Sierra Pine Residential

City of Rocklin, California

March 21, 2017

jcb Project # 2017-119

Prepared for:

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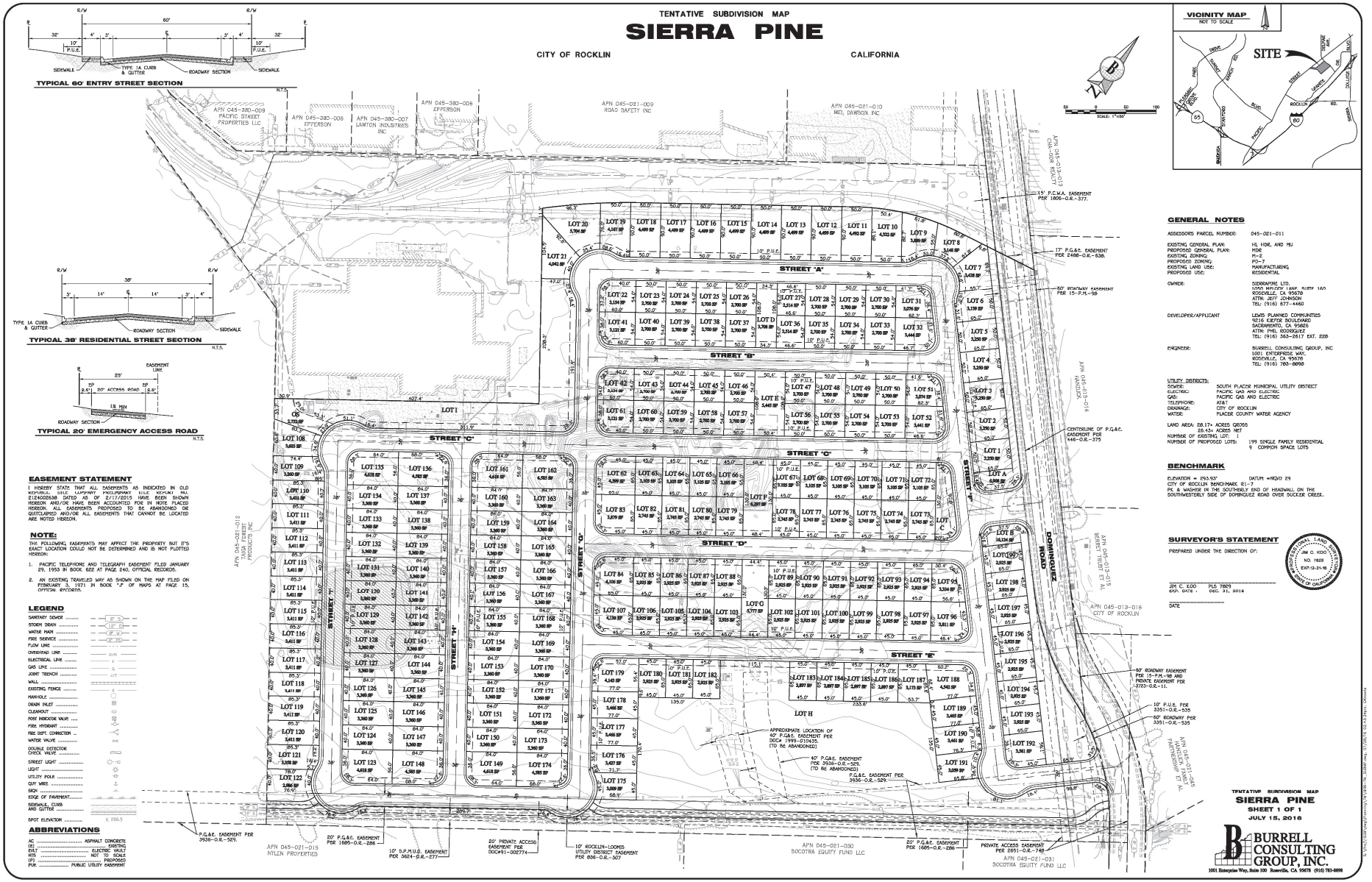
INTRODUCTION

The Sierra Pine Residential project includes the development of a 28.17 acre parcel bounded to the northeast by Dominguez Road, the northwest by a Union Pacific Railroad (UPRR) spur line, the southwest by Tiaga Forest Products, and to the southeast by a residential subdivision currently under construction. The project is located in the City of Rocklin, California.

Figure 1 shows the project site plan.

The purpose of this study is to determine whether noise levels from adjacent and nearby roadways (Dominguez Road, Pacific Street, and Interstate 80), existing industrial uses (Tiaga Forest Products and Pacific MDF Products, Inc.), and the nearby Union Pacific railroad would exceed the City of Rocklin exterior or interior noise level standards at the proposed residential uses. Predicted noise levels will be compared to the noise level standards of the City of Rocklin General Plan Noise Element. If necessary, noise control measures will be recommended for the proposed project.



Sierra Pine Residential Conversion

Figure 1: Site Plan

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Figure Prepared: March 2017

ENVIRONMENTAL SETTING

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, unless otherwise noted.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. Appendix A provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6 dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING CONDITIONS

The existing noise environment on the project site is defined primarily by traffic on the local roadway network, Union Pacific Railroad operations, and adjacent industrial uses.

Existing Ambient Noise Levels

To quantify the existing ambient noise environment in the project vicinity, four continuous 24-hour noise level measurements were conducted on the project site. The noise measurement locations are shown on Figure 2 and the noise survey results are provided in Table 2. See Appendix B for the complete noise measurement results.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

