4.11 NOISE

This section evaluates the potential for the proposed project to cause new or more severe noise impacts, including land use conflicts that may occur relating to environmental noise. To determine the potential for significant noise impacts, the baseline noise conditions and surrounding existing sensitive land uses have been identified. Changes in noise levels or changes in noise exposure circumstances caused by the contemplated project have been evaluated using the existing environmental baseline.

Potentially significant noise impacts that could occur as a result of the proposed project include increased noise levels during project construction, exposure of future site residents on lots within 750 feet of the Union Pacific Railroad centerline to high noise levels, and exposure of future site residents on lots within 70 feet of the Locust Road centerline to high noise levels. These impacts can be mitigated by confining construction activities to weekday day-time hours, requiring all construction vehicles and equipment to be equipped with mufflers in good condition, and through construction of properly designed sound barriers on lots affected by vehicle traffic and railroad operations. With implementation of the recommended mitigation measures, project impacts related to noise would be less than significant.

4.11.1 ENVIRONMENTAL SETTING

FUNDAMENTALS OF ACOUSTICS

Noise is often described as unwanted sound, and thus is a subjective reaction to the physical phenomenon of sound. Sound consists of variations in air pressure that the ear can detect. The ear responds to pressure changes over a range of 10^{14} to 1. This is roughly equivalent to the range of 1 second compared to 3.2 million years, or 1 square yard compared to the entire surface area of the earth. To deal with the extreme range of pressures that the ear can detect, researchers express the amount of acoustical energy of a sound by comparing the measured sound pressure to a reference pressure, then taking the logarithm (base 10) of the square of that number. This original unit of sound measurement, named the bel after Alexander Graham Bell, corresponds well to human hearing characteristics when it is divided by a factor of 10. The resulting unit, one tenth of a bel, is called the decibel, and is abbreviated as dB.

The threshold of hearing is considered to be zero (0) dB, and the range of sounds in normal human experience is 0 to 140 dB. Because sound pressure levels are defined as logarithmic numbers, the values cannot be directly added or subtracted. For example, two sound sources, each producing 50 dB, will produce 53 dB when combined, not 100 dB. This is because two sources have two times the energy of one source, and 10 times the logarithm of 2 equals 3. Similarly, ten sources produce a 10 dB higher sound pressure level than one source, as ten times the logarithm of 10 equals 10.

The ear responds to pressure variations in the air from about 20 times per second to about 20,000 times per second. The frequency of the variations is described in terms of hertz (Hz), formerly called cycles per second. The ear does not respond equally to all frequencies. For example, we do not hear very low frequency sounds as well as we hear higher frequency sounds, nor do we hear very high frequency sounds very well. This difference in perceived loudness varies with the sound pressure level of the sound. In general, the maximum sensitivity of the ear occurs at frequencies between about 500 and 8000 Hz.

To compensate for the fact that the ear is not as sensitive at some frequencies and sound pressure levels as at others, a number of frequency weighting scales have been developed. The "A" weighting scale is most commonly used for environmental noise assessment, as sound pressure levels measured using an A-weighting filter correlate well with community response to noise sources such as aircraft and traffic.

When an A-weighting filter is used to measure sound pressure levels, the results may be expressed as *sound levels*, in decibels (dB). It is sufficient to use the abbreviation “dB” if these terms are well defined, but many people prefer to use the expressions dBA or dB(A) for clarity. For convenience, many people use the term “noise level” interchangeably with “sound level.” Table 4.11.1 shows typical sound levels and relative loudness for various types of noise environments.

The ambient noise level is defined as the noise from all sources near and far, and refers to the noise levels that are present before a noise source being studied is introduced. A synonymous term is pre-project noise level. Noise exposure contours or noise contours are lines drawn about a noise source representing constant levels of noise exposure. CNEL or L_{dn} (DNL) contours are frequently utilized to graphically portray community noise exposure.

Variations in sound levels may be addressed by statistical methods. The equivalent sound level (L_{eq}) or energy average sound level is often used to describe the “average” sound level during a stated time period, usually one hour. The Day-Night Level (DNL or L_{dn}) is calculated from hourly L_{eq} values, after adding a “penalty” to the noise levels measured during the nighttime (10 p.m. to 7 a.m.) hours. The penalty for nighttime hours is a factor of 10, which is equivalent to 10 dB. The Community Noise Equivalent Level (CNEL) is similar to the DNL, except that an additional penalty of 4.77 dB is applied to noise events occurring during the evening hours of 7 p.m. to 10 p.m. In most situations, the CNEL value will be up to one dB higher than the DNL value.

Table 4.11.1
Examples of A-Weighted Sound Levels and Relative Loudness

Sound Source	Sound Level (dBA)	Relative Loudness (approximate)	Relative Sound Energy
Jet aircraft, 100 feet	130	128	10,000,000
Rock music with amplifier	120	64	1,000,000
Thunder, snowmobile (operator)	110	32	100,000
Boiler shop, power mower	100	16	10,000
Orchestral crescendo at 25 feet, noisy kitchen	90	8	1,000
Busy street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobile at low speed	50	1/2	.1
Average office	40	1/4	.01
City residence	30	1/8	.001
Quiet country residence	20	1/16	.0001
Rustle of leaves	10	1/32	.00001
Threshold of hearing	0	1/64	.000001

Source: U.S. Department of Housing and Urban Development, 1972.

PANORAMA PLANNED DEVELOPMENT NOISE ANALYSIS

A noise analysis, *Environmental Noise Analysis, Panorama Planned Development, Shasta County, California* (Brown-Buntin Associates, Inc., 2008) was completed for the proposed project. The analysis included in this section is based primarily on this analysis.

To describe the project setting in terms of ambient noise levels, Brown-Buntin Associates, Inc. (BBA) conducted long-term noise measurements at two locations in the project vicinity, and short-term measurements at four locations. Long-term noise measurements were conducted continuously over a twenty-four hour period, and the results were summarized on an hourly basis. The noise monitoring sites were selected to represent existing noise levels in noise-sensitive areas that could potentially be affected by noise associated with project activity, and are shown in Figure 4.11.1: Noise Measurement Sites.

