4904 Manzanita Avenue

Sacramento County, California

December 4, 2017

jcb Project # 2017-196

Prepared for:

SACRAMENTO COUNTY

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INTRODUCTION

The proposed project is located on an undeveloped lot at 4904 Manzanita Avenue in Sacramento County, California. The site is approximately 1.75 acres in size and proposes 17 three-story townhouse units. The project site is bordered by existing residential uses to the north and east, Bourbon Street to the south, and Manzanita Avenue to the west. Traffic on Manzanita Avenue has been identified as a potentially significant noise source, which may affect project design.

Figure 1 shows the project area. Figure 2 shows the project site plan.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

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.

4904 Manzanita Avenue

Figure 1: Project Location and Noise Measurement Sites

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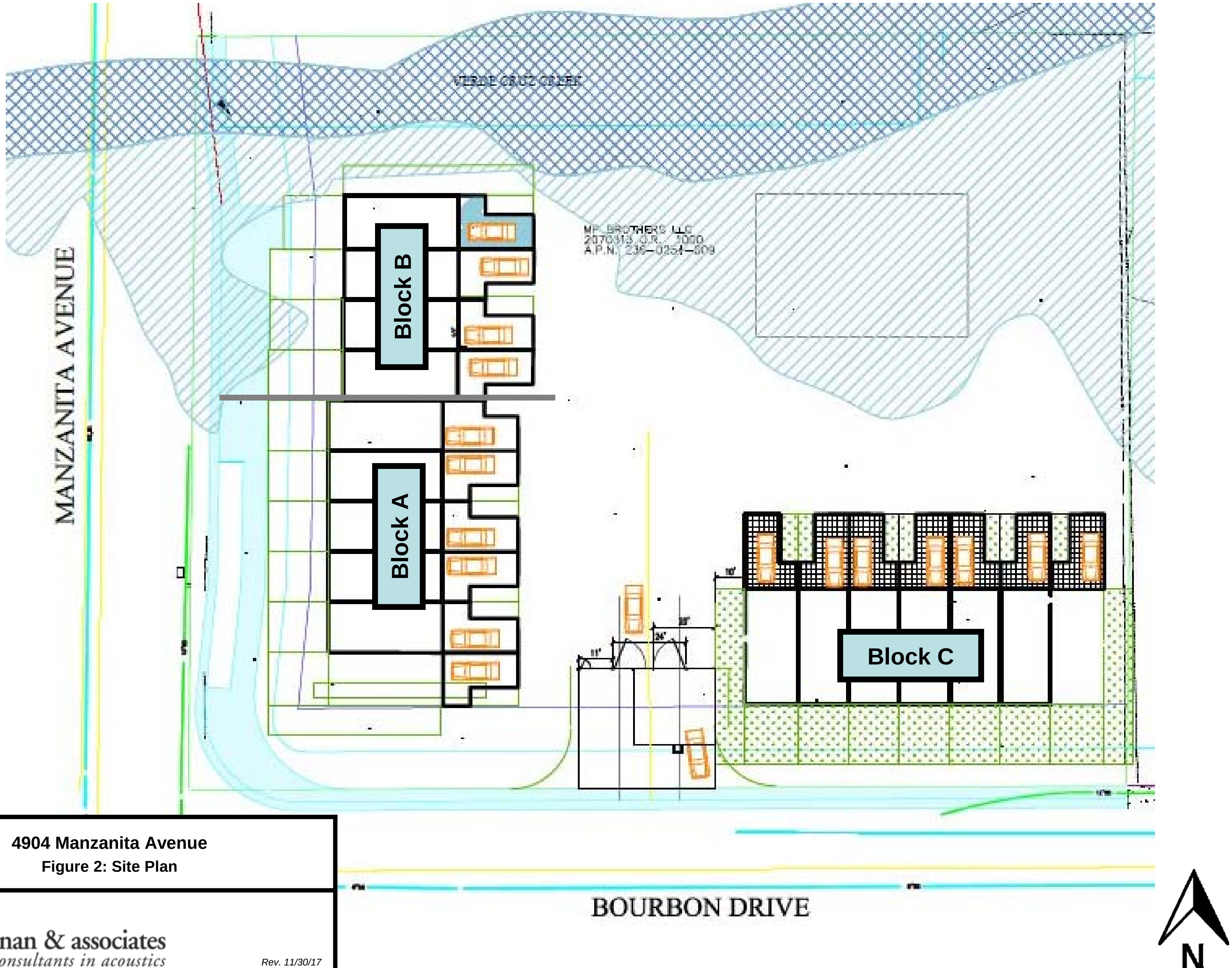
Legend

X : 24-hr Noise Measurement Location



4904 Manzanita Avenue

Figure 2: Site Plan

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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 (Leq), 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 Leq is the foundation of the composite noise descriptor, Ldn, and shows very good correlation with community response to noise.