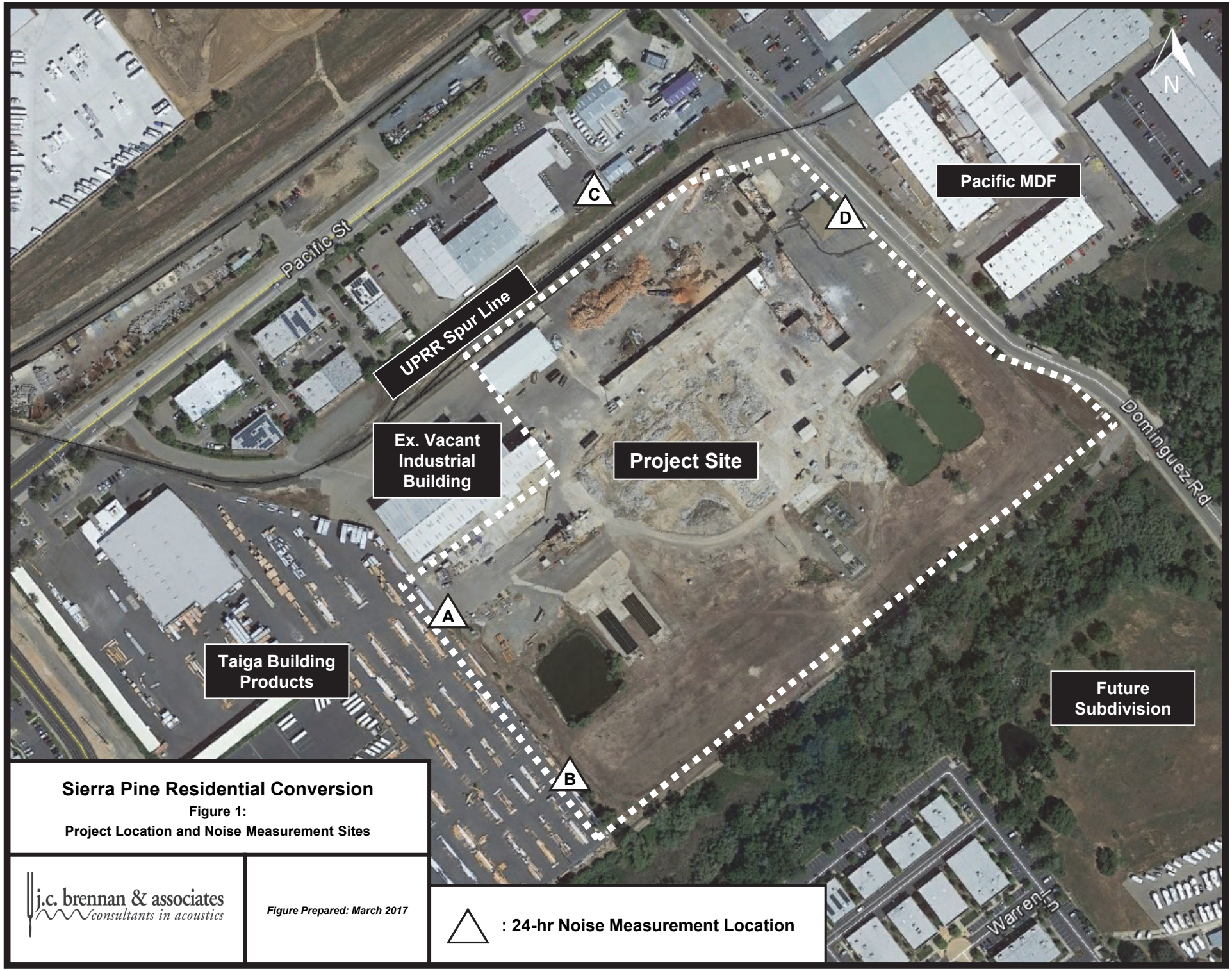

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Figure 1:

Project Location and Noise Measurement Sites

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Figure Prepared: March 2017

TABLE 1: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Site	Date	L_{dn}	Average[1] Measured Hourly Noise Levels					
			Daytime (7am-7 pm)			Nighttime (10pm-7am)		
			L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Continuous 24-hour noise level measurements								
LT-A	8/25/15 – 8/26/15	58	56	48	70	50	47	60
LT-B	8/25/15 – 8/26/15	56	52	46	72	49	47	58
LT-C	8/25/15 – 8/26/15	63	63	55	77	52	48	62
LT-D	8/25/15 – 8/26/15	66	63	60	82	59	55	75

1. Average values reported are the average of the hourly measured values over the daytime or nighttime period.

Source: j.c. brennan & associates, Inc., 2017.

REGULATORY CONTEXT

FEDERAL

There are no federal regulations related to noise that apply to the Proposed Project.

STATE

There are no state regulations related to noise that apply to the Proposed Project.

LOCAL

City of Rocklin General Plan Noise Element

The City of Rocklin General Plan (October 2012) includes criteria for stationary (non-transportation) and transportation noise sources. Tables 3 and 4 below show the stationary and transportation noise source criteria, respectively (Tables 2-1 and 2-2 of the General Plan).

TABLE 3: EXTERIOR NOISE LEVEL DESIGN STANDARDS FOR NEW PROJECTS AFFECTED BY OR INCLUDING STATIONARY 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 dBA	45 dBA

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

"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 pump stations, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

TABLE 4 : MAXIMUM ALLOWABLE NOISE EXPOSURE

TRANSPORTATION NOISE SOURCES

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient Lodging	65[4]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Non-Commercial Places of Public Assembly	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

[1] The outdoor activity area is generally considered to be the location where individuals may generally congregate for relaxation, or where individuals may require adequate speech intelligibility. Such places may include patios of residences, picnic facilities, or instructional areas.

Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.

At the discretion of the City, where no outdoor activity areas are provided or known, only the interior noise level criteria can be applied to the project.

[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 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of 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.

EVALUATION OF FUTURE TRAFFIC NOISE LEVELS AT THE PROJECT SITE

Future Traffic Noise Levels

To determine the future traffic noise levels on the project site, j.c. brennan & associates, Inc., utilized Cumulative Plus Project traffic predictions for Dominguez Road prepared by DKS Transportation consultants for the City of Rocklin General Plan Update (August, 2011).

Table 5 shows the predicted future traffic noise levels at the proposed residential uses located closest to Dominguez Road. A complete listing of the FHWA Traffic Noise Prediction Model inputs is provided in Appendix C.

TABLE 5: PREDICTED FUTURE TRAFFIC NOISE LEVELS

Roadway	Distance, feet[1]	ADT	Predicted Traffic Noise Levels, dB Ldn[2]			
			No Wall	6' Wall	7' Wall	8' Wall
Pacific Street – Nearest Backyards	360'	28,700	54	49	48	47
Dominquez Road – Nearest Backyards	55'	13,700	65	58	57	55
Interstate 80 – Nearest Backyards	1,800'	143,000	56	N/A	N/A	N/A

Notes: ADT = average daily trips

[1] Setback distances are measured in feet from the centerlines of the roadways to the center of residential backyards.

[2] The modeled noise barrier heights are relative to finished pad elevations.

Source: FHWA-RD-77-108 with inputs from Caltrans and City of Rocklin General Plan and j.c. brennan & associates, Inc. 2017.

The Table 5 data indicates that future traffic noise levels at outdoor activity areas of the proposed project are predicted to comply with the City of Rocklin 60 dB L_{dn} exterior noise level standard, as proposed with a 6-foot tall sound wall along Dominquez Road. Therefore, no additional exterior traffic noise reduction measures would be required. No wall would be required for Pacific Street or Interstate 80 noise.