Noise measurements were performed using Larson Davis Model 820 precision integrating sound level meters fitted with Bruel & Kjaer (B&K) Type 4176 microphones and random incidence correctors. The microphones were protected with B&K windscreens, and were mounted on booms or tripods at a height of about 5 feet above ground, in a vertical orientation. The sound level meters were calibrated before use with a B&K Type 4230 acoustical calibrator certified by its manufacturer to be consistent with reference sound pressure levels maintained by the National Bureau of Standards. Measurements were recorded in terms of A-weighted sound pressure levels.

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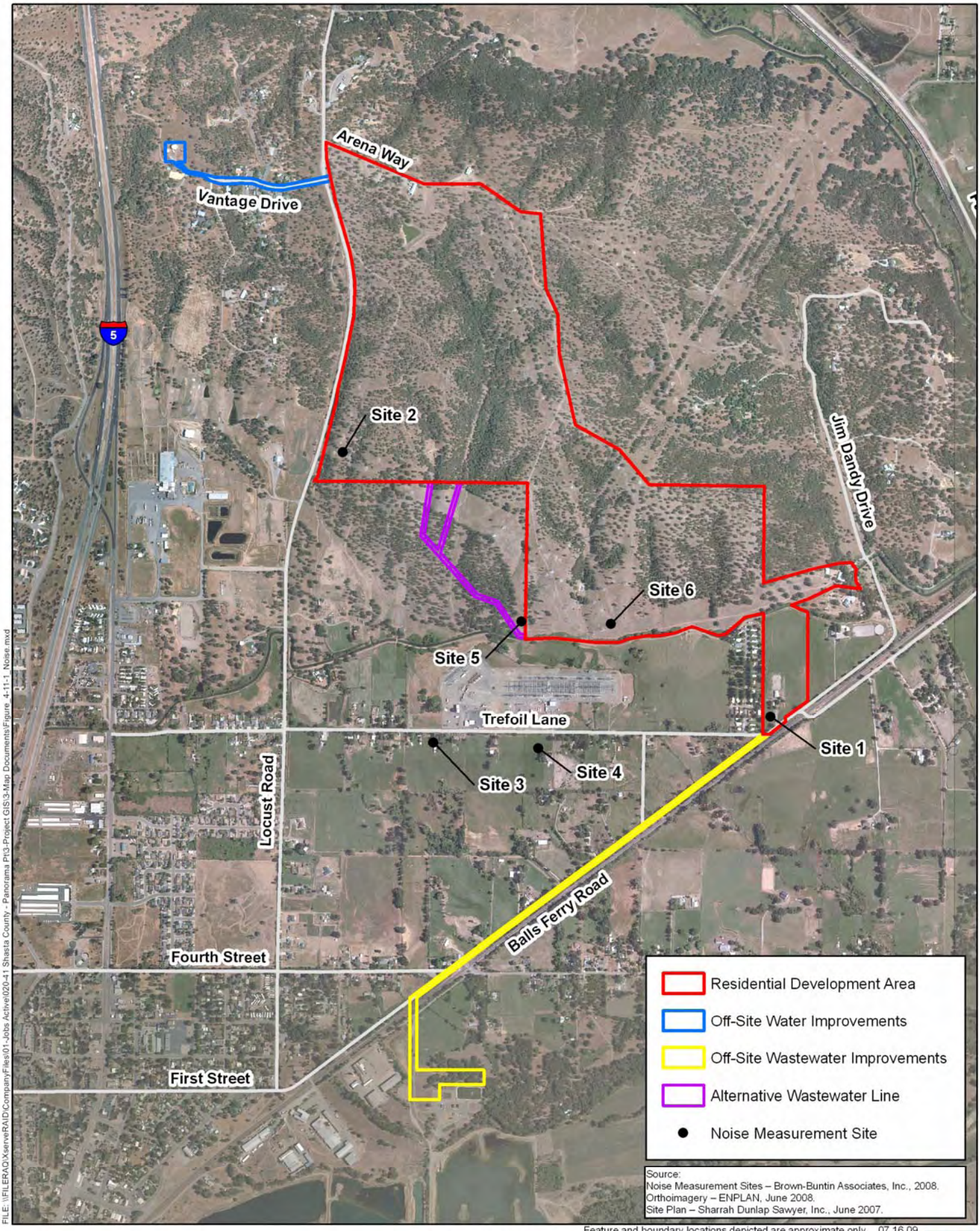

Feature and boundary locations depicted are approximate only. 07.16.09

Feet
0 500 1,000

Figure 4.11.1
Noise Measurement Sites

ENPLAN

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Measurement site 1 was located near the southeast corner of the project site, in the portion of the site designated as Phase 1. The dominant noise sources were traffic on Balls Ferry Road and railroad line operations on the adjacent Union Pacific Railroad (UPRR) tracks.

Measurement site 2 was located near the southwest corner of the project site, in the portion of the site designated as Phase 6. The dominant noise sources were local traffic on Locust Road and distant traffic on I-5.

Graphical illustrations of the hourly noise level statistics for these sites are provided in Figure 4.11.2: Measured Hourly Noise Levels (Site 1) and Figure 4.11.3: Measured Hourly Noise Levels (Site 2). Tables 4.11.2 and 4.11.3 summarize the noise measurement data at each site in terms of the hourly equivalent level (L_{eq}) and the Community Noise Equivalent Level (CNEL) for each full 24-hour period.

Additional ambient noise measurements were performed to quantify the noise levels produced by the PG&E Cottonwood Substation along the south project boundary. The noise measurements collected at these sites were of short duration (one to five minutes), and were intended to characterize the constant 125 Hz “buzz” produced by load banks and similar equipment located at the substation. Two sites (sites 3 and 4) were along Trefoil Lane, across the street from the substation, where the measured noise levels were about 49 and 47 dB, respectively.
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The remaining two sites (sites 5 and 6) were along the south project boundary, under the power lines. At these two locations, the “crackle” of high-tension power line corona discharge was also audible. The measured substation noise levels at sites 5 and 6 were 44 and 43 dB, respectively. The noise level due to corona discharge was estimated to be 40 to 41 dB at both locations.