The day/night average level (Ldn) 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 Ldn 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. October 1998.		

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.

REGULATORY CONTEXT

Federal

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

State

<u>California State Building Codes</u>

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room.

Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

Sacramento County General Plan

The Sacramento County General Plan Noise Element provides the following goals and policies relative to noise.

Goal 1 To protect the existing and future citizens of Sacramento County from the harmful effects of exposure to excessive noise. More specifically, to protect existing noise-sensitive land uses from new uses that would generate noise levels which are incompatible with those uses, and to discourage new noise-sensitive land uses from being developed near sources of high noise levels.

Traffic and Railroad Noise Sources

NO-1. The noise level standards for noise-sensitive areas of *new* uses affected by traffic or railroad noise sources in Sacramento County are shown by Table 1 [Table 2 of this report]. Where the noise level standards of Table 1 are predicted to be exceeded at new uses proposed within Sacramento County which are affected by traffic or railroad noise, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 1 standards.

General Noise Policy

NO-13. Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

Table 2
Noise Standards for New Uses Affected by Traffic and Railroad Noise
Sacramento County Noise Element [Table 1]

New Land Use	Sensitive Outdoor Area – L_{dn}	Sensitive Interior Area – L_{dn}	Notes
All Residential	65	45	5
Transient Lodging	65	45	3,5
Hospitals & Nursing Homes	65	45	3,4,5
Theaters & Auditoriums	--	35	3
Churches, Meeting Halls	65	40	3
Schools, Libraries, etc.	65	40	3
Office Buildings	65	45	3
Commercial Buildings	--	50	3
Playgrounds, Parks, etc	70	--	
Industry	65	50	3

Notes:
1. Sensitive areas are defined in acoustic terminology section.
2. Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.
3. Where there are no sensitive exterior spaces proposed for these uses, only the interior noise level standard shall apply.
4. Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designed for outdoor relaxation by either hospital staff or patients.
5. If this use is affected by railroad use, a maximum (Lmax) noise level standard of 70 dB shall be applied to all sleeping rooms to reduce the potential for sleep disturbance during nighttime train passages.

EVALUATION OF THE EXISTING NOISE ENVIRONMENT AT THE PROJECT SITE

Ambient Noise Levels in the Project Vicinity

Based on field observations and noise measurement data described below, the existing noise environment at the project site is defined by roadway traffic associated with Manzanita Avenue. Additional discussions on traffic noise, based on the noise measurement data, are included later in this report.

j.c. brennan & associates, Inc. conducted continuous hourly ambient noise level measurements for a period of 24-hours on the project site from November 29th to November 30th, 2017. Figure 1 shows the noise measurement location. The noise level measurements were conducted to determine typical background average (L_{eq}), median (L_{50}) and maximum (L_{max}) noise levels, and to determine the effective day/night distribution of roadway traffic for inclusion in the traffic noise prediction methodology. Instrumentation consisted of a Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter, which was calibrated in the field before and after use with an LDL Model CAL200 acoustical calibrator.

Table 3 shows the results of the continuous hourly ambient noise level measurements. Appendix B graphically shows the results of the noise level measurements.

Table 3
Existing Measured Ambient Noise Monitoring Results

Site	Location	Date	Average Measured Hourly Noise Levels, (dBA)						
			24-hr L_{dn}	Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm - 7 am)		
				L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Continuous 24hr Noise Measurement Sites									
A	250-ft. from centerline of Manzanita Avenue	11/29-30/17	61	59	58	69	53	49	63
Source - j.c. brennan & associates, Inc. 2017									

EVALUATION OF TRAFFIC NOISE LEVELS

Future Exterior Traffic Noise Levels

j.c. brennan & associates, Inc. employs the Federal Highway Administration (FHWA) Traffic Noise Prediction Model (FHWA RD-77-108) for the prediction of traffic noise levels. The model is based upon the CALVENO noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

Future traffic volumes for Manzanita Avenue were based upon the SACOG SACSIM15 year (year 2036) traffic model. Truck percentages and vehicle speeds on the local roadways were estimated from field observations.

