Attachment G
Noise Report

Green Valley Road/ Weber Creek Bridge Replacement Project
(CIP #77114)

ENVIRONMENTAL NOISE ANALYSIS

GREEN VALLEY ROAD
WEBER CREEK BRIDGE REPLACEMENT

El Dorado County, California

BBA Project No. 08-205

Prepared For

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Prepared By

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INTRODUCTION

The proposed Weber Creek Bridge replacement project is located along Green Valley Road east of Rescue in El Dorado County, California. The project would involve changes to the alignment of Green Valley Road to increase the radius of the curve west of the crossing at Weber Creek. Brown-Buntin Associates, Inc. (BBA) has performed an acoustical analysis to determine the potential for traffic noise impacts associated with proposed roadway design (Alternative 3) and an alternative alignment (Alternative 4) at the nearest residential properties.

Unless otherwise indicated, all noise levels described in this report are in terms of A-weighted sound pressure levels, or sound levels, in decibels (dB or dBA). Appendix A describes the acoustical terms used for this analysis.

It is usually assumed that a change in noise levels of 5 dB is clearly noticeable to most people. A change of 3 dB is perceptible in most cases, and a change of 1 dB is the minimum perceptible change in a quiet laboratory environment.

CRITERIA

Local Noise Standards

The July 2004 El Dorado County General Plan Public Health, Safety, and Noise Element establishes policies and standards for noise exposures at noise sensitive land uses. The relevant policies are reproduced below:

Policy 6.5.1.9 Noise created by new transportation noise sources, excluding airport expansion but including roadway improvement projects, shall be mitigated so as not to exceed the levels specified in Table 6-1 at existing noise-sensitive land uses.

Policy 6.5.1.12 When determining the significance of impacts and appropriate mitigation for new development projects, the following criteria shall be taken into consideration.

A. Where existing or projected future traffic noise levels are less than 60 dBA L_{dn} at the outdoor activity areas of residential uses, an increase of more than 5 dBA L_{dn} caused by a new transportation noise source will be considered significant;

B. Where existing or projected future traffic noise levels range between 60 and 65 dBA L_{dn} at the outdoor activity areas of residential uses, an increase of more than 3 dBA L_{dn} caused by a new transportation noise source will be considered significant; and

C. Where existing or projected future traffic noise levels are greater than 65 dBA L_{dn} at the outdoor activity areas of residential uses, an increase of more than 1.5 dBA L_{dn} caused by a new transportation noise will be considered significant.

TABLE 6-1
MAXIMUM ALLOWABLE NOISE EXPOSURE FOR 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	60[3]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls, Schools	60[3]	--	40
Office Buildings	--	--	45
Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

Notes:

[1] In Communities and Rural Centers, where the location of outdoor activity areas is not clearly defined, the exterior noise level standard shall be applied to the property line of the receiving land use. For residential uses with front yards facing the identified noise source, an exterior noise level criterion of 65 dB L_{dn} shall be applied at the building facade, in addition to a 60 dB L_{dn} criterion at the outdoor activity area. In Rural Regions, an exterior noise level criterion of 60 dB L_{dn} shall be applied at a 100 foot radius from the residence unless it is within Platted Lands where the underlying land use designation is consistent with Community Region densities in which case the 65 dB L_{dn} may apply. The 100-foot radius applies to properties which are five acres and larger; the balance will fall under the property line requirement.

[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.

SETTING

The project site is an existing roadway in a neighborhood of rural single-family residences. The noise environment in the project vicinity is dominated by traffic on Green Valley Road.

To quantify overall ambient noise levels, BBA performed a continuous noise measurement over a 47-hour period on March 7-9, 2008, at the north edge of the driveway at 7280 Lode Road (Receiver 3), as shown by Figure 1. The noise levels recorded at this site were primarily produced by traffic on Green Valley Road. Immediately west of the noise measurement site, the roadway incorporates a sharp curve with an advisory speed limit of 20 mph. The roadway climbs in either direction from the curve. Other segments of the road have a speed limit of 35 mph.

Instrumentation consisted of a Larson-Davis Laboratories (LDL) Model 820 precision integrating sound level meter, which was calibrated in the field before use with a Bruel & Kjaer Type 4230 acoustical calibrator. The sound level meter used complies with ANSI standards for Type 1 sound level meters. The measurement was taken with a microphone height of about seven feet above ground level.

The sound level meter was set to record hourly summaries of measured noise levels in terms of the average noise level (L_{eq}), the maximum noise level and other statistical descriptors. Figures 2 through 4 display the hourly noise measurement results. The calculated L_{dn} value for the 24-hour day of March 8, 2008, was 60.7 dB. The hourly L_{eq} values measured during the peak traffic noise hours on the measurement dates were in the range of 59 dBA to 65 dBA.

Traffic Noise Levels:

The traffic noise analysis addresses the noise effects of the changes in road alignment for the proposed project, accounting for the predicted future traffic volumes.

Brown-Buntin Associates, Inc. (BBA) employed the U.S. Department of Transportation (DOT) Traffic Noise Model (TNM), Version 2.5, for the prediction of existing and future traffic noise levels. The model is based upon reference noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to traffic volume, vehicle speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The TNM was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is considered to be accurate within 1.5 dB. One method to predict L_{dn} values is to derive a relationship between L_{eq} and L_{dn} values based upon 24-hour noise measurements.

