3: **Acceptable Levels of Exterior Noise Exposure**

Operational Noise	Normally Acceptable (without Correction Factors dBA CNEL)	Conditionally Acceptable (without Correction Factors dBA CNEL)
Single family residential	60	70
Transient lodging	65	70
Commercial businesses	70	77
Industrial	75	80

Source: Dixon General Plan, 1993.

Noise Generation Standards

The Dixon Zoning Ordinance contains the Noise Performance Standards listed in Table 4.10-4. The noise standards are applicable to A-weighting, slow response measurements, and the period of measurement for equivalent noise level (L_{eq}) is one hour.[2] No land use can generate sound exceeding the permitted maximum levels.

TABLE 4-10-4: **City of Dixon Noise Performance Standards**

Zoning District	Maximum Sound Pressure (dBA)[1,2]
Residential	55
Commercial	70
Industrial	75

Note: These are noise levels that cannot be emitted by individual land uses above the specific criteria.

[1] The following correction factors may be applied:

Emission only between 7 AM and 10 PM_{10}	add 5 dBA
Noise of unusual impulsive character	subtract 5 dBA
Noise of unusual periodic character	subtract 5 dBA

[2] The Zoning Ordinance provides exceptions for sounds from transportation equipment used exclusively in the movement of goods and people to and from given premises, temporary construction or demolition work.

IMPACTS AND MITIGATION MEASURES

Significance Criteria

Based on the Environmental Checklist in Appendix G of the CEQA Guidelines, a project could be considered to have significant noise impacts if it would result in:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

[2] City of Dixon Zoning Ordinance 12.24.06

- Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels.
- For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels.

Impacts Determined to Be Less than Significant

- **Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels**.

The operation of typical highway commercial uses would not generate groundborne vibration or noise and future site development is not expected to require the driving of piles.

- **A substantial permanent increase in ambient noise levels in the project vicinity**.

Typical highway commercial uses do not generate noise levels that would result in a substantial increase in ambient noise in an area, especially in an area dominated by existing freeway traffic.

- **Exposure of people to excessive noise levels from airport operations**.

The project site is not within an airport land use plan or within two miles of a public airport or a private airstrip.

Impacts Determined to Be Potentially Significant

- Exposure of persons to, or generation of, noise levels in excess of noise standards;.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Anticipated Future Impact 4.10-1

The future development of various commercial facilities on the project site would result in temporary increase in noise levels during construction. Construction activities may increase the ambient noise level for adjacent residences during daytime hours. This is a potentially significant impact.

Future construction noise levels would fluctuate depending on the type, number, and duration of use of various pieces of construction equipment. Heavy-duty construction equipment would primarily consist of bulldozers, graders, and loaders. Table 4.10-5, below, lists typical noise levels associated with different pieces of construction equipment. The highest construction noise levels associated with future site development are anticipated to be generated by large trucks, which can produce up to 83 dBA at 50 feet when noise muffling equipment is employed.

TABLE 4.10-5: **Construction Equipment Source Noise Levels**

Equipment Type	Typical Equipment	Quieted Equipment[1]
	at 50 Feet (dBA)	
Air compressor	81	71
Backhoe	85	75
Concrete pump	82	75
Concrete vibrator	76	75
Concrete breaker	82	75
Dozer	80	75
Generator	78	75
Loader	79	75
Paver	88	80
Water pump	76	75
Trucks	88	83

Source: U.S. EPA, 1971.

[1] Quieted equipment can be designed with enclosures, mufflers, or other noise-reducing features.

Assuming a conservative total construction noise level of 90 dBA, a 250-foot buffer zone would be required to reduce the noise level to the "normally acceptable" noise exposure level of 60 dBA. The closest residence to the commercial portion of the site is 250 feet. Therefore, future construction noise would not have a significant impact.

Trucks associated with the future site construction may use Currey Road. Assuming the trucks generate a noise level of 88 dBA at 50 feet (Table 4.10-5), the noise exposure standard for temporary noise for single family residences (70 dBA),[3] would be exceeded for a distance of 150 feet from the truck. There are residences approximately 50 to 75 feet from the edge of Currey Road and, therefore, assuming that some trucks would access or exit

[3] The normally acceptable noise level for a single-family residence is 60 dBA CNEL; an addition of 10 dBA is applied to account for acceptable temporary noise levels (OPR, 2003).

the site from or to the north, the temporary construction noise from truck traffic along Currey Road is a potentially significant impact.