Interior Traffic Noise Levels:

Standard construction practices, consistent with the uniform building code typically provides an exterior-to-interior noise level reduction of approximately 25 dB, assuming that air conditioning is included for each unit, which allows residents to close windows for the required acoustical isolation. Therefore, as long as exterior noise levels at the building facades do not exceed 70 dB L_{dn}, the interior noise levels will typically comply with the interior noise level standard of 45 dB L_{dn}.

There are no residential facades predicted to be exposed to exterior traffic noise levels exceeding 70 dB L_{dn} or higher. Therefore, interior noise levels are predicted to be less than 45 dB L_{dn} at all proposed residential interior space. Therefore, no noise reduction measures appear to be warranted, assuming that air-conditioning is provided to allow windows to remain closed for acoustical isolation.

EVALUATION OF RAILROAD NOISE LEVELS AT THE PROJECT SITE

j.c. brennan & associates, Inc., conducted continuous (24-hour) noise level measurements of railroad operations on August 25-26, 2015. It is our understanding that this line includes one roundtrip railroad car per day providing rail service to Pacific MDF located east of the project site.

The noise measurements were conducted at a distance of 55 feet from the centerline of the railroad spur line. Figure 2 shows the noise measurement site, labeled as Site C. The sound monitoring at this location indicated that the total noise exposure at this location was 63 dB L_{dn}. It should be noted that this total noise exposure included background traffic noise from Pacific Street and Dominquez Road, noise from the main Union Pacific railroad line north of Pacific Street, and noise from surrounding industrial uses. For the purpose of this noise study, the total exposure of 63 dB L_{dn} will be attributed to the adjacent spur line and corresponding noise control measures will be recommended.

Based upon the noise exposure of 63 dB L_{dn}, the predicted railroad noise level at the center of the nearest proposed residential backyards, would be 65 dB L_{dn}.

Table 6: Predicted Railroad Noise Levels

Location	Predicted Exterior Noise Level, L_{dn}	Predicted Noise Level with 6' Wall
Backyards	65 dBA L_{dn}	60 dBA L_{dn}
Source: j.c. brennan & associates, Inc., 2017		

Based upon the Table 6 data, backyards are predicted to be exposed to exterior noise levels exceeding the City of Rocklin 60 dB L_{dn} exterior noise level standard. However, the project includes the construction of a 6-foot tall sound wall on top of a retaining wall. Therefore, no additional noise reduction measures should be required to meet the City's 60 dB L_{dn} exterior noise level standard.

Prediction of Interior Noise Levels:

The City of Rocklin applies a 45 dB L_{dn} interior noise level standard for residential uses exposed to transportation noise sources. The residential uses adjacent to the UPRR spur line are predicted to be exposed to first-floor exterior noise levels of approximately 60 dB L_{dn}, based upon the Table 6 data. Second floor noise levels are typically 2-3 dB higher than first floor noise levels and do not received shielding from sound walls. Therefore, exterior noise levels at the second floor facades are predicted to be up to 68 dB L_{dn}.

Modern construction practices, consistent with the building code typically provide an exterior to interior noise level reduction of approximately 25 dB, assuming that air conditioning is included for each unit, which allows residents to close windows for the required acoustical isolation. Therefore, interior noise level of 43 dBA L_{dn} are predicted for the residential uses along the UPRR spur lines. This meets the City of Rocklin 45 dBA L_{dn} interior noise level standard without any additional noise control measures.

Analysis of Surrounding Industrial Use Exterior Noise Levels

The surrounding industrial uses include Taiga Lumber Products to the west and Pacific MDF Products to the east, across Dominquez Road. Additionally, an existing vacant industrial building, which was previously known as the Sierra Pine TMDF building, is expected to house an industrial use in the future. The following is a discussion of the noise generation associated with each of the above-listed noise sources.

Taiga Lumber Products

The Taiga Lumber Products industrial use includes a large outdoor lumber yard which borders the west boundary of the project site. Noise sources observed included fork lifts, vehicle movements, and saws. The facility operates during daylight hours which are approximately 6:00 a.m. to 5:00 p.m. during summer and 7:00 a.m. to 6:00 p.m. during winter.

Based upon ambient noise monitoring conducted along the west boundary of the project site, typical noise levels ranged between 46-63 dBA L_{eq} during daytime hours and 55-57 dBA L_{eq} during the nighttime (6:00 a.m.) hour. Based upon the ambient noise monitoring conducted along the west project boundary, nighttime (10:00 p.m. to 7:00 a.m.) ambient noise levels were approximately 42-48 dBA L_{eq}. Therefore, application of the City's nighttime 45 dBA L_{eq} noise level standard would be appropriate to ensure that future residential uses are not exposed to noise from Taiga Lumber Products which would be substantially louder than nighttime ambient noise levels.

To achieve compliance with a 45 dBA L_{eq} nighttime noise level standard for early morning operations, the project should include the construction of an 8-foot tall sound wall (relative to pad elevations) along the western boundary of the project site. The Appendix D noise barrier calculations indicate that the 8-foot tall wall would reduce noise levels to 45 dBA L_{eq} during early-morning operations. The wall would also reduce daytime noise levels from a high of 63 dBA L_{eq} to 51 dBA L_{eq}. This would also meet the City's daytime (7:00 a.m. to 10:00 p.m.) 55 dBA L_{eq} noise level standard.

Pacific MDF Products

The Pacific MDF Products industrial use includes a lumber processing facility with elevated outdoor mechanical dust collection systems. The site is located immediately east of the project site, across Dominquez Road. The primary noise source observed was associated with fan noise for the dust collection system. The facility operates a normal daytime shift of 6:00 a.m. to 4:30 p.m. When the facility is busy, a swing shift may operate between 4:00 p.m. to 2:30 a.m.

Based upon ambient noise monitoring conducted along the east boundary of the project site, the mechanical equipment was measured to generate a steady noise level of 57 dBA during operation of the dust collection facility. However, traffic noise was found to be the louder noise source with typical daytime levels of 59-65 dBA L_{eq} and nighttime levels of 55-63 dBA L_{eq}. Therefore, it is recommended that noise from the dust collection system be reduced to equal the quietest measured nighttime noise level of 55 dBA L_{eq}.

To achieve a 55 dBA L_{eq} nighttime noise level, the project should include the construction of an 8-foot tall sound wall (relative to pad elevations) along the eastern boundary of the project site. The Appendix D noise barrier calculations indicate that the 8-foot tall wall would reduce noise levels to 53 dBA L_{eq} during operation of the dust collection system. This would be

approximately 2 dBA quieter than the lowest measured nighttime traffic noise level of 55 dBA L_{eq}.