Future traffic noise levels are predicted at the outdoor activity area and the first, second, and third floor facades at the project site. Generally, second and third floor receivers will experience traffic noise levels slightly higher than noise levels at the ground floor due to the lack of ground absorption. Therefore, a +3 dB correction factor was added to the FHWA prediction model. A -5 dB correction factor was added to the FHWA model at the outdoor activity area and Block C due to partial shielding provided by townhouse buildings nearest to Manzanita Avenue.

Table 4 shows the predicted future traffic noise levels at the noise-sensitive areas on the project site. Appendix C provides the complete inputs for the FHWA Traffic Noise Prediction model.

Table 4
Predicted Exterior Traffic Noise Levels - Manzanita Avenue

Receptor	Location	Distance [1]	Model Correction[2]	Unmitigated Noise Levels, L_{dn}
Blocks A & B	1st Floor Façade	80-ft.	0 dB	68 dB
	2nd & 3rd Floor Facades	80-ft.	+3 dB	71 dB
Block C	1st Floor Façade	215-ft.	-5 dB	56 dB
	2nd & 3rd Floor Facades	215-ft.	-2 dB	59 dB
Outdoor Activity Area		250-ft.	-5 dB	55 dB

1. Distances are measured from the roadway centerline.
2. Cumulative
Source: FHWA-RD-77-108 with inputs from SACOG SACSim Model and j.c. brennan & associates, Inc. - 2017

The Table 4 data for future conditions indicate that the predicted exterior traffic noise levels at the common outdoor activity area will comply with the 65 dB L_{dn} exterior noise level standard. The predicted Manzanita Avenue traffic noise levels will range between 68 dB Ldn and 71 dB Ldn at the Blocks A and B building facades, and between 56 dB Ldn and 59 dB Ldn at the Block C building facade.

In addition, the project proponent is proposing a 6-foot tall sound wall along Manzanita Avenue, which will provide a minimum sound attenuation of -5 dB at the first floor facades of each building. The wall is proposed to be constructed as follows:

- Wood frame on a concrete footing;
- 1/2" plywood or particle board siding on each side of the fame;
- A minimum of a two-coat stucco on the wood siding.

Future Interior Traffic Noise Levels

Standard construction practices consistent with the uniform building code typically provide a 25 dB exterior-to-interior noise level reduction with windows closed. Therefore, sensitive receptors exposed to exterior noise levels of 70 dB L_{dn}, or less, will typically comply with the Sacramento County 45 dB L_{dn} interior noise level standard. Additional noise reduction measures, such as acoustically rated windows are generally required for exterior noise levels exceeding 70 dB L_{dn}.

Based upon Table 4, the first floor facades of each building will be exposed to traffic noise levels of 70 dB Ldn or less, without applying the shielding from the proposed sound wall. Therefore, it is expected that interior noise levels at first floor rooms will comply with the interior noise level standard of 45 dB Ldn.

The second and third floor facades or the Block A and B buildings are expected to be exposed to traffic noise levels up to 71 dB Ldn, and may require additional noise mitigation measures.

Building elevations and detailed floor plans are not available at this time. However, a typical floor plan and building facade construction was used to determine interior traffic noise levels and the project's ability to comply with the interior noise level criterion of 45 dB L_{dn}.

The building is assumed to be constructed of a wood frame, with a minimum of R-21 insulation in the stud cavities and the R-38 in the attic spaces. Stucco siding is used for the exterior, with 5/8" gypsum board on the interior. Units are assumed to have windows with an STC rating of 28 to 30.

Table 5 shows the results of the interior noise calculations for a third floor end unit closest to Manzanita Avenue, which has a noise exposure to two wall facades. The wall parallel to Manzanita Avenue was analyzed for a noise level exposure of 71 dB L_{dn}, and the perpendicular wall was analyzed for a noise level exposure of 69 dB L_{dn}. These values are used as inputs for conservative analysis. A 3 dB correction factor was added to account for variations in construction. Appendix D provides the calculation inputs for a typical bedroom and living room.