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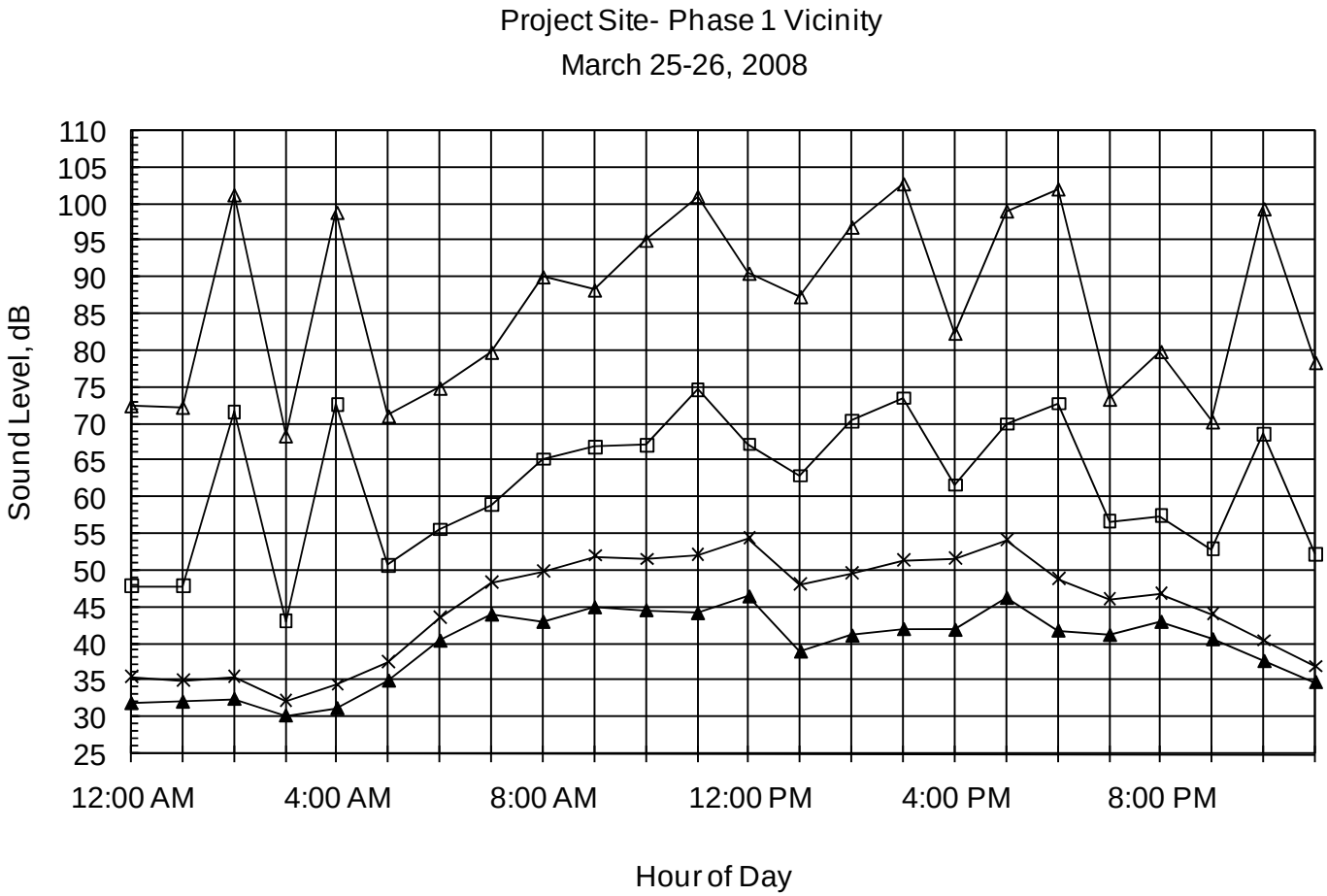

Ldn = 73.4 dB

Figure 4.11.2

Measured Hourly Noise Levels (Site 1)

(Source: Brown-Buntin Associates, Inc., 2008)

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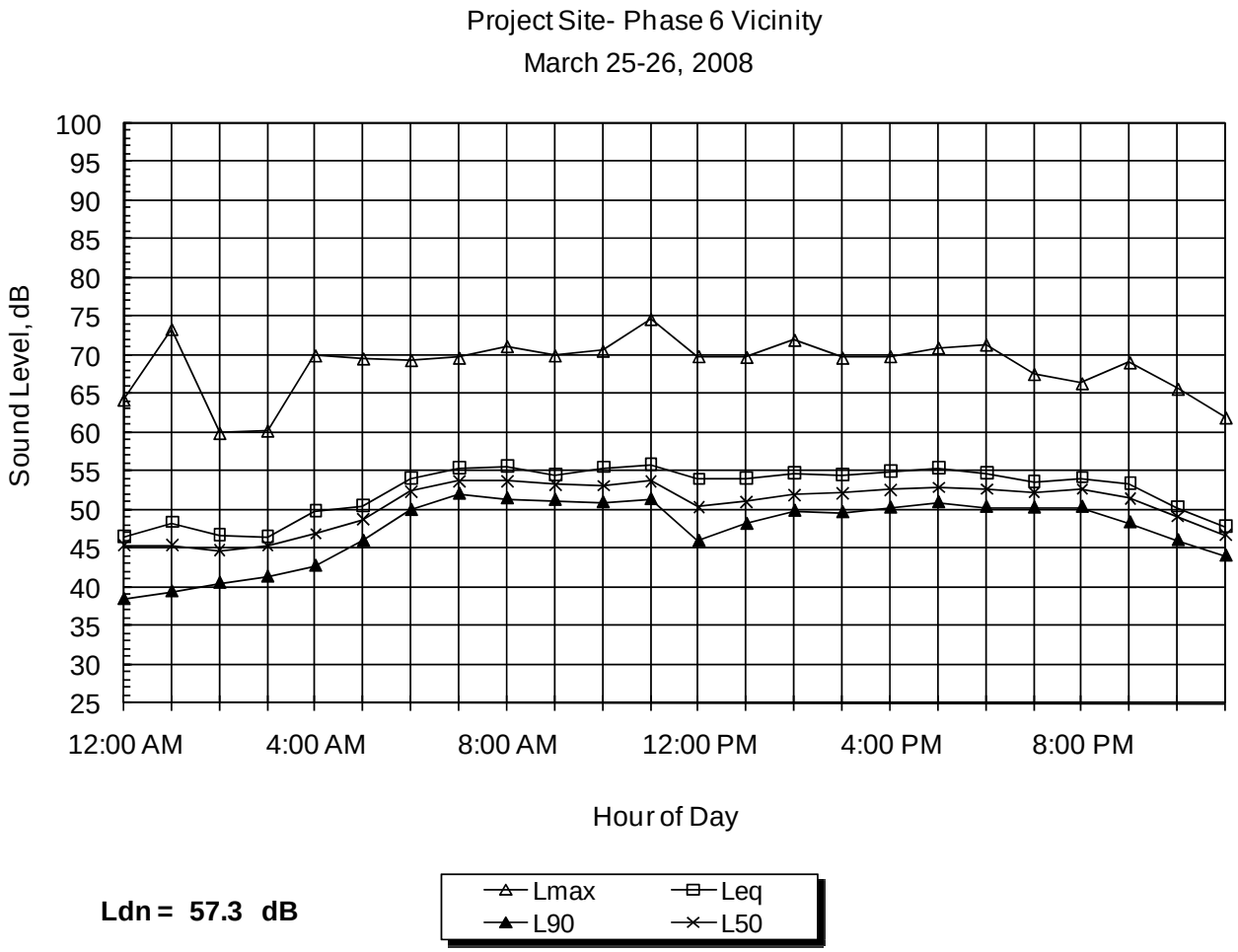

