

**Appendix G**  
**NOISE REPORT**  
**J.C. BRENNAN & ASSOCIATES, INC.**



November 2, 2011

Mr. Adrian Tieslau  
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**Subject: Tahoe Vista Recreation Area – Phase 2**

Dear Mr. Tieslau:

j.c. brennan & associates, Inc. previously prepared an Environmental Noise Assessment for the above-referenced project dated August 1, 2008. Based upon our review of the current project site plans, dated January 3, 2011, the project appears to be consistent with the plans previously analyzed. Additionally, j.c. brennan & associates, Inc. believes that the ambient noise monitoring conducted July 21-22, 2008 is still representative of existing conditions at the project site. Therefore, no revisions to the noise analysis appear to be warranted at this time.

If you have any questions, please contact me at (530) 823-0960 or [lsaxelby@jcbrennanassoc.com](mailto:lsaxelby@jcbrennanassoc.com).

Respectfully submitted,

j.c. brennan & associates, Inc.

Luke Saxelby, INCE  
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# Environmental Noise Assessment

## Tahoe Vista Recreation Area - Phase 2

Placer County, California

Job # 2008-180

Prepared For:

**Tieslau Civil Engineering**

P.O. Box 2297  
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Attn: Mr. Adrian Tieslau

Prepared By:

**j.c. brennan & associates, Inc.**

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August 1, 2008

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## INTRODUCTION

The proposed Tahoe Vista Recreation Area Phase 2 project is located at 6965 North Lake Tahoe Boulevard in Tahoe Vista, California.

Phase 1 of the redevelopment project was completed in 2007 on the south side (lakeside) of SR 28. Phase 2 proposes to construct a parking area in the northwest quadrant of the SR 28/National Avenue intersection, which is also referred to as the "upland parcel." Phase 2 includes 41 non-boater parking spaces, 21 boater parking spaces, and improvements to the westbound transit stop along SR 28.

There are two proposed access points to the facility. The southern access point is proposed to be an entrance for all vehicles as well as an exit for passenger vehicles. The northern access point is proposed to be an exit-only for vehicles with trailers. Note that a future concession building location is indicated on the site plans for the upland parcel. However, as the Phase 2 project does not include construction of a concession building, the potential noise impacts associated with the potential concession use are not evaluated in this study.

Figure 1 shows the project site and its vicinity.

The intent of this analysis is to quantify existing background noise levels within the project area, and determine impacts due to and upon the proposed project. This analysis will examine compliance with both Placer County and Tahoe Regional Planning Agency (TRPA) noise standards.



## ACOUSTIC TERMINOLOGY<sup>1</sup>

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, but are expressed as dB, 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 to measure the ambient noise level 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, CNEL, and shows very good correlation with community response to noise.

The day/evening/night average level (CNEL) is based upon the average noise level over a 24-hour day, with a +3 decibel penalty is applied to evening (7:00 p.m. to 10:00 p.m.) hourly  $L_{eq}$  values, and

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<sup>1</sup> For an explanation of these terms, see Appendix A: "Acoustical Terminology"

a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. Because CNEL presumes increased evening and nighttime sensitivity, this descriptor is best applied as criteria for land uses where evening and nighttime noise exposures are critical to the acceptability of the noise environment, such as residential developments. Because CNEL 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 noise sources. Appendix A provides a summary of acoustical terms used in this report.

### 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.

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. October 1998.

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.

## CRITERIA

### Placer County Noise Ordinance:

Placer County has recently adopted the hourly exterior noise level performance standards presented in Table 2. These criteria are based upon hourly average ( $L_{eq}$ ) and maximum ( $L_{max}$ ) noise level descriptors. These noise level descriptors have been found to provide good correlation to stationary noise sources such as those associated with the proposed pool and clubhouse area.

Additionally, project-related noise exposure should not exceed the measured existing ambient noise level by more than 5 dB at the closest noise-sensitive properties.