Table 5
Calculated Interior Traffic Noise Levels
for Block A and B Buildings

Room	Exterior Noise Levels			Interior Noise Levels	
	Parallel Wall Exterior	Perpendicular Wall Exterior	Cumulative Exterior	Cumulative Interior	NLR
Living / Bedroom	71 dBA	69 dBA	73 dBA	44 dB DNL*	27 dB

Appendix D shows the results of the Interior Calculation Model.
Source: j.c. brennan & associates, Inc., 2017
*Results include STC 30 windows.

The results of the predictive analysis indicate that the interior noise levels for a typical second or third floor unit at the project site will comply with the Sacramento County interior noise level criterion of 45 dB Ldn, provided that the windows and doors on the parallel and perpendicular sides of the second and third floor facades facing Manzanita Avenue of the Block A and Block B buildings have an STC rating of 30.

CONCLUSIONS

The project will comply with the Sacramento County exterior and interior noise level requirements provided that the following recommendations are included in the project design:

1. Air conditioning is provided to allow residents to close windows and doors for acoustical isolation;

2. The windows and doors on the parallel and perpendicular sides of the second and third floor facades facing Manzanita Avenue, of the Block A and Block B buildings, have an STC rating of 30.

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
4904 Manzanita Avenue
24hr Continuous Noise Monitoring - Site A
November 29th - 30th, 2017

Hour	Leq	Lmax	L50	L90
15:00:00	58.1	65.3	57.8	53.8
16:00:00	59.7	76.6	58.9	55.3
17:00:00	59.0	68.8	58.8	54.8
18:00:00	58.5	66.8	58.1	54.3
19:00:00	57.4	66.5	56.9	52.4
20:00:00	56.9	74.3	55.8	51.0
21:00:00	55.3	63.3	54.6	49.5
22:00:00	53.4	64.8	52.2	46.7
23:00:00	51.1	60.3	49.6	44.5
0:00:00	49.9	64.2	46.3	40.0
1:00:00	47.8	59.7	43.8	40.4
2:00:00	46.9	59.7	43.1	39.8
3:00:00	47.0	58.9	43.3	40.4
4:00:00	50.6	67.1	47.6	42.5
5:00:00	54.8	66.6	53.4	47.6
6:00:00	58.5	64.9	57.9	53.2
7:00:00	60.6	72.1	60.3	57.2
8:00:00	60.6	67.1	60.3	57.1
9:00:00	58.6	65.8	58.4	54.6
10:00:00	58.2	76.3	57.3	51.8
11:00:00	57.8	64.2	57.4	53.3
12:00:00	57.6	62.6	57.4	52.8
13:00:00	58.4	74.5	57.8	54.1
14:00:00	58.4	68.5	58.1	54.7

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	61	55	59	58	47	53
Lmax (Maximum)	77	63	69	67	59	63
L50 (Median)	60	55	58	58	43	49
L90 (Background)	57	50	54	53	40	44