Ldn = 57.3 dB

Figure 4.11.3

Measured Hourly Noise Levels (Site 2)

(Source: Brown-Buntin Associates, Inc., 2008)

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Table 4.11.2
Measured Noise Levels—Vicinity of Phase 1 (Site 1)

Date	Hour	Hourly Leq, dB	Daily CNEL, dB
May 25, 2008	13:00:00	62.9	N/A
	14:00:00	70.4	
	15:00:00	73.5	
	16:00:00	61.6	
	17:00:00	70.0	
	18:00:00	72.8	
	19:00:00	56.7	
	20:00:00	57.4	
	21:00:00	52.9	
	22:00:00	68.6	
	23:00:00	52.2	
May 26, 2008	0:00:00	47.9	73.4
	1:00:00	47.8	
	2:00:00	71.6	
	3:00:00	43.0	
	4:00:00	72.6	
	5:00:00	50.7	
	6:00:00	55.6	
	7:00:00	58.9	
	8:00:00	65.2	
	9:00:00	66.8	
	10:00:00	67.1	
	11:00:00	74.7	
	12:00:00	67.2	

Source: Brown-Buntin Associates, Inc., 2008.

Table 4.11.3
Measured Noise Levels—Vicinity of Phase 6 (Site 2)

Date	Hour	Hourly Leq, dB	Daily CNEL, dB
May 25, 2008	12:00:00	54.0	N/A
	13:00:00	54.1	
	14:00:00	54.8	
	15:00:00	54.6	
	16:00:00	55.0	
	17:00:00	55.4	
	18:00:00	54.7	
	19:00:00	53.6	
	20:00:00	54.2	
	21:00:00	53.4	
	22:00:00	50.4	
	23:00:00	47.8	
May 26, 2008	0:00:00	46.6	57.3
	1:00:00	48.4	
	2:00:00	46.7	
	3:00:00	46.5	
	4:00:00	49.8	
	5:00:00	50.6	
	6:00:00	54.1	
	7:00:00	55.4	
	8:00:00	55.7	
	9:00:00	54.5	
	10:00:00	55.5	
	11:00:00	55.9	

Source: Brown-Buntin Associates, Inc., 2008.

RAILROAD NOISE

The noise measurements conducted at Site 1 included noise events produced by UPRR railroad line operations, as the tracks and a grade crossing are located about 100 feet from the measurement site. Trains move in both directions (north- and south-bound) on this track segment. The train engineers sound their warning horns within about 1,000 feet of the intersection of Balls Ferry Road and the grade crossing.

Based upon the long-term noise measurements and BBA staff observations of train movements, there were about 12 train passages in the 24-hour measurement period. Nine of those passages occurred during daytime hours (7 a.m.to 10 p.m.). The measured L_{dn} value due to the train events was 73.1 dB, which was essentially the total noise exposure at the monitoring site as described by L_{dn}.

To illustrate the nature of railroad noise events, BBA conducted addition single-event noise measurements on May 26, 2008, at a distance of 35 feet from the railroad centerline, about 100 feet north of the Balls Ferry Road grade crossing. Figure 4.11.4 shows the noise level time history of local traffic and four railroad noise events during the period from 10:35 a.m. to noon on that date.

TRAFFIC NOISE

Traffic on I-5, Locust Road, Panorama Point Road, and Balls Ferry Road is a noticeable noise source in the project vicinity. Noise levels due to traffic on local roadways were predicted using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108). The FHWA model is an analytical method that has long been favored for traffic noise prediction by state and local agencies, and has been applied to numerous federal and state roadway projects by the California Department of Transportation (Caltrans). The model is based upon the CALVENO (California/Nevada) noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is considered to be accurate within 1.5 dB. To predict L_{dn} or CNEL values, it is necessary to determine the day/evening/night distribution of traffic and to adjust the traffic volume input data to yield an equivalent hourly traffic volume.

A traffic noise level measurement was conducted for 15 minutes adjacent to Balls Ferry Road on May 25, 2008. The purpose of the noise measurements was to determine the accuracy of the FHWA model in predicting traffic noise at the project site. A concurrent count of traffic was conducted during the measurement period. The noise measurement was conducted in terms of the L_{eq}, and the measured values were later compared to the values predicted by the FHWA model using the observed traffic volumes, speed, and distance to the microphones. The short-term measurement site location is adjacent to Site 1, which is depicted on Figure 4.11.1: Noise Measurement Sites.