Industrial Building at Northwest Corner of Property (Previous Sierra Pine TMDF)

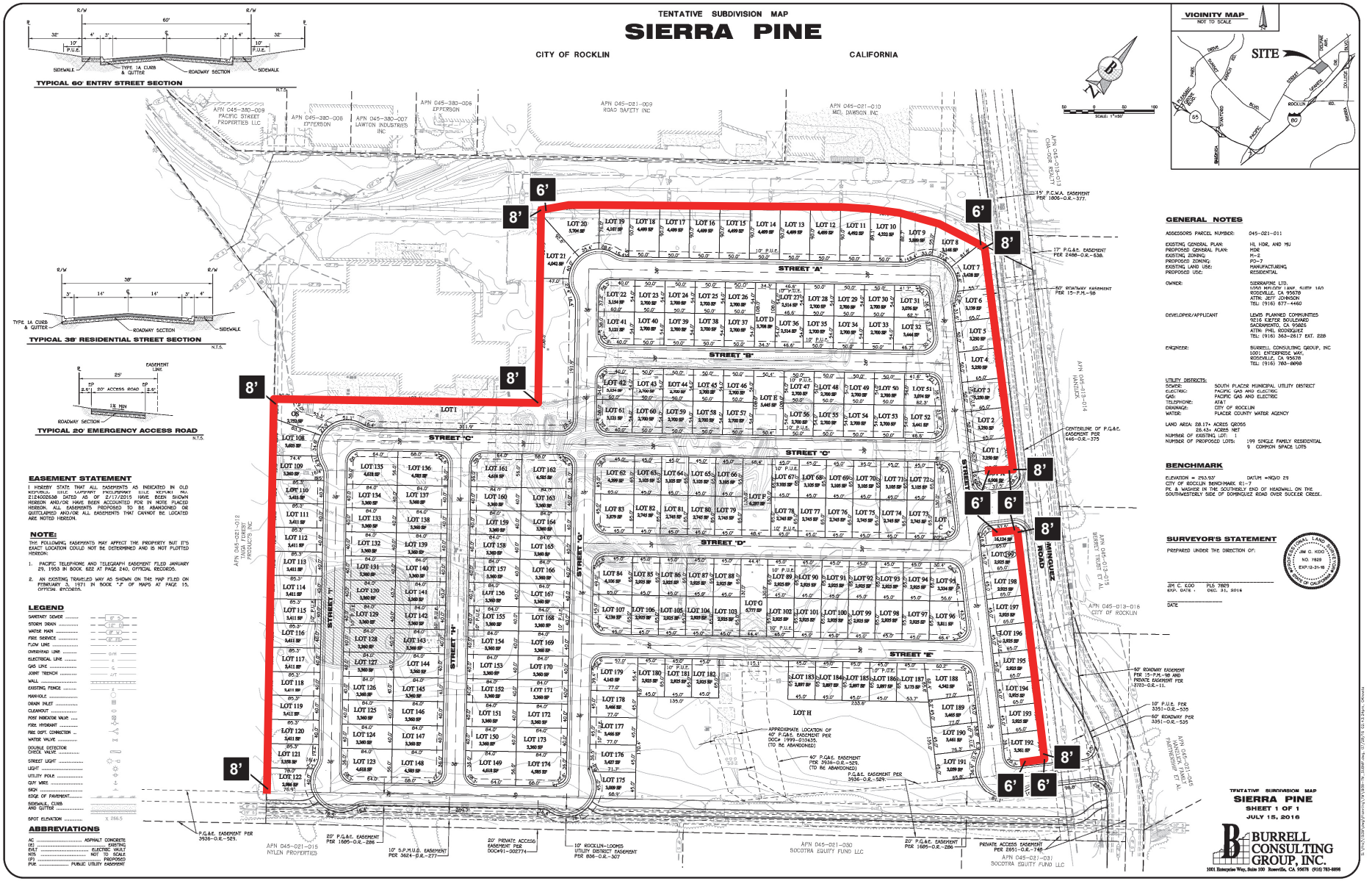
It is assumed that the future industrial use may include indoor activities which include manufacturing, or other substantial noise-generating activities. These indoor activities would be substantially muffled by the existing building construction. Additionally, it is expected that any outdoor mechanical equipment would be shielded from view and would be required to have noise muffling installed such that outdoor noise levels would comply with the City's 55 dBA L_{eq} daytime and 45 dBA L_{eq} nighttime noise standards at the nearest residential receptors.

It is expected that exterior noise due to truck circulation and some loading activity should be expected to occur near the northeast corner of the existing building. j.c. brennan & associates, Inc. estimates that noise levels due to loading dock activities could be in the range of 55-60 dBA L_{eq} at a distance of 100 feet. In order to meet the City of Rocklin 55 dB L_{eq} exterior noise level standard, a property line noise barrier 8-feet in height would be required, as shown by the Appendix D noise barrier calculation. This analysis assumes that no nighttime (10:00 p.m. to 7:00 a.m.) deliveries would be allowed for this use.

Figure 3 shows recommended noise barrier locations and heights.

Analysis of Surrounding Industrial Use Interior Noise Levels

Maximum hourly noise levels for the surrounding industrial uses are predicted to range between 46 dBA L_{eq} to 63 dBA L_{eq} at first floor elevations, prior to the construction of sound walls. Because second floor noise levels are typically 2-3 dB louder, it is expected that second floor residential facades would be exposed to maximum hourly noise levels of 49 dBA L_{eq} to 66 dBA L_{eq}. Therefore, interior noise levels would be expected to range between 24 dBA L_{eq} to 41 dBA L_{eq}. This range of interior noise levels would comply with the City of Rocklin maximum hourly noise level standard of 45 dBA L_{eq}. Therefore, no additional interior noise control measures would be required.



Sierra Pine Residential Conversion

Figure 3: Recommended Noise Barriers and Heights

j.c. brennan & associates
consultants in acoustics

Figure Prepared: March 2017

CONCLUSIONS

The proposed project is predicted to be exposed to transportation and non-transportation noise levels in compliance with the City of Rocklin exterior and interior noise level standards, assuming the following:

- Sound walls shall be constructed, as described below and shown on Figure 3. Sound wall heights are relative to proposed pad elevations and should be constructed of concrete masonry materials, earthen berm, or any combination of the two achieving the total required height.
-
    - An 8-foot tall sound wall should be constructed along the western boundary of the project, adjacent to the existing industrial uses.
    - A 6-foot tall sound wall should be constructed along the northern boundary of the project site, adjacent to the UPRR spur line.
    - An 8-foot tall sound wall should be constructed along the eastern boundary of the project, along Dominquez Road.
- The future industrial use in the previous Sierra Pine TMDF building shall provide noise control measures as necessary to ensure that outdoor mechanical equipment does not exceed the City's noise level standards at the nearest residential property lines. Additionally, shipping/receiving shall be limited to daytime (7:00 a.m. to 10:00 p.m.) hours.
- Mechanical ventilation shall be provided to allow residents to keep doors and windows closed for acoustic isolation.