Computed Ldn, dB	61
% Daytime Energy	86%
% Nighttime Energy	14%

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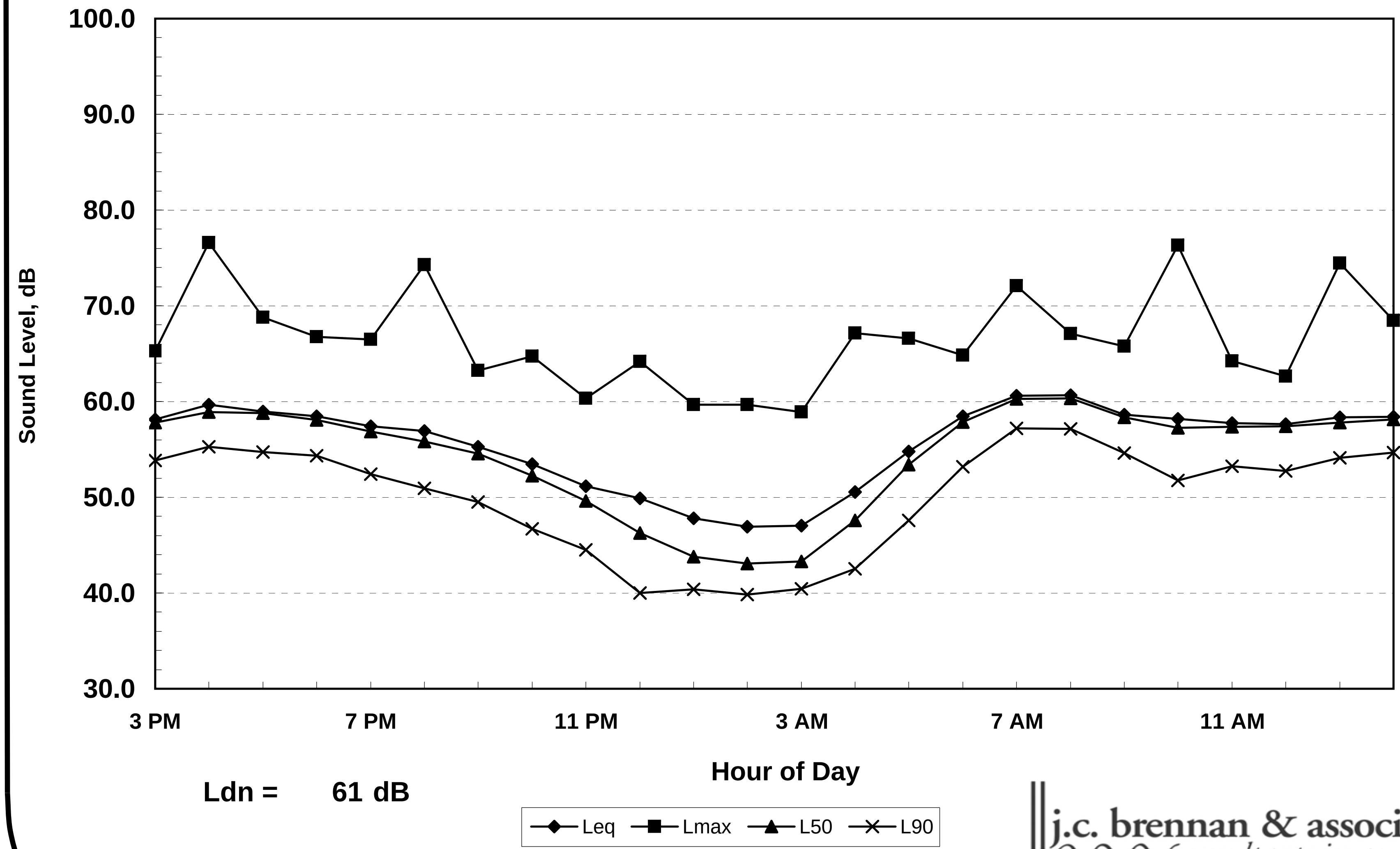
Appendix B
4904 Manzanita Avenue
24hr Continuous Noise Monitoring - Site A
November 29th - 30th, 2017



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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2017-196
Description: Future 2036 Traffic Noise Levels - Manzanita Avenue
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Manzanita Avenue	Block A: 1st Floor Façade	29,637	86		14	2	1	40	78	
2	Manzanita Avenue	Block A: 2nd-3rd Floor Façades	29,637	86		14	2	1	40	78	3
3											
4	Manzanita Avenue	Block B: 1st Floor Façade	29,637	86		14	2	1	40	82	
5	Manzanita Avenue	Block B: 2nd-3rd Floor Façades	29,637	86		14	2	1	40	82	3
6											
7	Manzanita Avenue	Block C: 1st Floor Façade	29,637	86		14	2	1	40	215	-5
8	Manzanita Avenue	Block C: 2nd-3rd Floor Façades	29,637	86		14	2	1	40	215	-2
9											
10	Manzanita Avenue	Outdoor Activity Area	29,637	86		14	2	1	40	250	-5
11											
12											
13											
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Appendix C

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

Project #: 2017-196
Description: Future 2036 Traffic Noise Levels - Manzanita Avenue
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Manzanita Avenue	Block A: 1st Floor Façade	66.2	58.2	60.1	68
2	Manzanita Avenue	Block A: 2nd-3rd Floor Façades	69.2	61.2	63.1	71
4	Manzanita Avenue	Block B: 1st Floor Façade	65.8	57.9	59.7	67
5	Manzanita Avenue	Block B: 2nd-3rd Floor Façades	68.8	60.9	62.7	70
7	Manzanita Avenue	Block C: 1st Floor Façade	54.6	46.6	48.5	56
8	Manzanita Avenue	Block C: 2nd-3rd Floor Façades	57.6	49.6	51.5	59
10	Manzanita Avenue	Outdoor Activity Area	53.6	45.7	47.5	55