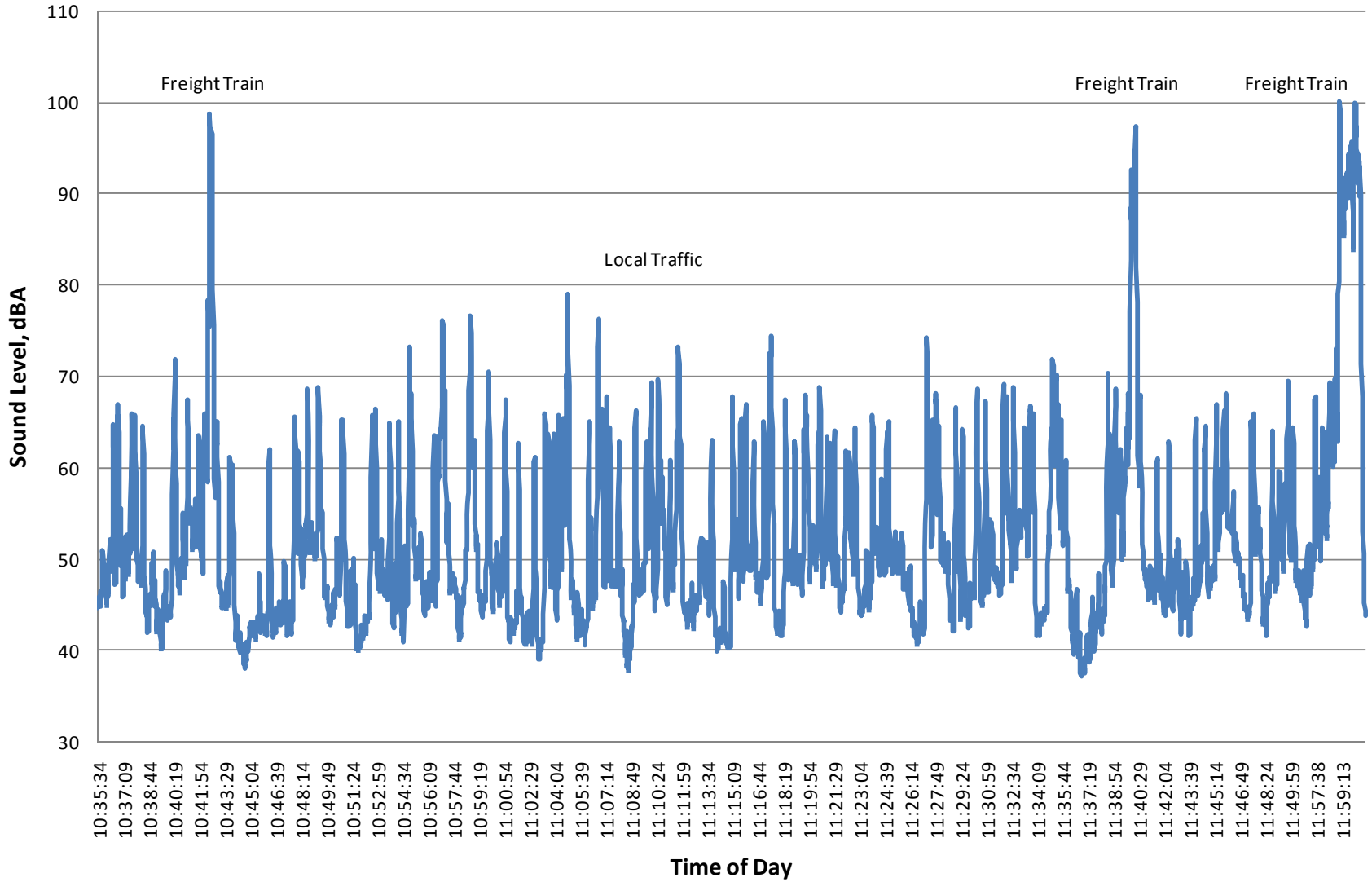

Figure 4.11.4

Time History of Noise Levels (35 feet from UPRR Tracks)

(Source: Brown-Buntin Associates, Inc., 2008)

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Table 4.11.4 compares the measured and modeled noise levels for the observed traffic conditions. The FHWA model reasonably predicted the measured average noise level for traffic on Balls Ferry Road. Based upon these measurements, no adjustment factors were deemed necessary for noise modeling.

Table 4.11.4
Traffic Noise Measurement Summary—Balls Ferry Road
May 25, 2008

Location	Mic Height (feet)	Vehicles per Hour			Posted Speed (mph)	Distance (feet)*	Measured L_{eq}, dB	Modeled L_{eq}, dB**
		Autos	Medium Trucks	Heavy Trucks				
Near Trefoil Lane	5	100	0	20	45	50	62.8	63.0

Source: Brown-Buntin Associates, Inc., 2008.
* Distance is measured from the roadway centerline.
** Acoustically "soft" site assumed

The traffic analysis prepared by KD Anderson & Associates, Inc. (KD Anderson & Associates, Inc., 2008) was used to calculate Annual Average Daily Traffic (ADT) volumes for local roadways for existing conditions. Truck mix was estimated from observations of existing traffic. Day/night distribution of traffic was assumed to be 83%/17% for existing and future conditions, based on the ambient noise measurement results in the vicinity of Phase 6. Vehicle speeds were assumed to remain at existing limits.

Table 4.11.5 lists the traffic noise modeling results in terms of the Day-Night Level (L_{dn}).

Table 4.11.5
Predicted Traffic Noise Levels
Existing Conditions

Roadway Name	Segment Description	Predicted L_{dn}, dB, at 50 feet from Centerline				Distances from Centerline to L_{dn} Contours, feet	
		Autos	Medium Trucks	Heavy Trucks	Total	60 dB	65 dB
Locust Road	East of Barney	59.3	51.3	64.6	65.9	123	57
Locust Road	Panorama Point to Arena Way	55.6	47.0	48.5	56.9	31	14
Locust Road	Arena to Cattleman Drive	53.0	44.4	45.9	54.3	21	10
Locust Road	Cattleman to Trefoil	53.0	44.4	45.9	54.3	21	10
Locust Road	Trefoil to 4th Street	54.2	45.6	47.1	55.5	25	12
Panorama Point Road	Kimberly to Balls Ferry	57.0	49.1	62.3	63.6	87	40

Table 4.11.5 (cont.-)
Predicted Traffic Noise Levels
Existing Conditions

		Predicted L_{dn}, dB, at 50 feet from Centerline				Distances from Centerline to L_{dn} Contours, feet	
Roadway Name	**Segment Description**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**	**60 dB**	**65 dB**
Balls Ferry Road	Panorama Point to Trefoil	57.5	49.6	62.8	64.1	94	44
Balls Ferry Road	Trefoil to 4th Street	56.3	48.4	61.6	62.9	78	36
Trefoil Lane	Main Street to Locust	53.8	45.9	47.7	55.3	24	11
Trefoil Lane	Locust to Balls Ferry	53.0	45.0	46.9	54.5	21	10
Gas Point Road	I-5 to Main Street	60.9	53.7	55.9	62.7	75	35
4th Street	Main Street to Locust	56.4	49.2	51.4	58.2	38	18
4th Street	Locust to Balls Ferry	53.8	46.6	48.8	55.6	25	12
Main Street	Cattleman to Trefoil	60.2	53.0	55.2	62.0	68	31
Main Street	Trefoil to 4th Street	60.1	52.9	55.1	61.8	66	31

Source: Brown-Buntin Associates, Inc., 2008.