Short-term traffic noise level measurements were conducted for 15 minutes at three locations along Green Valley Road on March 7, 2008, and February 27, 2009. The purpose of the noise measurements was to determine the accuracy of the TNM in predicting traffic noise at the project site.

Sound measurement equipment consisted of a Larson Davis Model 820 precision integrating sound level meter. The meter was calibrated with a Bruel & Kjaer Type 4230 acoustical calibrator in the field before use. The equipment meets the specifications of the American National Standards Institute (ANSI) for Type I sound measurement systems.

The measurements were conducted with a microphone height of 5 feet. Concurrent counts of traffic were conducted during each measurement period. The noise measurements were conducted in terms of the L_{eq}, and the measured values were compared to the values predicted by the TNM using the observed traffic volumes, speed, and distance to the microphone. The short-term measurement site locations are depicted on Figure 1. Table II compares the measured and modeled noise levels for the observed traffic conditions.

TABLE II TRAFFIC NOISE MEASUREMENT SUMMARY Green Valley Road March 7, 2008 and February 27, 2009									
Location	**Mic Height (feet)**	**Vehicles per Hour**			**Posted Speed (mph)**	**Distance (feet)***	**Measured L_{eq}, dBA**	**Modeled L_{eq}, dBA**	Difference, dBA
		Autos	**Med. Trk.**	**Hvy. Trk.**					
7280 Lode Road	5	476	0	0	20	12	66.8	57.6	+9.2
7301 Green Valley Road	5	388	0	0	35	115	59.6	53.5	+6.1
		328	1	0		133	58.1	50.5	+7.6
* Distance is measured from the roadway centerline.									

The Lode Road measurement site was immediately adjacent to the roadway, which was the only site readily accessible for the March 7, 2008 measurements. The difference between measured and modeled noise levels at that site was 9.2 dB. Two measurement sites were employed at 7301 Green Valley Road on February 27, 2009. The first site was adjacent to the side façade of the house, near a side door and the fireplace chimney. The second site was at the corner of the house adjacent to a lawn area. The average difference between measured and modeled noise levels at those two sites was about 6.9 dB.

The TNM substantially under-predicted the measured average noise level for existing traffic on Green Valley Road. The reasons for the difference between the measured and predicted levels were presumed to be vehicle acceleration and deceleration for the curve, and vehicles climbing uphill in both directions. Based upon these measurements, an average adjustment factor of +7.6 dB was deemed appropriate for noise modeling of existing traffic noise levels with TNM in the project vicinity. This value also corresponds to the worst-case adjustment that would be appropriate for the home at 7301 Green Valley Road.

Traffic Noise Prediction Model Inputs:

Inputs to the TNM include peak hour traffic volume (vph), auto, medium and heavy truck percentages, and vehicle speed. Existing (Year 2007) and future (Year 2032) traffic data were obtained from the El Dorado County Department of Transportation. Medium and heavy truck traffic factors were assumed to be minimal based upon observed traffic mix and the character of the roadway. The TNM inputs are shown in Table III.

TABLE III TNM INPUTS Weber Creek Bridge Replacement Existing Conditions					
Roadway	**Vehicles per Hour**	**% Medium Trucks**	**% Heavy Trucks**	**Speed (mph)**	**Adjustment Factor, dB**
Green Valley	561	0.1	0.1	20/35	+7.6

For this project, the noise sensitive receivers were assumed to be the residential building facades located nearest Green Valley Road. The houses analyzed were numbered in accordance with Figure 1.

The TNM was used to predict existing traffic noise levels in terms of the peak hour L_{eq}. Based on the 24-hour noise measurement data cited above, the peak hour L_{eq} value was assumed to be approximately equal to the L_{dn} value. Table IV shows the predicted existing noise levels at each receiver location. Note that the predicted noise level of 60.1 dB L_{dn} for existing conditions at Receiver 3 reasonably matches the measured traffic noise level of 60.7 dB L_{dn} at that site on March 8, 2008.

The existing traffic noise levels exceed the standards of El Dorado County Table 6-1 at all locations except Receiver 20.

TABLE IV PREDICTED EXISTING TRAFFIC NOISE LEVELS Weber Creek Bridge Replacement	
Receiver	**Existing Exterior Noise Level, dB Ldn**
1	60.3
3	60.1
7	63.6
8	70.0
12	62.9
15	64.6
16	62.6
23*	60.3
20	55.8
25	66.9
* Adjacent to southwest corner of house	

IMPACT ANALYSIS

The TNM was used to predict future traffic noise levels with and without the proposed Project (Alternative 3) and an alternative alignment (Alternative 4), based upon the Year 2032 traffic volumes reported by the El Dorado County Department of Transportation, accounting for the proposed changes in the roadway alignments, which primarily occurred in the vicinity of Receivers 3, 7, 8, 23 and 20. Table V lists the TNM input assumptions. It is assumed that the improvements to the horizontal curve, the vertical alignment and increase in lane width and shoulder width would reduce the amount of down-hill braking and up-hill acceleration with more consistent design speeds (near 25 mph) in the area where the alignment would be changed. To account for these improvements, the overall adjustment factor for the proposed future roadway segments was reduced to +7 dB, which approximates the average adjustment that was appropriate at 7301 Green Valley Road (Receiver 23). At that location, the changes to the curve design are expected to have little direct effect on measured noise levels.