Appendix C

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

Project #: 2017-196
Description: Future 2036 Traffic Noise Levels - Manzanita Avenue
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Manzanita Avenue	Block A: 1st Floor Façade	25	54	117	252	544
2	Manzanita Avenue	Block A: 2nd-3rd Floor Façades	40	86	186	400	862
4	Manzanita Avenue	Block B: 1st Floor Façade	25	54	117	252	544
5	Manzanita Avenue	Block B: 2nd-3rd Floor Façades	40	86	186	400	862
7	Manzanita Avenue	Block C: 1st Floor Façade	12	25	54	117	252
8	Manzanita Avenue	Block C: 2nd-3rd Floor Façades	19	40	86	186	400
10	Manzanita Avenue	Outdoor Activity Area	12	25	54	117	252

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Appendix D

Building Facade Noise Reduction Worksheet

4904 Manzanita Avenue

Plans Dated:

Analysis Date: 12/4/2017

Room Description: **Typical Bedroom**

Parallel Panel Size, ft^2: **88** | **Perpendicular Panel Size, ft^2:** 136

Parallel Exterior level, dB: 71 | **Perpendicular Exterior level, dB:** 69

Correction Factor, dB: 3

Noise Source Information:

Arterial Traffic	Parallel, dB	52	54	54	57	57	58	58	61	64	63	62	60	58	56	51	47
Arterial Traffic	Perpendicular, dB	50	52	52	55	55	56	56	59	62	61	60	58	56	54	49	45

		One-Third Octave Band Center Frequency (Hz)															
Material	***Area(ft^2)***	***125***	***160***	***200***	***250***	***315***	***400***	***500***	***630***	***800***	***1K***	***1.25K***	***1.6K***	***2K***	***2.5K***	***3.15K***	***4K***
Sound Absorption Data:																	
Gyp Board	409	0.29	0.29	0.10	0.10	0.10	0.05	0.05	0.05	0.04	0.04	0.04	0.07	0.07	0.07	0.09	0.09
Glass	39	0.35	0.35	0.25	0.25	0.25	0.18	0.18	0.18	0.12	0.12	0.12	0.01	0.01	0.01	0.04	0.04
Carpet, on foam rubber pad	187	0.08	0.08	0.24	0.24	0.24	0.57	0.57	0.57	0.69	0.69	0.69	0.71	0.71	0.71	0.73	0.73
Gyp Board	187	0.29	0.29	0.10	0.10	0.10	0.05	0.05	0.05	0.04	0.04	0.04	0.07	0.07	0.07	0.09	0.09
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Absorption Parallel, dB:		-4	-4	-1	-1	-1	-2	-2	-2	-3	-3	-3	-3	-3	-3	-3	-3
Absorption Perpendicular, dB:		-2	-2	1	1	1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1
Transmission Loss Information: Parallel Façade																	
Wall - Stucco Wall (Egen)	49	21	21	33	33	33	41	41	41	46	46	46	47	47	47	51	51
Window - Millgard 910 1/8*1/8 STC 30	39	22	21	23	18	20	23	25	28	32	35	38	41	44	44	40	31
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transmission Loss Information: Perpendicular Façade																	
Wall - Stucco Wall (Egen)	112	21	21	33	33	33	41	41	41	46	46	46	47	47	47	51	51
Window - Millgard 910 1/8*1/8 STC 30	24	22	21	23	18	20	23	25	28	32	35	38	41	44	44	40	31
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Summary																	
Composite TL - Parallel, dB:		21	21	26	21	23	26	28	31	35	38	41	43	45	45	43	34
Composite TL - Perpendicular, dB:		21	21	29	25	27	30	32	35	39	41	43	45	46	46	46	38
Absorption Parallel, dB:		-4	-4	-1	-1	-1	-2	-2	-2	-3	-3	-3	-3	-3	-3	-3	-3
Absorption Perpendicular, dB:		-2	-2	1	1	1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1
Safety Factor, dB:		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Interior Level - Parallel, dB:		30	33	30	37	36	33	31	31	29	25	22	17	13	11	8	12
Interior Level - Perpendicular, dB:		30	33	27	33	32	29	27	28	25	22	19	15	12	10	5	8

Parallel Outside Level, dB: 71 | *Perpendicular Outside Level, dB:* 69

Noise Reduction, dB: 27

Parallel Interior Level, dB: 43 | *Perpendicular Interior Level, dB:* 40

Total Interior Noise Level, dB: **44**

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