The data in Table 4.11.5 indicate that noise from existing traffic on portions of Locust Road, Panorama Point Road, and Balls Ferry Road dominates the noise environment at receivers located immediately adjacent to the roadway. Noise levels along these roads are elevated in general due to the existing heavy truck traffic. Noise levels along Gas Point Road and Main Street are elevated in general due to the higher traffic volumes.

MEASURES OF CHANGES IN AMBIENT NOISE LEVELS

For non-transportation noise sources affecting noise sensitive land uses, many jurisdictions consider an increase in ambient noise levels of 5 dB to be potentially significant. This amount of change in environmental noise levels is generally considered to be the minimum required to be clearly noticeable by most people.

Some additional guidance as to the significance of changes in ambient noise levels is provided by the 1992 findings of the Federal Interagency Committee on Noise (FICON), which assessed the annoyance effects of changes in ambient noise levels resulting from aircraft operations. The FICON findings are based upon studies that relate aircraft and traffic noise levels to the percentage of persons highly annoyed by the noise. Annoyance is a summary measure of the general adverse reaction of people to noise that generates speech interference, sleep disturbance, or interference with the desire for a tranquil environment.

The rationale for the FICON findings is that it is possible to consistently describe the annoyance of people exposed to transportation noise in terms of L_{dn} or CNEL. The changes in noise exposure shown in Table 4.11.6 are expected to result in equal changes in annoyance at sensitive land uses.

Table 4.11.6
Potentially Significant Increases in Cumulative Noise Exposure For Transportation Noise Sources

Ambient Noise Level Without Project (L_{dn} or CNEL)	Change in Ambient Noise Level Due to Project
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Brown-Buntin Associates, Inc., 2008.

REGULATORY SETTING

An overview of existing and proposed *Shasta County General Plan* land use classifications and *Shasta County Zoning Plan* designations for the project site is provided in Section 3.4: Panorama Planned Development Regulatory Setting. Following is a discussion of objectives and policies in the *Shasta County General Plan* that are pertinent to the noise evaluation for the project site.

Shasta County General Plan

Objectives

There are no noise-related *Shasta County General Plan* objectives that relate to the proposed project.

Policies

N-a New noise-sensitive uses shall not be allowed in areas where the noise level created by existing non-transportation noise sources will exceed the noise level standards of Table N–IV from the *Shasta County General Plan* [Table 4.11.7 for the purposes of this document] as measured immediately within the property line or within a designated outdoor activity area (at the discretion of the Planning Director) of the proposed project, unless effective noise mitigation measures will be incorporated into the project design to achieve compliance with the standards specified in Table 4.11.7.

N-d The feasibility of proposed projects with respect to existing and future transportation noise levels shall be evaluated by comparison to Figure N-1 from the *Shasta County General Plan* [Figure 4.11.5: Transportation Noise-Related Land Use Compatibility Guidelines for Development, for the purposes of this document] and Table N-VI from the *Shasta County General Plan* [Table 4.11.8 for the purposes of this document].

N-e New development of noise-sensitive land uses will not be permitted in areas exposed to existing or projected noise levels from transportation-related sources which exceed the levels specified in Table 4.11.8 unless the project design includes effective mitigation measures to reduce both exterior and interior noise levels to satisfy the requirements in Table 4.11.8.

Table 4.11.7 (Table N-IV from the Shasta County General Plan)
Noise Level Performance Standards for New Projects
Affected by or Including Non-Transportation Noise Sources

Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly $L_{eq,}$ dB	55	50

Source: Brown-Buntin Associates, Inc., 2008. (Data from *Shasta County General Plan*)

The noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply for residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

The County can impose noise-level standards which are more restrictive than those specified above based upon determination of existing low ambient noise levels.

In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100' away from the residence.

Industrial, light industrial, commercial, and public-service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed noise sources which are typically of concern include, but are not limited to, the following:

HVAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

Note: For the purposes of the Noise Element, transportation sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.

FIGURE N-1
TRANSPORTATION NOISE RELATED
LAND USE COMPATIBILITY GUIDELINES FOR DEVELOPMENT

LAND USE CATEGORY		COMMUNITY NOISE EXPOSURE L_{dn} OR CNEL, dB 55	60	65	70	75	80		
Residential, Theaters, Music Halls, Meeting Halls, Churches, & Auditoriums	G.A.	■	■						
	C.A.			▒	▒				
	G.U.					■	■	■	■
Transient Lodging - Motels, Hotels, & RV Parks	G.A.	■	■						
	C.A			▒	▒	▒			
	G.U.						■	■	■
Schools, Libraries, Museums, Nursing Homes, & Child Care	G.A.	■	■						
	C.A.			▒	▒	▒			
	G.U.						■	■	■
Playgrounds, Neighborhood Parks, & Amphitheaters	G.A.	■	■	■	■				
	C.A.					▒			
	G.U.						■	■	■
Office Buildings, Business, Commercial, & Professional	G.A.	■	■	■					
	C.A.				▒	▒			
	G.U.						■	■	■
Industrial, Manufacturing, Agriculture, & Utilities	G.A.	■	■	■	■				
	C.A.					▒	▒	▒	
	G.U.								
Golf Courses, Outdoor Spectator Sports, & Riding Stables	G.A.	■	■	■	■				
	C.A.					▒	▒		
	G.U.								■

INTERPRETATION

G.A. = **GENERALLY ACCEPTABLE**
Specified land use is satisfactory. No noise mitigation measures are required.

C.A. = **CONDITIONALLY ACCEPTABLE**
Use should be permitted only after careful study and inclusion of protective measures as needed to satisfy the policies of the Noise Element.

G.U. = **GENERALLY UNACCEPTABLE**
Development is usually not feasible in accordance with the goals of the Noise Element.

Source: Brown-Buntin Associates Inc, 1998

Figure 4.11.5

Transportation Noise-Related Land Use Compatibility Guidelines for Development [Source: Shasta County, 2004.]