<b>Table 2</b> <b>Hourly Exterior Noise Performance Standards for Stationary (Non-Transportation)</b> <b>Noise Sources</b> <b>Placer County Noise Ordinance</b>		
Noise Metric	Acceptable Noise Level, dBA	
	Daytime (7 a.m. - 10 p.m.)	Nighttime (10 p.m. - 7 a.m.)
$L_{eq}$	55	45
$L_{max}$	70	65

### **Tahoe Regional Planning Agency Criteria:**

The Tahoe Regional Planning Agency (TRPA) has adopted environmental thresholds for the Lake Tahoe Region. The noise standards, or "Thresholds" as they are commonly referred to, are numerical CNEL values for various land use categories and transportation corridors.

As a form of zoning, the TRPA has divided the Lake Tahoe Region into more than 175 separate Plan Areas. Boundaries for each of the Plan Areas have been established based on similar land uses and the unique character of each geographic area. For each Plan Area, a "Statement" is made as to how that particular area should be regulated to achieve regional environmental and land use objectives. As a part of each Statement, an outdoor CNEL standard is established.

The project site is located within the Tahoe Vista Commercial Plan Area 022. The project site is bordered to the east by Plan Area 023 (Tahoe Vista Subdivision) and to the north by Plan Area 021 (Tahoe Estates). The Plan Area Statements noise level criteria are shown in Table 3.

<b>Plan Area #</b>	<b>Plan Area Name</b>	<b>TRPA Noise Level Criteria</b>
21	Tahoe Estates	55 dB CNEL for entire Plan Area
022 (Contains Project Site)	Tahoe Vista Commercial	55-65 dB CNEL for Site area as specified in the Tahoe Vista Community Plan
023	Tahoe Vista Subdivision	55 dB CNEL for entire Plan Area

### **EXISTING AMBIENT NOISE LEVELS**

On July 21-22, 2008, j.c. brennan & associates, Inc., staff conducted continuous hourly background noise level measurements on the project property for a period of 24-hours. Figure 1 shows the location of the noise measurement sites. The noise level measurements were conducted to provide an indication of existing hourly noise levels and the existing CNEL value at the nearest adjacent residential property line to the east of the project site.

Equipment used for the noise measurement survey included a Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters. 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). The noise measurement results are summarized in Table 4.