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_{(n)}$	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L_{50} is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the AMaximum@ level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is s rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B
Sierra Pine Residential Conversion
24hr Continuous Noise Monitoring - Site A
Tuesday, August 25, 2015 - Wednesday, August 26, 2015

Hour	Leq	Lmax	L50	L90
12:00	51	71	48	44
13:00	52	68	49	46
14:00	55	78	50	46
15:00	54	74	50	46
16:00	49	63	46	43
17:00	45	59	45	43
18:00	45	59	44	42
19:00	50	72	46	44
20:00	48	61	48	46
21:00	50	71	48	46
22:00	48	59	47	45
23:00	46	57	45	43
0:00	45	62	44	41
1:00	42	55	42	39
2:00	43	50	43	40
3:00	45	60	44	43
4:00	48	58	48	45
5:00	51	58	51	50
6:00	57	76	55	53
7:00	63	81	57	54
8:00	62	83	51	47
9:00	49	69	47	45
10:00	54	72	50	45
11:00	53	74	48	44

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	63	45	56	57	42	50
Lmax (Maximum)	83	59	70	76	50	60
L50 (Median)	57	44	48	55	42	47
L90 (Background)	54	42	46	53	39	44

Computed Ldn, dB	58
% Daytime Energy	86%
% Nighttime Energy	14%

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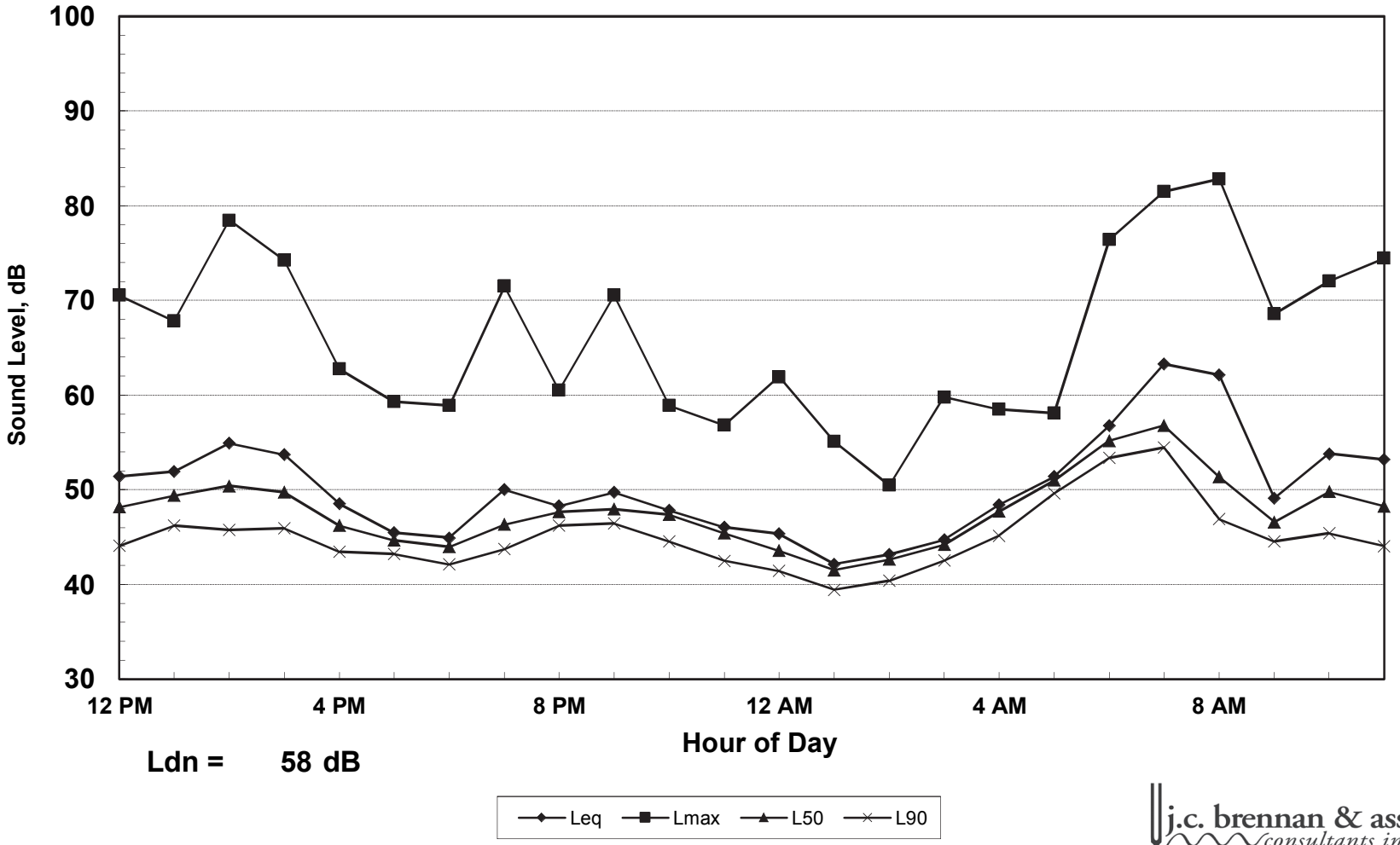
Appendix B

Sierra Pine Residential Conversion

24hr Continuous Noise Monitoring - Site A

Tuesday, August 25, 2015 - Wednesday, August 26, 2015



Ldn = 58 dB

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Appendix B
Sierra Pine Residential Conversion
24hr Continuous Noise Monitoring - Site B
Tuesday, August 25, 2015 - Wednesday, August 26, 2015

Hour	Leq	Lmax	L50	L90
12:00	54	79	47	43
13:00	53	75	48	44
14:00	54	78	48	43
15:00	54	77	47	43
16:00	56	83	44	41
17:00	44	56	43	41
18:00	44	56	43	41
19:00	48	71	45	43
20:00	48	62	47	46
21:00	50	69	48	47
22:00	47	54	47	45
23:00	47	59	46	44
0:00	46	63	45	43
1:00	44	51	44	42
2:00	44	50	44	43
3:00	45	53	45	43
4:00	48	57	47	45
5:00	50	56	50	48
6:00	55	76	53	51
7:00	56	82	53	51
8:00	51	72	48	45
9:00	46	59	45	43
10:00	53	85	45	43
11:00	51	74	46	43