TABLE V
TNM INPUTS
Weber Creek Bridge Replacement
Year 2032 Conditions

Roadway	Vehicles per Hour	% Medium Trucks	% Heavy Trucks	Speed (mph)	Adjustment Factor, dB
Green Valley	1,132	0.1	0.1	25/35	+7.0

Table VI shows the predicted future noise levels at the nearest houses, with and without the proposed project. Table VI also lists the differences in future traffic noise levels between the (No Project) and proposed (Project) alignments. In all cases but one (Receiver 23), the Project would result in reduced traffic noise levels due to realignment of the roadway and the assumed reduction in traffic noise generation due to the factors listed above.

TABLE VI
PREDICTED FUTURE TRAFFIC NOISE LEVELS FOR THE PROPOSED PROJECT
Weber Creek Bridge Replacement

	Future Exterior Noise Level, dB Ldn					
Receiver	No Project	Project	Difference, dB (Change versus No Project)	GP Policy 6.5.1.12 Criterion	Significant If Increase Is Greater Than	Significant per GP Policy 6.5.1.12 (Yes/No)
1	63.4	62.9	-0.5	6.5.1.12.B	3 dBA Ldn	No
3	63.2	58.3	-4.9	6.5.1.12.B	3 dBA Ldn	No
7	66.6	63.9	-2.7	6.5.1.12.C	1.5 dBA Ldn	No
8	73.0	69.1	-3.9	6.5.1.12.C	1.5 dBA Ldn	No
12	66.0	65.4	-0.6	6.5.1.12.C	1.5 dBA Ldn	No
15	67.6	67.1	-0.5	6.5.1.12.C	1.5 dBA Ldn	No
16	65.7	65.0	-0.7	6.5.1.12.C	1.5 dBA Ldn	No
20	58.8	58.9	+0.1	6.5.1.12.A	5 dBA Ldn	No
23*	63.3	65.9	+2.6	6.5.1.12.B	3 dBA Ldn	No
25	69.9	69.3	-0.6	6.5.1.12.C	1.5 dBA Ldn	No

* Adjacent to southwest corner of house

Table VI shows that future traffic noise levels with the Project would be lower at all but two receiver locations, due to the realignment of the roadway so that the traffic is farther away from the houses. At Receivers 20 and 23, the re-aligned roadway is closer to the receivers, which causes an increase in predicted traffic noise levels.

Table VII shows the predicted future noise levels at the nearest houses, with and without the proposed alternative alignment. Table VII also lists the differences in future traffic noise levels between the existing (No Project) alignment and Alternative 4.

TABLE VII
PREDICTED FUTURE TRAFFIC NOISE LEVELS FOR ALTERNATIVE 4
Weber Creek Bridge Replacement

	Future Exterior Noise Level, dB Ldn					
Receiver	**No Project**	**Alternative 4**	**Difference, dB (Change versus No Project)**	**GP Policy 6.5.1.12 Criterion**	**Significant If Increase Is Greater Than**	**Significant per GP Policy 6.5.1.12 (Yes/No)**
1	63.4	62.9	-0.5	6.5.1.12.B	3 dBA L_{dn}	No
3	63.2	59.5	-3.7	6.5.1.12.B	3 dBA L_{dn}	No
7	66.6	66.5	-0.1	6.5.1.12.C	1.5 dBA L_{dn}	No
8	73.0	71.0	-2.0	6.5.1.12.C	1.5 dBA L_{dn}	No
12	66.0	65.4	-0.6	6.5.1.12.C	1.5 dBA L_{dn}	No
15	67.6	67.0	-0.6	6.5.1.12.C	1.5 dBA L_{dn}	No
16	65.7	65.0	-0.7	6.5.1.12.C	1.5 dBA L_{dn}	No
20	58.8	58.7	-0.1	6.5.1.12.A	5 dBA L_{dn}	No
23*	63.3	64.2	+0.9	6.5.1.12.B	3 dBA L_{dn}	No
25	69.9	69.3	-0.6	6.5.1.12.C	1.5 dBA L_{dn}	No

* Adjacent to southwest corner of house

Future traffic noise levels with and without the Project or Alternative 4 will exceed the 60 dB L_{dn} standard of El Dorado County Table 6-1 at all locations except Receiver 20. This condition would occur with or without the project, and would not be a significant effect of the project.

The proposed Project (Alternative 3) would result in lower noise levels at all locations except Receivers 23 and 20.

The predicted changes in traffic noise exposures due to the Project are less than significant when evaluated using General Plan Policy 6.5.1.12. However, the predicted noise levels exceed the standards of General Plan Policy 6.5.1.9, Clarification of Policies 6.5.1.9 and 6.5.1.12 was provided through litigation in 1998, where it was found that, when a project is approved that would "further exceed" a Policy 6.5.1.9-specified noise level, that project, to be consistent with Policy 6.5.1.9, must mitigate the additional noise it creates.

At Receiver 23, the Project-related increase in traffic noise levels would be 2.6 dB, and the resulting noise level would exceed the standards of Table 6-1. As a result, mitigation is required to achieve a reduction in traffic noise levels of at least 2.6 dB at this receiver.

Alternative 4 would result in lower noise levels at all locations except Receiver 23. With Alternative 4, the project-related increase in traffic noise levels at Receiver 23 would be below the criteria given in Policy 6.5.1.12(A), which states that, where existing or projected future traffic noise levels are less than 65 dB L_{dn} at the outdoor activity areas of residential uses, an increase of more than 3 dB L_{dn} caused by a new transportation noise source will be considered significant. Because the increase is less than 3 dB L_{dn}, changes in traffic noise levels due to the project would be less than significant. Alternative 4 would cause traffic noise levels to increase by 0.9 dB, which is an imperceptible change. To be consistent with General Plan Policy 6.5.1.9, this alternative would require mitigation to reduce traffic noise by 0.9 dB.