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Table 4.11.8 (Table N-VI from the Shasta County General Plan)
Maximum Allowable Noise Exposure
Transportation Noise Sources

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		Ldn/CNEL, dB	Ldn/CNEL, dB
Residential	60[3]	45	--
Transient Lodging	60[4]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playground, Neighborhood Parks	70	--	--

Source: Brown-Buntin Associates, Inc., 2008. (Data from *Shasta County General Plan)*

[1] Where the location of outdoor activity areas is unknown, the exterior noise-level standard shall be applied to the property line of the receiving land use. Where it is not practical to mitigate exterior noise levels at patios or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.

[2] As determined for a typical worst-case hour during periods of use.

[3] Where it is not possible to reduce noise in outdoor activity areas to 60dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, exterior noise levels up to 65 dB L_{dn}/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

[4] In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.

4.11.2 THRESHOLDS OF SIGNIFICANCE

Criteria for determining the significance of impacts related to noise were based on the Environmental Checklist Form in Appendix G of the State CEQA Guidelines (Cal. Code Regs., Title 14, Section 15000 et seq.), as well as Federal Interagency Committee on Noise (FICON) findings. An impact related to noise was considered significant if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels.
- Substantially and permanently increase ambient noise levels in the project vicinity above levels existing without the project.
- Substantially, either temporarily or periodically, increase 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, expose people residing or working in the project area to excessive noise levels.

- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

4.11.3 ENVIRONMENTAL IMPACTS AND MITIGATION

Impact NOI-4.11-1 Expose Persons to Excessive Noise Levels *(Less-than-Significant Impact with Mitigation Incorporated)*

The potentially significant noise sources addressed by this analysis are project construction activities, vehicle traffic, and the Union Pacific Railroad operations.

CONSTRUCTION NOISE IMPACTS

Construction activities that could produce potentially significant noise levels include use of engine-powered equipment, power tools, impact sounds, and vehicles. It is not expected that blasting would be required. Construction noise effects would be primarily related to the use of powered equipment; the duration and timing of the construction is of potential concern. Table 4.11.9 lists the noise levels associated with typical construction equipment. Some heavy powered construction equipment could produce potentially significant vibration levels. Table 4.11.10 lists vibration levels expected for representative heavy powered equipment.

Table 4.11.9
Construction Equipment Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level at 50 feet (dBA)
Site Clearing and Excavation	Dump Truck Backhoe	84 80
Concrete Pouring	Concrete Pump Truck Concrete Mixer Truck	82 85
Steel Erection	Crane Jack Hammer	85 85
Mechanical	Crane Pneumatic Tools	85 85
Clean-Up	Front End Loader Flat Bed Truck	80 84

Source: Federal Highway Administration, 2006.

Table 4.11.10
Construction Equipment Vibration Levels

Equipment	PPV* at 25 feet (in/sec)	Vibration Level at 25 feet (VdB)
Clam Shovel Drop	0.202	94
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: Federal Transit Administration, 1995.
PPV = Peak Particle Velocity

The actual period of construction noise associated with the project would vary with the location of the sensitive receptor, and it should be noted that the noise exposure for a given receptor would not be constant over the construction period. Rather, there are likely to be relatively short periods (days or weeks) of intense activity, separated by days or weeks. The overall time frame for noise exposure at a given sensitive receptor location would be limited. However, noise due to construction activities may result in a potentially significant impact. Mitigation measures incorporated into this section will reduce any potentially significant construction-related impacts to a less-than-significant level.

RAILROAD NOISE

The existing UPRR tracks are adjacent to the lots in Phase 1 of the project, in the southeast corner of the project site. The nearest lots would be approximately 100 feet from the centerline of the railroad tracks, essentially receiving the same noise exposure that was observed at noise measurement Site 1. The measured noise exposure on March 25-26, 2008, was 73.1 dB L_{dn}. This noise exposure exceeds the noise impact threshold of 60 dB L_{dn}. Prior contact with UPRR has indicated that no significant increases in its railroad operations are planned for the near future. Based upon the measured noise levels, the distance from the railroad tracks to the 60 dB L_{dn} contour would be about 750 feet. That is, the railroad noise exposure would exceed the noise impact threshold at any lots within 750 feet of the railroad centerline.

Mitigation for railroad line operations noise may be accomplished by using a noise barrier. Noise barriers that block the line of sight between the noise source and the receiver sites provide about 5 dB of noise reduction. Line-of-sight noise barriers may be placed either near the receptors or adjacent to the noise source(s); what matters is that the barrier be of sufficient height and mass to block the line of sight between the source and the receiver.

For a railroad noise source such as that observed at the project site, the primary noise sources are the engine exhaust and the warning horn. These are both located on top of the locomotive, about 14 feet above the tracks.

Assuming that the railroad and the receiver are essentially at grade, and that the receiver is 5 feet above the ground about 10 feet inside the nearest lot line, the height of a barrier at the receiving lot line required to block line of sight is 6 feet. The barrier height required to reduce the railroad noise level by 13 dB (to achieve 60 dB L_{dn}) is about 8 feet. If the barrier is designed to satisfy the noise impact threshold at the nearest lots, it is expected to satisfy the threshold at more distant lots, assuming that the barrier design blocks line of sight to all potentially affected receivers.

Noise barriers may be constructed from a variety of materials, including solid or tongue-and-groove wood panels, concrete panels, and masonry. A barrier may also be constructed as a combination of an earthen berm and a wall. The required heights and design of the barriers necessary to block the line of sight between the source and the receiver depend upon the topography at the project site boundary and the location of

the noise source and receivers. These factors will not be determined until final lot configurations and grading plans have been developed. As a result, the final barrier configurations cannot be established until that time.

TRAFFIC NOISE

As noted in the Existing Setting section, traffic on local roadways is a potentially significant noise source. In general, traffic noise levels are highest in working hours after 5 a.m., and lowest from midnight to 4 a.m. The highest traffic noise level is expected to occur between 7 and 8 a.m., due to relatively high hourly traffic volumes.

Noise levels due to future (Year 2029) traffic on local roadways were predicted using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108). The traffic analysis prepared by KD Anderson & Associates, Inc. (2008) was used to calculate Annual Average Daily Traffic (ADT) volumes for four future scenarios: Existing Plus Approved (pending) Projects (EPAP), EPAP plus the Project, Cumulative without the Project, and Cumulative plus the Project. Truck mix, day/night traffic distribution, and speeds were assumed to remain the same as in the existing condition.