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	56	44	52	55	44	49
Lmax (Maximum)	85	56	72	76	50	58
L50 (Median)	53	43	46	53	44	47
L90 (Background)	51	41	44	51	42	45

Computed Ldn, dB	56
% Daytime Energy	79%
% Nighttime Energy	21%

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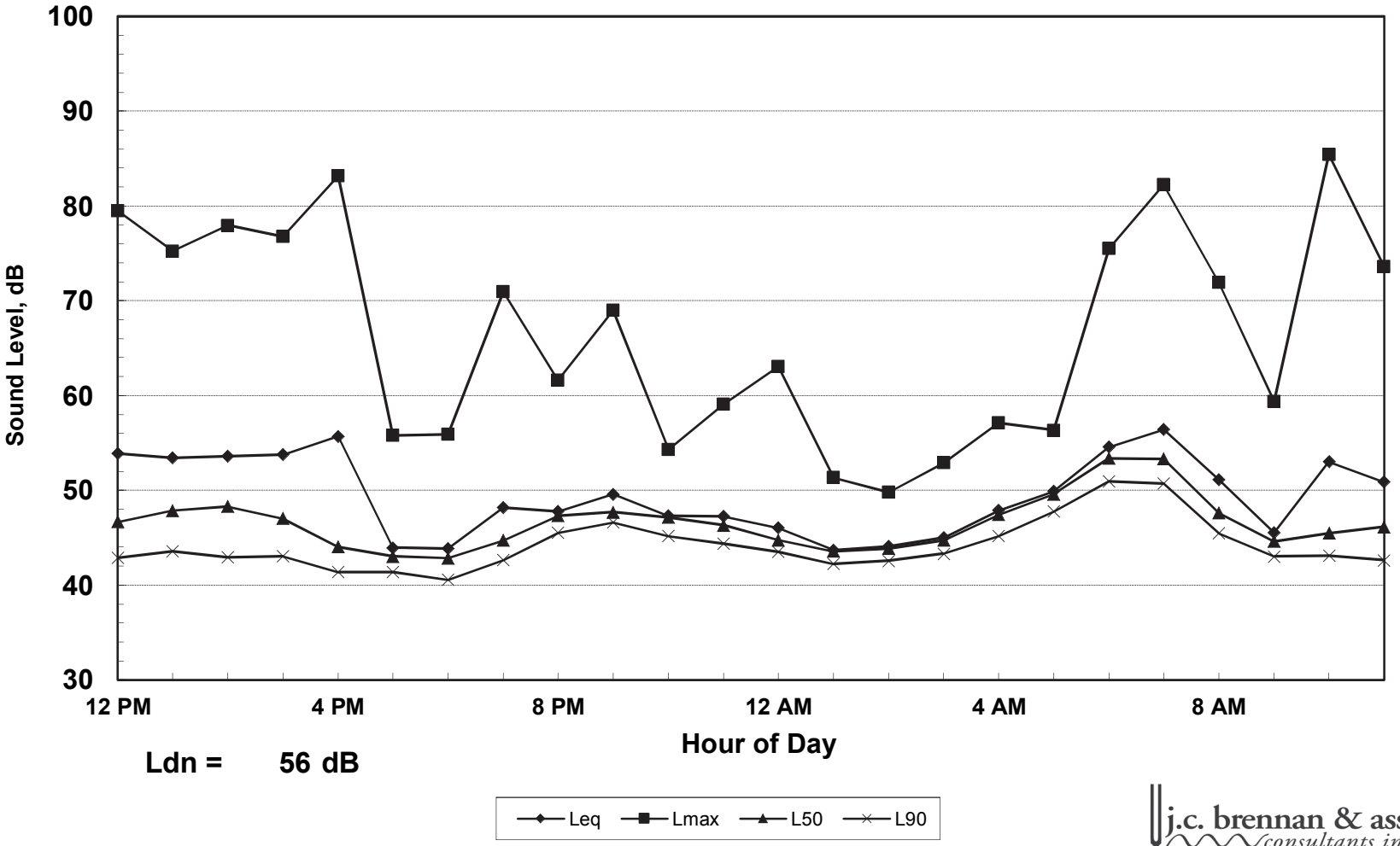
Appendix B

Sierra Pine Residential Conversion

24hr Continuous Noise Monitoring - Site B

Tuesday, August 25, 2015 - Wednesday, August 26, 2015



Ldn = 56 dB

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Appendix B
Sierra Pine Residential Conversion
24hr Continuous Noise Monitoring - Site C
Tuesday, August 25, 2015 - Wednesday, August 26, 2015

Hour	Leq	Lmax	L50	L90
12:00	65	83	54	48
13:00	68	89	65	58
14:00	69	82	66	61
15:00	60	79	52	47
16:00	52	67	51	47
17:00	55	84	51	47
18:00	52	75	50	46
19:00	53	72	49	46
20:00	51	66	49	47
21:00	51	71	50	48
22:00	50	59	49	47
23:00	48	60	48	45
0:00	47	61	46	44
1:00	46	61	45	44
2:00	45	56	44	42
3:00	45	58	44	42
4:00	55	67	49	45
5:00	54	67	53	51
6:00	57	68	57	54
7:00	64	80	58	55
8:00	67	84	60	53
9:00	57	73	54	51
10:00	59	76	55	50
11:00	62	83	60	54

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	69	51	63	57	45	52
Lmax (Maximum)	89	66	77	68	56	62
L50 (Median)	66	49	55	57	44	48
L90 (Background)	61	46	51	54	42	46