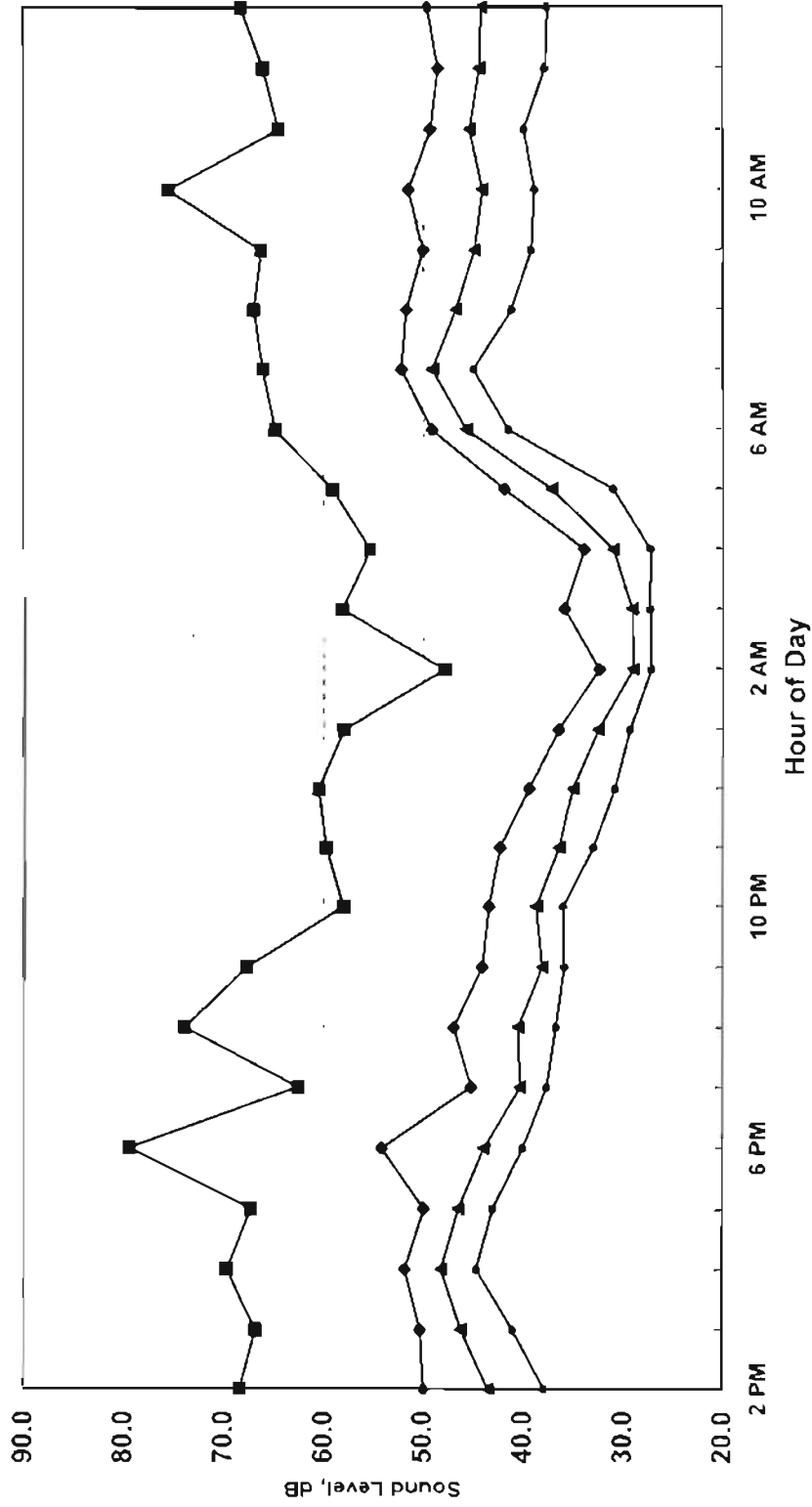
**Table 4**  
**Existing Ambient Noise Monitoring Results**  
**Tahoe Vista Recreation Area Phase 2 – Placer County, California**

Site	Location	Date	Duration	Average Measured Hourly Noise Levels, (dBA)						
				24-hr CNEL	Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm - 7 am)		
					Leq	L50	Lmax	Leq	L50	Lmax
A	North portion of project site	July 21-22, 2008	24 hrs	51.5	51.0	45.6	68.7	42.4	58.0	34.9
B	South portion of project site	July 21-22, 2008	24 hrs	56.7	56.1	52.1	74.2	47.5	39.3	62.6

Source - j.c. brennan & associates, Inc. 2008

The measured noise levels at the continuous noise measurement location were dominated by roadway traffic on North Lake Boulevard (Highway 28) to the south and by National Avenue to the north. Figure 2 graphically shows the results of the 24-hour noise measurements. Appendix B provides the complete ambient noise monitoring data.