EVALUATION OF POTENTIAL MITIGATION MEASURES

At Receiver 23 (7301 Green Valley Road), the proposed Project (Alternative 3) would cause the traffic noise exposure to exceed 65 dB L_{dn}, which is the upper limit of acceptable residential noise exposures in residential areas that are described by El Dorado County Public Health, Safety, and Noise Element Table 6-1. Potential noise mitigation measures include increased setbacks, alternative pavement materials, installation of a traffic noise barrier, or sound insulation of the house.

Setbacks:

The project site is severely constrained due to the substantial vertical elevation change between the current bridge deck and the study limits, the wide ravine, the 90 degree turn at the south bridge approach, traffic and safety for circulation, and the right-of-way (ROW) take. The proposed centerline alignment removes the sharp short radius horizontal curve and replaces it with a longer radius curve. A design speed of 25 mph was selected for this curve based upon the remaining Green Valley Road alignment and existing road classification.

Alternative 4 would place the roadway centerline about 25 feet farther away from Receiver 23 than would the proposed Project.

Alternative Pavement Materials:

To reduce the noise due to tire/roadway interaction, BBA also considered the option of applying open-graded asphalt concrete (OGAC) as part of the Project design.

Significant improvements in tire noise emissions may be attained under some circumstances by employing different binder materials and different mixes of particle size in asphalt concrete. Much attention has been given to the use of a thin (about one inch) surface layer of OGAC, with and without "rubberized" binder materials. The basic concept of open grading (also called open-gap grading, or gap-grading) is that the mix of aggregate particle sizes is adjusted so that there are few particles of intermediate size, leaving a "gap" in the particle size distribution. The openings thus created in the asphalt mix provide a conduit for water to run off the road surface, making the roadway better suited to wet conditions. The relatively porous surface of the open graded material also allows the air trapped between a tire tread and the surface to escape, which reduces the noise produced when the air is squeezed out.

The asphalt particles are held together by a binder material, which classically consisted of oil. Modern open-graded asphalt pavements use polymer binders that include a variety of polymers to improve durability, to reduce pollution, and to enhance attachment of the asphalt with the underlying road layer. One possible additive to the binder is rubber from recycled tires.

Although use of "rubberized asphalt" began in the 1960s, and has been studied extensively in Europe, the more recent accumulation of tires for recycling in the United States and California has led to an upsurge in research and application of open-graded asphalt. Caltrans and others have recently sponsored research into the noise reduction from open-graded asphalt, with and without rubber additives, as compared to conventional dense-graded asphalt. For example, Caltrans has commissioned noise level measurements for a segment of Highway 80 in Davis over the past four years, documenting the acoustical performance of an OCAG overlay. Sacramento County began evaluation of long-term noise reduction for a segment of rubberized asphalt overlay on Alta Arden Expressway in 1993, and conducted additional studies on Antelope Road and Bond Road.

Two excellent reports are available that describe the noise reduction provided by the OGAC in Davis and Sacramento County. The Caltrans report, I-80 Davis OGAC Pavement Noise Study[1], was updated in 2007. That report concluded that, over the 7-year study period, the OGAC has yielded a consistent noise level reduction of 4.5 to 6 dBA as compared to the previous concrete pavement. The OGAC has also provided a reduction of 3 to 4 dBA when compared to the dense-graded asphalt concrete that was applied before the OGAC friction course was overlaid. The report also notes that the reduction in A-weighted sound pressure levels is due to a significant reduction in high frequency noise generation, especially in the range of 1,000 to 1,600 Hz. This means that the characteristic "singing" of tires on the roadway was dramatically reduced.

The other report of significance to this discussion is the Report on the Status of Rubberized Asphalt Traffic Noise Reduction in Sacramento County[2], prepared in November 1999. This report concluded that, over a period of six years, the rubberized OGAC surface on Alta Arden Expressway and Antelope Road contributed to a 5 dBA noise level reduction, as compared to the original conventional asphalt surface. Traffic on a conventional asphalt surface on Bond Road, however, produced the same amount of noise four years after renovation as it did prior to renovation.

Several other researchers have reported similar findings, so it appears that the use of open-graded asphalt concrete (OGAC) would provide a measurable improvement in traffic noise levels where the dominant noise source is tire/road interaction. This would be expected to occur where traffic flow is uninterrupted and where vehicle speeds are above 35 mph. It is not known what effects

1 7th Year Summary Report: I-80 Davis OGAC Pavement Noise Study, Traffic Noise Levels Associated with an Aging Open Grade Asphalt Concrete Overlay, Illingworth & Rodkin, Inc., December 2005.
2 Report on the Status of Rubberized Asphalt Traffic Noise Reduction in Sacramento County, Sacramento County Department of Environmental Review and Assessment and Bollard & Brennan, Inc., November 1999.

would be experienced at the lower design speed for this project of 25 mph, but it is likely that some improvement would be received.

In consideration of the above information, it is expected that the use of OGAC for the Project and its Alternatives could yield a reduction in traffic noise of up to 3 dB. This would be a perceptible improvement, and would reduce the predicted changes in future traffic noise levels to and insignificant amount. The OGAC should be applied to the entire length of the Project.