Computed Ldn, dB	63
% Daytime Energy	95%
% Nighttime Energy	5%

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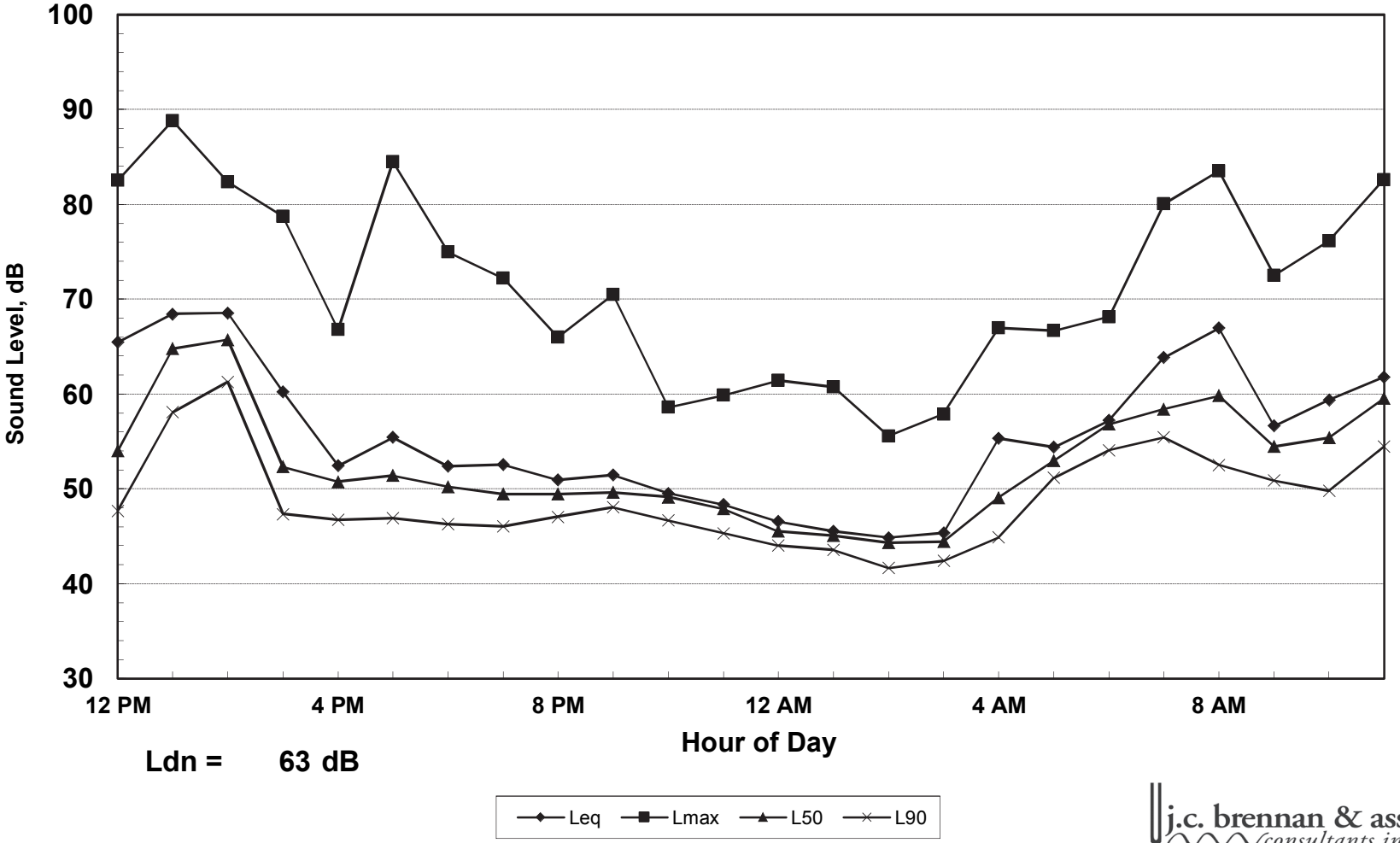
Appendix B

Sierra Pine Residential Conversion

24hr Continuous Noise Monitoring - Site C

Tuesday, August 25, 2015 - Wednesday, August 26, 2015



Ldn = 63 dB

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Appendix B
Sierra Pine Residential Conversion
24hr Continuous Noise Monitoring - Site D
Tuesday, August 25, 2015 - Wednesday, August 26, 2015

Hour	Leq	Lmax	L50	L90
12:00	64	86	60	57
13:00	64	84	60	57
14:00	63	81	60	57
15:00	64	86	61	57
16:00	65	89	60	57
17:00	63	75	60	57
18:00	62	79	59	57
19:00	60	78	58	57
20:00	59	75	58	57
21:00	60	78	58	57
22:00	60	80	59	57
23:00	58	68	58	57
0:00	58	71	57	56
1:00	59	74	58	57
2:00	56	73	51	44
3:00	56	79	48	43
4:00	55	77	50	45
5:00	60	76	59	51
6:00	63	78	61	59
7:00	64	87	61	59
8:00	64	80	61	58
9:00	63	87	60	58
10:00	63	81	60	57
11:00	65	89	61	58

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	65	59	63	63	55	59
Lmax (Maximum)	89	75	82	80	68	75
L50 (Median)	61	58	60	61	48	55
L90 (Background)	59	57	57	59	43	52