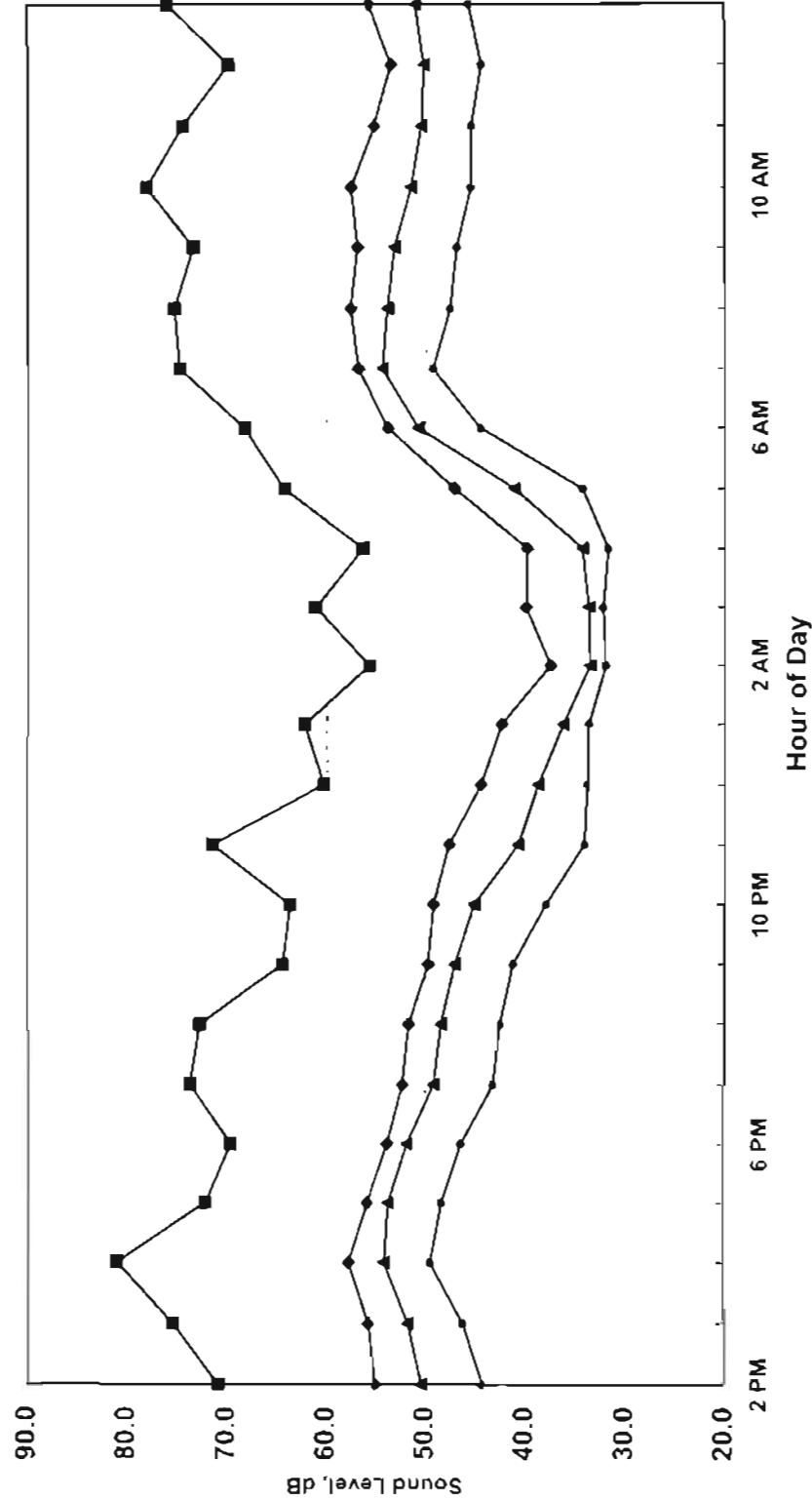
**Figure 2A**  
 Tahoe Vista Recreation Area Phase 2  
 Continuous 24 Hr Monitoring - Site A  
 July 21-22, 2008



CNEL = 51.5 dB

—◆— Leq —■— Lmax —▲— L50 —●— L90

**Figure 2B**  
 Tahoe Vista Recreation Area Phase 2  
 Continuous 24 Hr Monitoring - Site B  
 July 21-22, 2008



CNEL = 56.7 dB

Legend:  
 -◆- Leq  
 -■- Lmax  
 -▲- L50  
 -●- L90

## ANALYSIS

As a means of determining the noise levels due to parking lot activities, j.c. brennan & associates, Inc., utilized noise level data collected for previous parking lot studies, and trip generations from the project traffic study. A typical SEL due to automobile arrivals/departures, including car doors slamming and people conversing is approximately 71 dB, at a distance of 50 feet. Based upon trip generation contained in the project traffic study, 460 cars are predicted to enter or leave the parking lot on a daily basis. A total of 75 vehicles are predicted to enter or exit the site during a peak hour. Parking lot noise levels were determined using the following formulas.