Traffic Noise Barriers:

To provide a meaningful reduction in traffic noise, a barrier (or berm) must intercept line of sight from the source to the receiver. The required barrier height may be determined from accurate topographic information, assuming that the receiver is located at the outdoor activity area, at a height of 5 feet above the ground. In this case, the noise source (primarily tires on pavement) may be assumed to be at the roadway surface. Where a noise barrier just breaks line of sight between the roadway noise sources and the receiver, the insertion loss is about 5 dB. Lower barrier heights are not considered to be effective, and are not recommended for noise control. Caltrans has established a minimum barrier height of 6 feet above ground, assuming that the design breaks line of sight between source and receiver.

The available topographic information for the roadway and for Receiver 23 indicates that the roadway and the building pad are approximately at the same elevation. Since the amount of noise reduction needed to achieve the No Project noise level is 2.6 dB), A barrier height of about 6 feet relative to pad elevation would be recommended.

The most effective location for a noise barrier at Receiver 23 would be close to the house on private property, rather than in the public right-of-way. This is because a barrier is most effective close to either the source or the receiver. A barrier placed at the edge of the right-of-way would be farther from the traffic noise sources than a barrier at the edge of the outdoor activity area would be from an outdoor receiver. However, a right-of-way noise barrier could be considered as a mitigating design feature for this project during the design stage. The top of the barrier should be about 6 feet above the receiver elevation.

Caltrans policy does not support construction of a barrier on private property, primarily because there would be no assurance that the barrier would be properly maintained in the future, and secondarily due to liability issues. Such a barrier might be unacceptable to the property owner or inconsistent with County policies.

However, one could consider constructing a barrier at the receiving property if it were acceptable to all parties. The selection of a barrier location and height would depend on the assumed location of the sensitive receivers. The side yard of the house is the site for the propane tank, and would not be considered an outdoor activity area. (This area could be shielded by a barrier at the south edge of the property, at the ravine.) The lawn at the southwest building corner is the more likely outdoor activity area. That area, however, generally slopes downhill to the southwest, and any barrier intended to shield the lawn would have to be designed to ensure that line of sight was interrupted along its length. The barrier height might have to be increased relative to the lawn to satisfy this requirement.

As a practical matter, little relief would be offered by a barrier at this property, as the actual outdoor activity area at the west side of the house is an outdoor deck which is attached to the house, slightly above the roadway elevation, and quite distant from the roadway right of way. It does not appear to be practical to construct a roadside barrier of sufficient height to shield the deck.

Although Caltrans policy would not support constructing a barrier at the edges of the outdoor deck, the County could choose to do so. If construction of a barrier at the edges of the deck were to be undertaken, the required barrier height would remain in the range of 6 feet above the deck elevation. The barrier should be of sufficient length to block line of sight to the majority of the roadway. Suitable materials for such a barrier would include 2-inch (nominal) thickness wood, a 4-inch thick wood stud wall with wood paneling or stucco on both sides, or clear acrylic or laminated glass panels. These materials could be combined to create a partition topped with clear panels.

Sound Insulation:

The primary rooms used by the occupant are located above the outdoor deck. From the traffic noise measurement site, the primary living rooms are elevated, and the subterranean improvements are at ground level. (The deck, which is only slightly elevated above the ground at the traffic noise measurement site, is considered the outdoor activity area for this house.) It has been BBA's experience that traffic noise levels at elevated receivers such as the primary living rooms may be 2 to 3 dB higher than at the first floor, due to reduced ground absorption of traffic noise. As a result, the predicted future traffic noise exposure due to the Project (Alternative 3) at the primary living areas facing Green Valley Road may be in the range of 68 to 69 dB L_{dn}. With Alternative 4, the predicted future traffic noise exposure at the primary living areas facing Green Valley Road may be in the range of 66 to 67 dB L_{dn}.

To judge compliance with the 45 dB L_{dn}/CNEL interior noise level required by Table 6-1, it is necessary to determine the noise reduction provided by the building facade. Typical facade designs and constructions in accordance with prevailing industry practices would result in an exterior to interior noise attenuation of 20 to 25 dB with windows closed, depending upon the materials used for the facade construction. Therefore it is usually assumed that an interior noise standard of 45 dB L_{dn}/CNEL can be achieved with standard construction practices where the exterior noise level is 65 dB L_{dn}/CNEL or less. Given the predicted exterior noise level of up to 69 dB L_{dn} at Receiver 23 for the Project, interior noise levels may not be in compliance with Table 6-1. For Alternative 4, it is likely that interior noise levels would be in compliance with Table 6-1.

Standard dual-pane windows meeting current energy conservation standards provide a Sound Transmission Class (STC) rating of about 28, and will reduce traffic noise by about 23 dBA. Acoustically rated window assemblies using different thicknesses of glass, larger air spaces or additional panes are available to achieve higher STC ratings.

One method to ensure that the interior noise standard is satisfied inside the house at 7301 Green Valley Road is to conduct detailed concurrent traffic noise measurements inside and outside each habitable room that faces Green Valley Road. Another method would be to conduct concurrent noise measurements inside and outside the house using a loudspeaker system and simulated traffic noise.

CONCLUSIONS

The proposed Project would result in less than significant changes in traffic noise levels at the outdoor activity areas of the nearest residences, as judged by General Plan Policy 6.5.1.12. The Project would result in an increase of 2.6 dB L_{dn} in traffic noise exposure at Receiver 23 (7301 Green Valley Road). Alternative 4 would result in an increase of 0.9 dB L_{dn} in traffic noise exposure at Receiver 23.