The applicant has committed to requiring future site development contractors to adhere to all applicable noise regulations, as well as informing nearby residents and businesses of the construction schedule and project contact persons. In addition to these measures, the following measures are recommended.

Anticipated Future Mitigation Measure 4.10-1a

All construction trucks operating off-site during future site development shall be required to comply with local, state, and federal noise regulations, including fitting trucks with noise reducing mufflers according to the manufacturer's specifications.

Anticipated Future Mitigation Measure 4.10-1b

All construction shall adhere to restrictions on construction activity to those hours specified by City of Dixon; the City will perform inspections to ensure compliance.

Anticipated Future Mitigation Measure 4.10-1c

Prior to development of the highway commercial uses of the site, the applicant shall submit a truck routing plan that shall identify routes for construction vehicles. The routes shall not include accessing or exiting the site from or to the north on Currey Road.

These mitigation measures would reduce this anticipated future impact to a level of less than significant.

Anticipated Future Impact 4.10-2

Operational activities, once the site is developed, may expose people at the site to noise levels in excess of City of Dixon standards from existing noise sources or development-related noise sources. This is a potentially significant impact.

Changes in noise levels at the project site will occur in the future due to increased traffic on adjacent roadways and operational noise from activities on-site once the site has been developed. Increased noise at the site from traffic on adjacent roadways would be dominated by Interstate 80 and Currey Road. The Bollard and Brennan report included predictions of noise levels on the site for the year 2010 assuming both site development and no site development. The noise predictions were based on noise emissions from traffic on Interstate 80 and Currey Road. The predicted future noise contours are shown on Figures 4.10-1 and 4.10-2 for noise emissions from Interstate 80 and Currey Road, respectively.

Most of the portion of the site proposed for highway commercial uses would be subjected to noise levels above the 70 dBA CNEL levels from the Interstate 80 corridor (about a 450-foot band along Interstate 80) for predicted future 2010 conditions with and without the proposed project.

East of Currey Road, the 70 dBA CNEL contour extends about 150 feet onto the site for 2010 conditions without site development and about 200 feet with site development, indicating that 150 to 200 feet west of Currey Road, the noise environment would exceed 70 dBA CNEL following project implementation. These levels exceed the "normally acceptable" levels of noise exposure for the proposed development of hotel/wellness center (transient lodging, motels and hotels); commercial facilities (commercial and professional businesses, and industrial); and light industry.

Operational noise from the developed portion of the site would likely be from delivery trucks and building air handling equipment, such as HVAC systems. The noise study performed by Bollard and Brennan indicated that the noise levels from roof-top mounted HVAC systems would generate 55 dBA at a distance of 50 feet. Because of the distance from the areas of future commercial development and the existing residences, the expected noise level at the off-site residences would be below 50 dBA CNEL.

Truck traffic can create noise levels of approximately 75 to 85 dBA at a distance of 50 feet. The distance between future truck circulation routes and the neighboring residences is sufficient to reduce noise to below 55 dBA L_{eq} for one hour.

Because of the additive nature of decibel measurements, future operational noises would not be expected to increase noise levels on the site significantly. The applicant has committed to design the project to attain acceptable interior or exterior noise levels through structural massing and shielding and sound masking design elements. In addition, the following mitigation measure is recommended.

Anticipated Future Mitigation Measure 4.10-2

Prior to obtaining any development permits, the applicant shall submit an acoustical study, prepared by an experienced professional, that identifies specific project design features that will accomplish adherence to City of Dixon noise level acceptability criteria for proposed development components. This shall include design features that will address noise emissions from on-site activities and from the ambient noise environment and provide for visual separation between the project site and the Interstate 80 corridor by vegetation, landscaping, berms, and/or devices other than standard acoustical walls.

Implementation of this mitigation measure would reduce this anticipated future impact to a less-than-significant level.