$$\begin{aligned} \text{CNEL} &= 71 + 10 \cdot \log(N_{\text{eq}}) - 49.4, \text{ and} \\ \text{Peak Hour } L_{\text{eq}} &= 71 + 10 \cdot \log(N) - 35.6; \end{aligned}$$

where 71 is the mean Sound Exposure Level (SEL) for an automobile operation,  $N_{\text{eq}}$  is the equivalent number of parking lot operations in a given 24-hours ( $N_{\text{eq}}$  is assumed to be 575 for this project),  $N$  is the number of parking lot operations in a peak hour ( $N$  is assumed to be 75 for this project), 49.4 is 10 times the logarithm of the number seconds in a 24-hour period, and 35.6 is 10 times the logarithm of the number of seconds in an hour.

It is important to note that the  $N_{\text{eq}}$  applies a penalty of three times the number of operations which occur during the evening period (7:00 p.m. to 10:00 p.m.) and ten times the number of operations which occur during the nighttime period (10:00 p.m. – 7:00 a.m.).

Using the equations and operations data described above, the proposed parking lot would result in noise levels of approximately 49 dB CNEL and 54 dB Peak Hour  $L_{\text{eq}}$  at a distance of 50 feet. This analysis assumes 7:00 a.m. to 10:00 p.m. operation of the parking lot. No nighttime (10:00 p.m. – 7:00) operation of the parking lot was assumed.

Based upon the project site plan, the closest residential receivers to the west are approximately 70 feet from the center of the proposed parking lot. Therefore, the predicted noise levels are 46 dB CNEL and 51 dB  $L_{\text{eq}}$ . These levels would comply with the Placer County daytime 55 dB  $L_{\text{eq}}$  exterior noise level standard and the TRPA 55 dB CNEL exterior noise level standard.

Additionally, maximum noise levels ( $L_{\text{max}}$ ) are generally assumed to be approximately 10 dB less than the measured SEL, or approximately 61 dB at 50 feet for this project. The distance between the closest parking spaces and the closest residences will be approximately 20 feet. Due to this reduced distance, the calculated  $L_{\text{max}}$  from activities at these parking spaces are predicted to be 69 dB  $L_{\text{max}}$ . This noise level complies with the County's 70 dB  $L_{\text{max}}$  daytime noise exposure standard.

Project noise exposure at the closest residential receivers to the north and east are expected to be less than those predicted to the west of the proposed parking lot due to increased distance from the project.

## CONCLUSIONS

The proposed Tahoe Vista Recreation Area Phase 2 parking lot is not predicted to exceed the Placer County Noise Ordinance noise level standards, or the TRPA PAS noise level standards. Therefore, No noise mitigation measures are recommended for this project. This analysis assumes daytime (7:00 a.m. to 10:00 p.m.) operation of the parking facility.

## Appendix A Acoustical Terminology

<b>Acoustics</b>	The science of sound.
<b>Ambient Noise</b>	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.
<b>Attenuation</b>	The reduction of an acoustic signal
<b>A-Weighting</b>	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
<b>Decibel or dB</b>	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.
<b>CNEL</b>	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
<b>Frequency</b>	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz
<b>Ldn</b>	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
<b>Leq</b>	Equivalent or energy-averaged sound level.
<b>Lmax</b>	The highest root-mean-square (RMS) sound level measured over a given period of time.
<b>L(n)</b>	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one hour period.
<b>Loudness</b>	A subjective term for the sensation of the magnitude of sound.
<b>Noise</b>	Unwanted sound.
<b>Peak Noise</b>	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.
<b>RT<sub>60</sub></b>	The time it takes reverberant sound to decay by 60 dB once the source has been removed
<b>Sabin</b>	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.
<b>SEL</b>	A 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.
<b>Threshold of Hearing</b>	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
<b>Threshold of Pain</b>	Approximately 120 dB above the threshold of hearing.
<b>Impulsive</b>	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
<b>Simple Tone</b>	Any sound which can be judged as audible as a single pitch or set of single pitches.