Traffic noise levels at the elevated building facades of the house at Receiver 23 are expected to be up to 3 dB higher than at the ground level. With proposed Project (Alternative 3), the interior noise levels in upper-floor rooms may not satisfy the interior noise standard of Table 6-1. An appropriate noise mitigation measure for interior noise levels for Alternative 3 would be to retrofit the windows on the nearest building facades facing Green Valley Road with acoustical glazing having an STC rating of 35.

Respectfully Submitted,
Brown-Buntin Associates, Inc.

Jim Buntin
Principal Consultant

Figure 1
Project Vicinity and Noise Measurement Sites

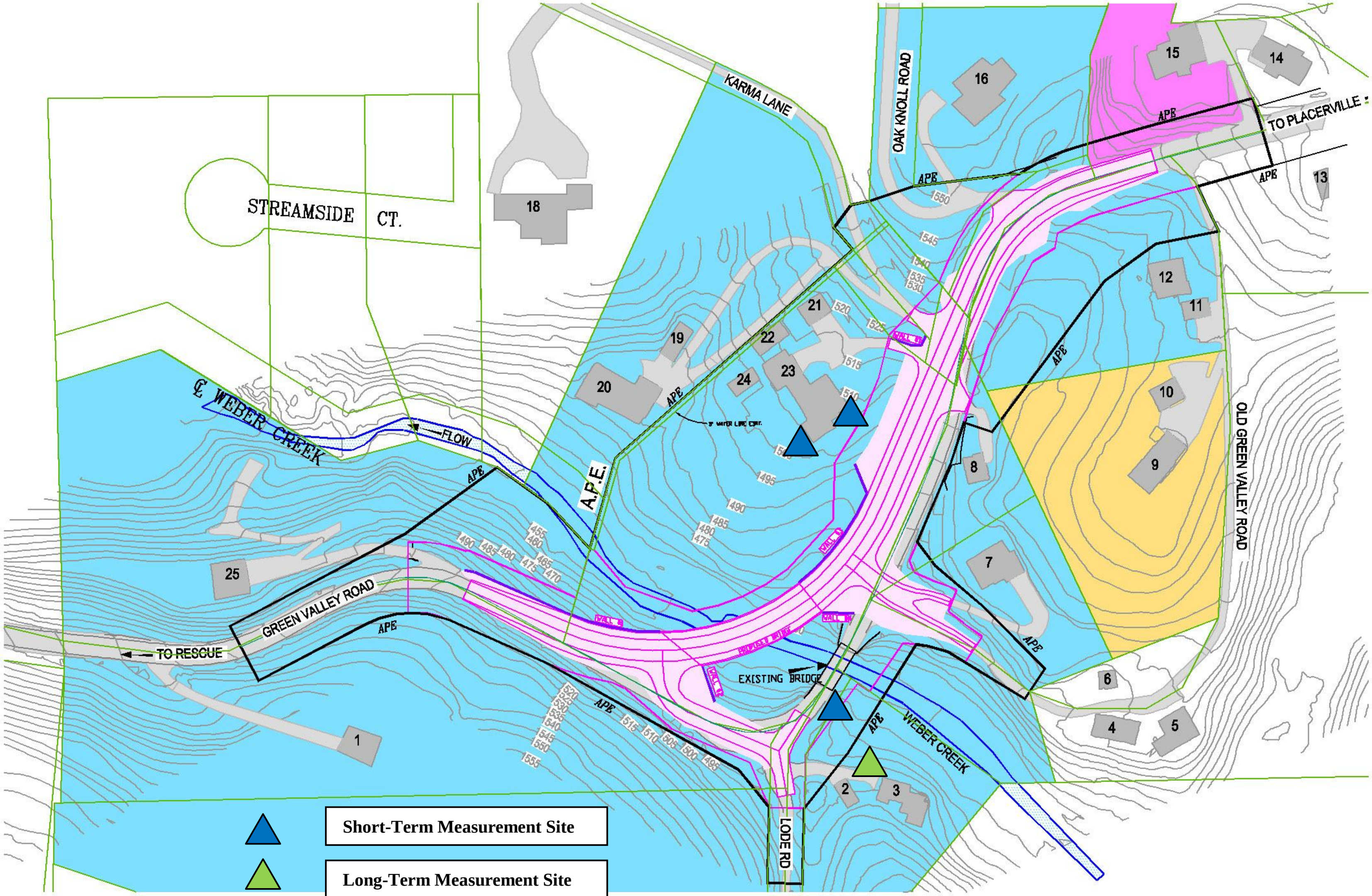

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Figure 2: Measured Hourly Noise Levels