The EPAP + Project would cause the County exterior noise standard of 60 dB Ldn to be exceeded at 50 feet along three roadway segments: Locust Road between Panorama Point Road and Arena Way, Locust Road between Cattleman Drive and Trefoil Lane, and 4th Street between Main Street and Locust Road.

On the affected segments of Locust Road, the nearest homes are more than 100 feet from the roadway, where the traffic noise levels would be reduced by about 4.5 dB to less than 60 dB Ldn. This would be a less than significant impact.

On the affected segment of 4th Street, there are about 8 homes and a mobile home park that would experience EPAP + Project-related traffic noise levels exceeding 60 dB Ldn. In addition, future cumulative development without the Project would result in substantial increases in traffic noise levels along segments of Locust Road, Ball's Ferry Road, Trefoil Lane and 4th Street. However, these conditions would occur with or without the project, and these traffic noise levels would be surpassed by the future cumulative traffic noise levels without the Project; this would be a less than significant impact.

In the long-term (cumulative) scenario, the increases in traffic noise levels would be potentially significant only on the portion of Locust Road between Barney Road and the intersection with Kimberly Road. There are no sensitive receivers located along this segment of Locust Road. This would be a less than significant impact.

Proposed residential lots along the Locust Road site frontage would also be exposed to high noise levels. Significant noise exposure could occur in on-site lots with outdoor activity areas located within 70 feet of the Locust Road centerline. This impact can be mitigated through construction of a properly designed sound barrier.

Primary traffic noise sources are heavy truck exhaust outlets and tire/road interaction. These sources are located approximately 8 feet above the roadway, and at the roadway surface, respectively. Assuming that the roadway centerline and the receiver are essentially at grade, and that the receiver is 5 feet above the ground about 10 feet inside the nearest lot line, the height of a barrier at the receiving lot line required to block line of sight is 6 feet. This barrier height would reduce traffic noise by about 5 dB. If the barrier is designed to satisfy the noise impact threshold at the nearest lots, it would be expected to satisfy the threshold at more distant lots, assuming that the barrier design blocks line of sight to all potentially affected receivers.

The required heights and design of the barriers necessary to block the line of sight between the source and the receiver depend upon the topography at the project site boundary and the location of the noise source and receivers. These factors cannot be determined until final lot configurations and grading plans have been developed. As a result, the final barrier configurations cannot be established until that time.

The following mitigation is necessary for the above significant impact:

MM NOI-4.11-1a. Noise-level increases during project construction shall be minimized by confining construction activities to weekdays between the hours of 7 a.m. and 7 p.m., and requiring all vehicles and equipment to be equipped with mufflers in good condition.

MM NOI-4.11-1b. The outdoor activity areas of the residential lots within 750 feet of the railroad tracks shall be shielded by a property line noise barrier designed to achieve an exterior noise level of 60 dB L_{dn} or less. It is anticipated that the required barrier height would be in the range of 8 feet above building pad elevation, though the final barrier configuration would be dependent upon the final lot configurations and grading plans. To minimize aesthetic concerns, all noise barriers over 6 feet tall shall be combined with an earthen berm, with the wall height not to exceed 6 feet. In addition, residences in Phase 1 within 750 feet of the railroad tracks shall be designed and constructed to ensure that the interior noise standard of 45 dB L_{dn} is satisfied. Both the building design and noise barrier design shall be reviewed by a qualified acoustical consultant to ensure that the 45 dB L_{dn} and 60 dB L_{dn} standards are met.

MM NOI-4.11-1c. The outdoor activity areas of the on-site residential lots within 70 feet of the Locust Road centerline shall be shielded by a property line noise barrier designed to achieve an exterior noise level of 60 dB L_{dn} or less. To minimize aesthetic concerns, all noise barriers over 6 feet tall shall be combined with an earthen berm, with the wall height not to exceed 6 feet. In addition, residences adjacent to Locust Road shall be designed and constructed to ensure that the interior noise standard of 45 dB L_{dn} is satisfied. Both the building design and noise barrier design shall be reviewed by a qualified acoustical consultant to ensure that the 45 dB L_{dn} and 60 dB L_{dn} standards are met.

Following mitigation, impacts related to excessive noise levels would be less than significant.

Impact NOI-4.11-2 Generate Excessive Groundborne Vibration or Noise Levels *(Less-than-Significant Impact)*

As stated, groundborne vibration or noise could potentially be generated temporarily during construction of the Panorama Planned Development. These impacts, if they occur, would be localized and most likely not noticeable beyond the immediate project vicinity. Mitigation for groundborne vibration during construction is not required.

No mitigation measures are necessary for this less-than-significant impact.

Impact NOI-4.11-3 Substantial Permanent Increase in Ambient Noise Levels *(Less-than-Significant Impact with Mitigation Incorporated)*

See analysis under Impact NOI-4.11-1.

Mitigation measures are necessary for this potentially-significant impact. See Mitigation Measure NOI-4.11-1 above.

Following mitigation, impacts related to a permanent increase in ambient noise levels would be less than significant.

Impact NOI-4.11-4 Substantial Temporary or Periodic Increase in Ambient Noise Levels *(Less-than-Significant Impact with Mitigation Incorporated)*

See analysis under Impact NOI-4.11-1.

Mitigation measures are necessary for this potentially-significant impact. See Mitigation Measure NOI-4.11-1 above.

Following mitigation, impacts related to a temporary or periodic increase in ambient noise levels would be less than significant.

Impact NOI-4.11-5 Expose People to Excessive Noise Levels in the Vicinity of a Public Airport *(No Impact)*

The project is not located in the vicinity of a public airstrip. There would be no impact.

No mitigation measures are necessary because there would be no impact.

Impact NOI-4.11-6 Expose People to Excessive Noise Levels in the Vicinity of a Private Airport *(No Impact)*

The project is not located in the vicinity of a private airstrip. There would be no impact.

No mitigation measures are necessary because there would be no impact.

4.11.4 LEVEL OF SIGNIFICANCE AFTER MITIGATION

Following implementation of the above mitigation measure (Mitigation Measure NOI-4.11-1), impacts with respect to noise level increases would be reduced to a less-than-significant level.

End of Section.