Computed Ldn, dB	66
% Daytime Energy	81%
% Nighttime Energy	19%

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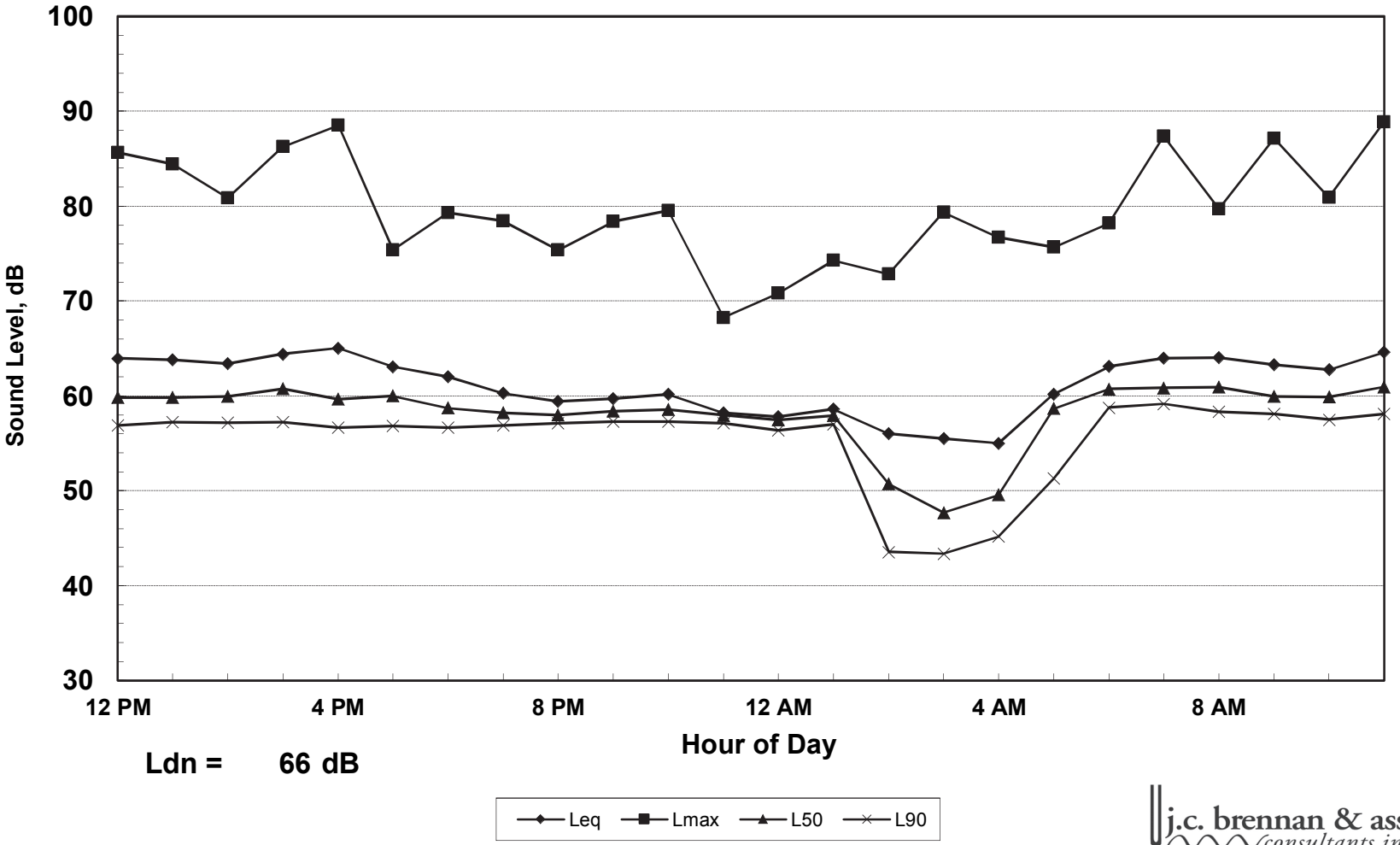
Appendix B

Sierra Pine Residential Conversion

24hr Continuous Noise Monitoring - Site D

Tuesday, August 25, 2015 - Wednesday, August 26, 2015



Ldn = 66 dB

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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-119 Sierra Pine Residential Development
Description: Cumulative + Project Traffic
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name - Segment	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Pacific Street - Nearest Residential Backyards	28,700	88		12	3	2	45	360	-5
2	Dominquez Road - Nearest Residential Backyards	13,700	83		17	1	0.5	35	55	
3	Interstate 80 - Nearest Residential Backyards	143,000	80		20	1	4	65	1800	-5

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-119 Sierra Pine Residential Development
Description: Cumulative + Project Traffic
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name - Segment	Autos	Medium Trucks	Heavy Trucks	Total
1	Pacific Street - Nearest Residential Backyards	52	45	48	54
2	Dominquez Road - Nearest Residential Backyards	64	54	56	65
3	Interstate 80 - Nearest Residential Backyards	54	41	50	56

Appendix D

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2017-119
Project Name: Sierra Pine Residential
Location(s): Nearest Residential

Noise Level Data:

Source Description: Tiaga Forest Products
Source Noise Level, dBA: 57
Source Frequency (Hz): 1000
Source Height (ft): 302

Site Geometry:

Receiver Description: Nearest Backyard
Source to Barrier Distance (C_1): 20
Barrier to Receiver Distance (C_2): 15

Pad/Ground Elevation at Receiver: 300
Receiver Elevation[1]: 305
Base of Barrier Elevation: 300
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
306	6	-9	48	Yes
307	7	-11	47	Yes
308	8	-12	45	Yes
309	9	-13	44	Yes
310	10	-15	43	Yes
311	11	-15	42	Yes
312	12	-16	41	Yes
313	13	-17	40	Yes
314	14	-17	40	Yes
315	15	-17	40	Yes
316	16	-17	40	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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Appendix D

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2017-119
Project Name: Sierra Pine Residential
Location(s): Nearest Residential

Noise Level Data:

Source Description: Pacific MDF
Source Noise Level, dBA: 57
Source Frequency (Hz): 500
Source Height (ft): 397

Site Geometry:

Receiver Description: Nearest Backyard
Source to Barrier Distance (C_1): 280
Barrier to Receiver Distance (C_2): 15

Pad/Ground Elevation at Receiver: 300
Receiver Elevation[1]: 305
Base of Barrier Elevation: 300
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
306	6	-1	56	No
307	7	-1	56	No
308	8	-4	53	No
309	9	-5	52	No
310	10	-5	52	Yes
311	11	-5	52	Yes
312	12	-6	51	Yes
313	13	-7	50	Yes
314	14	-8	49	Yes
315	15	-9	48	Yes
316	16	-10	47	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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Appendix D

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2017-119
Project Name: Sierra Pine Residential
Location(s): Nearest Residential

Noise Level Data:

Source Description: Ex. Vacant Residential E
Source Noise Level, dBA: 62
Source Frequency (Hz): 500
Source Height (ft): 308

Site Geometry:

Receiver Description: Nearest Backyard
Source to Barrier Distance (C_1): 65
Barrier to Receiver Distance (C_2): 15

Pad/Ground Elevation at Receiver: 303
Receiver Elevation[1]: 308
Base of Barrier Elevation: 303
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
309	6	-5	57	Yes
310	7	-6	56	Yes
311	8	-8	54	Yes
312	9	-9	53	Yes
313	10	-10	52	Yes
314	11	-11	51	Yes
315	12	-12	50	Yes
316	13	-13	49	Yes
317	14	-13	49	Yes
318	15	-14	48	Yes
319	16	-15	47	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

Appendix D

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2017-119
Project Name: Sierra Pine Residential
Location(s): Nearest Residential

Noise Level Data:

Source Description: UP Railroad
Source Noise Level, dBA: 65
Source Frequency (Hz): 500
Source Height (ft): 310

Site Geometry:

Receiver Description: Nearest Backyard
Source to Barrier Distance (C_1): 25
Barrier to Receiver Distance (C_2): 15

Pad/Ground Elevation at Receiver: 304
Receiver Elevation[1]: 309
Base of Barrier Elevation: 304
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
310	6	-5	60	Yes
311	7	-6	59	Yes
312	8	-8	57	Yes
313	9	-9	56	Yes
314	10	-10	55	Yes
315	11	-11	54	Yes
316	12	-12	53	Yes
317	13	-13	52	Yes
318	14	-14	51	Yes
319	15	-15	50	Yes
320	16	-15	50	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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