7280 Lode Road

March 7, 2008

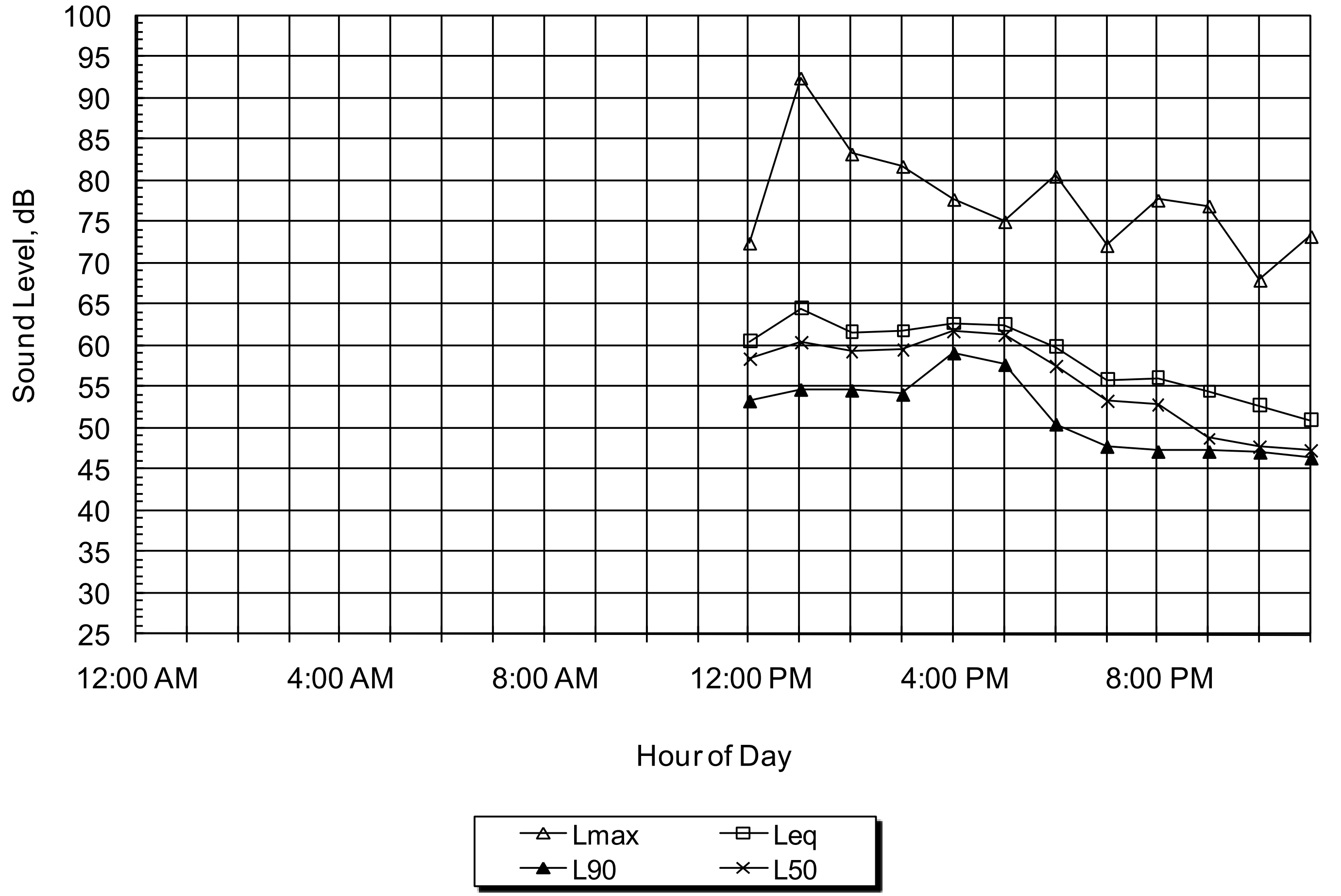

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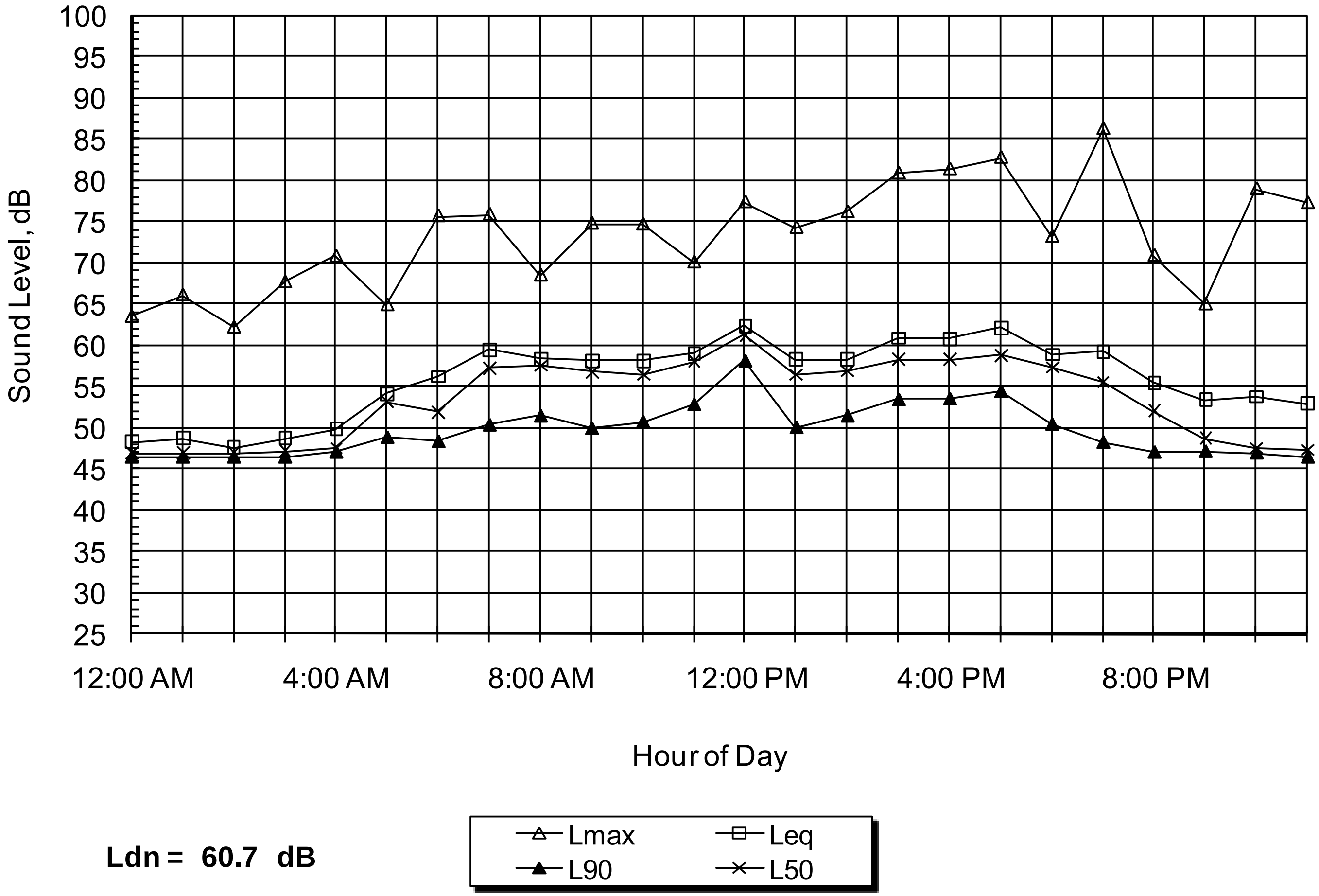
Figure 3: Measured Hourly Noise Levels