**Appendix B-1**

Tahoe Vista Recreation Area Phase 2

Continuous 24 Hr Monitoring - Site A

July 21-22, 2008

Hour	Leq	Lmax	L50	L90
14:00	49.9	68.3	43.4	37.8
15:00	50.3	66.7	46.2	41.0
16:00	51.8	69.6	48.1	44.6
17:00	49.8	67.2	46.4	43.0
18:00	54.1	79.4	43.9	40.0
19:00	45.2	62.5	40.3	37.6
20:00	47.0	73.9	40.5	36.7
21:00	44.1	67.7	38.1	35.9
22:00	43.4	58.1	38.7	36.0
23:00	42.3	59.7	36.4	33.0
0:00	39.4	60.5	35.0	30.8
1:00	36.5	58.0	32.5	29.3
2:00	32.4	47.8	29.0	27.2
3:00	35.8	58.2	29.1	27.3
4:00	33.9	55.4	31.0	27.3
5:00	41.9	59.1	37.2	31.0
6:00	49.2	64.8	45.7	41.5
7:00	52.2	66.1	49.1	45.0
8:00	51.7	67.0	46.7	41.2
9:00	50.0	66.2	44.9	39.2
10:00	51.5	75.5	44.1	38.9
11:00	49.2	64.5	45.3	39.9
12:00	48.5	66.0	44.3	37.8
13:00	49.5	68.2	44.1	37.5

	Statistical Summary											
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 9 p.m.)			Nighttime (9 p.m. - 7 a.m.)					
	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	54.1	48.5	51.0	47.0	44.1	45.6	49.2	32.4	42.4			
Lmax (Maximum)	79.4	64.5	68.7	73.9	62.5	68.0	64.8	47.8	58.0			
L50 (Median)	49.1	43.4	45.6	40.5	38.1	39.6	45.7	29.0	34.9			
L90 (Background)	45.0	37.5	40.5	37.6	35.9	36.7	41.5	27.2	31.5			

Computed CNEL, dB	51.5
% Daytime Energy	85%
% Evening Energy	6%
% Nighttime Energy	9%



**Appendix B-2**

Tahoe Vista Recreation Area Phase 2

Continuous 24 Hr Monitoring - Site B

July 21-22, 2008

Hour	Leq	Lmax	L50	L90
14:00	54.9	70.7	50.2	44.1
15:00	55.7	75.3	51.6	46.1
16:00	57.7	80.8	54.0	49.4
17:00	55.8	72.0	53.6	48.3
18:00	53.8	69.5	51.8	46.4
19:00	52.3	73.6	49.2	43.2
20:00	51.7	72.7	48.4	42.5
21:00	49.7	64.4	47.1	41.2
22:00	49.2	63.7	45.1	37.9
23:00	47.6	71.5	40.7	34.1
0:00	44.5	60.3	38.7	33.8
1:00	42.4	62.2	36.2	33.7
2:00	37.4	55.7	33.5	31.9
3:00	39.9	61.1	33.7	32.2
4:00	39.8	56.4	34.3	31.7
5:00	47.1	64.3	41.1	34.3
6:00	53.8	68.3	50.8	44.5
7:00	56.9	74.8	54.3	49.3
8:00	57.7	75.3	53.9	47.5
9:00	56.9	73.4	53.2	46.9
10:00	57.6	78.1	51.5	45.5
11:00	55.2	74.5	50.4	45.4
12:00	53.4	69.8	50.1	44.4
13:00	55.7	76.0	51.0	45.6

	Statistical Summary								
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 9 p.m.)			Nighttime (9 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	57.7	53.4	56.1	52.3	49.7	51.4	53.8	37.4	47.5
Lmax (Maximum)	80.8	69.5	74.2	73.6	64.4	70.2	71.5	55.7	62.6
L50 (Median)	54.3	50.1	52.1	49.2	47.1	48.2	50.8	33.5	39.3
L90 (Background)	49.4	44.1	46.6	43.2	41.2	42.3	44.5	31.7	34.9

Computed CNEL, dB	56.7
% Daytime Energy	84%
% Evening Energy	7%
% Nighttime Energy	9%