7280 Lode Road
March 8, 2008



Ldn = 60.7 dB

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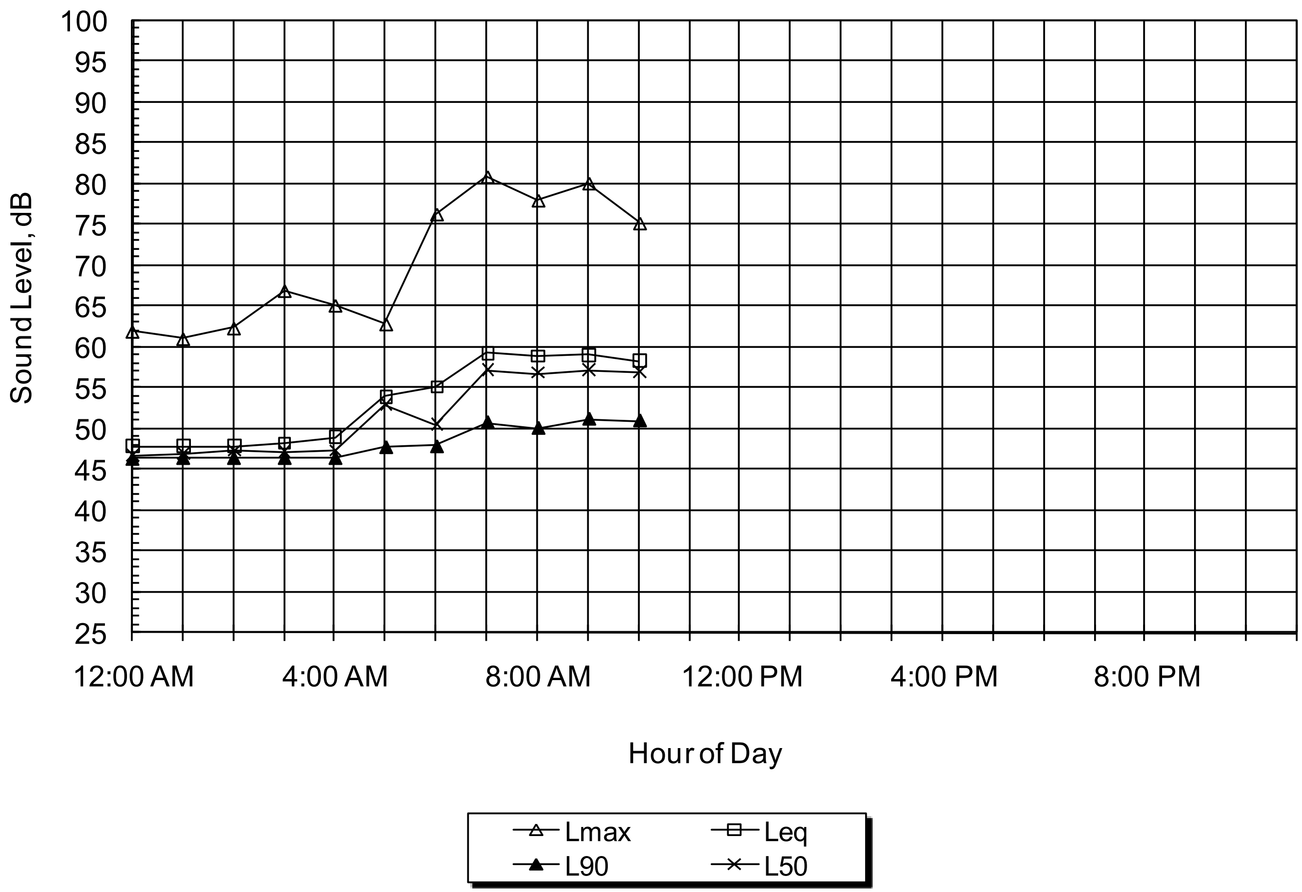
Figure 4: Measured Hourly Noise Levels

7280 Lode Road

March 9, 2008



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APPENDIX A

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

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ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR): The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of Anoise level reduction@ combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL: The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC): The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.