

Environmental Noise Assessment

Trackside Mixed-Use Development

Davis, California

BAC Job # 2015-215

Prepared For:

Mr. Kemble Pope
Trackside Center, LLC
2940 Spafford St., Ste. 202
Davis, CA. 95618

Prepared By:

Bollard Acoustical Consultants, Inc.



Paul Bollard, President

September 20, 2016



Introduction

The proposed Traskside Mixed Use Development (project) consists of the construction of retail and residential uses at 901 3rd Street in the City of Davis, California. Existing California Northern Railroad (CFNR) tracks run adjacent to the western side of the site. The project area is shown in Figure 1, and first-floor and second-floor site plans are shown in Figure 2.

Due to the proximity of the site to railroad tracks to the west, an acoustical analysis was performed by Bollard Acoustical Consultants, Inc. (BAC) to assess noise levels at the proposed development and to compare those levels against the applicable City of Davis noise standards for acceptable noise exposure at residential land uses. In addition, this analysis evaluates potential impacts associated with off-site increases in traffic noise resulting from the proposed project.

Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard, and thus are called sound. 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 allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness. Appendix A contains definitions of Acoustical Terminology. Figure 3 shows common noise levels associated with various sources.

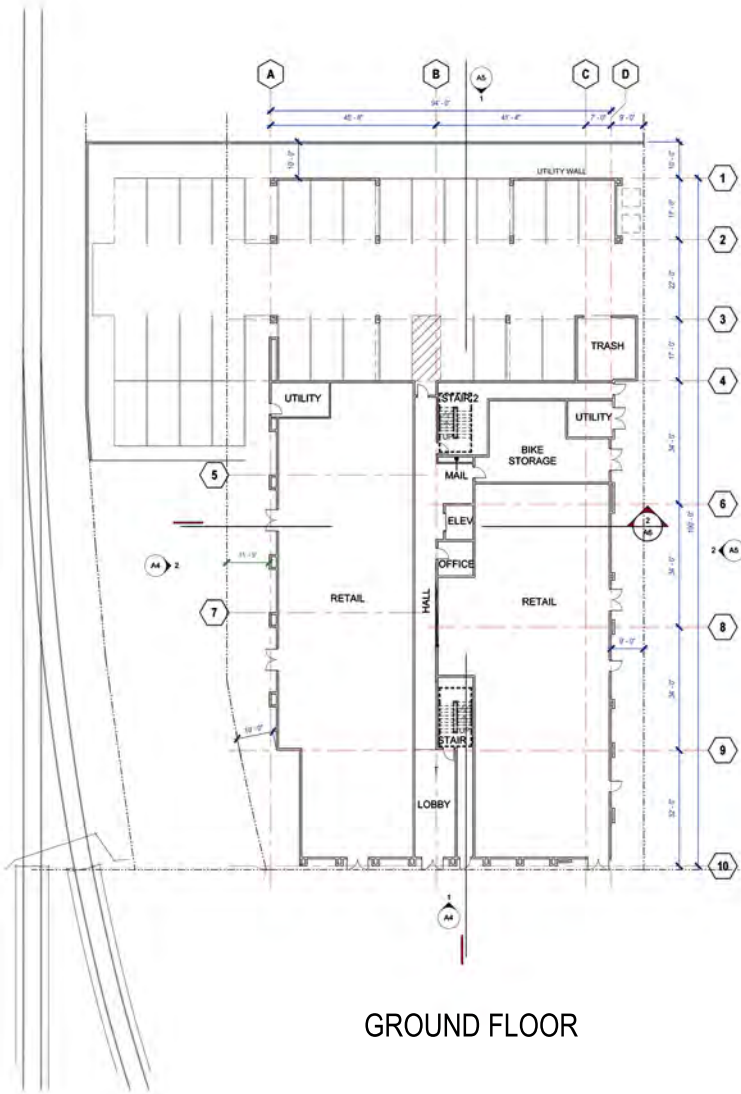
The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. 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 in decibels.

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 noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, L_{dn} , and shows very good correlation with community response to noise.

Figure 1
Project Area and Noise Measurement Location
Trackside Mixed Use Development - Davis, California



Figure 2
 Proposed Project Site Plan
 Traskside Mixed Use Development - Davis, California



GROUND FLOOR



SECOND FLOOR

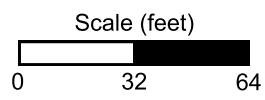
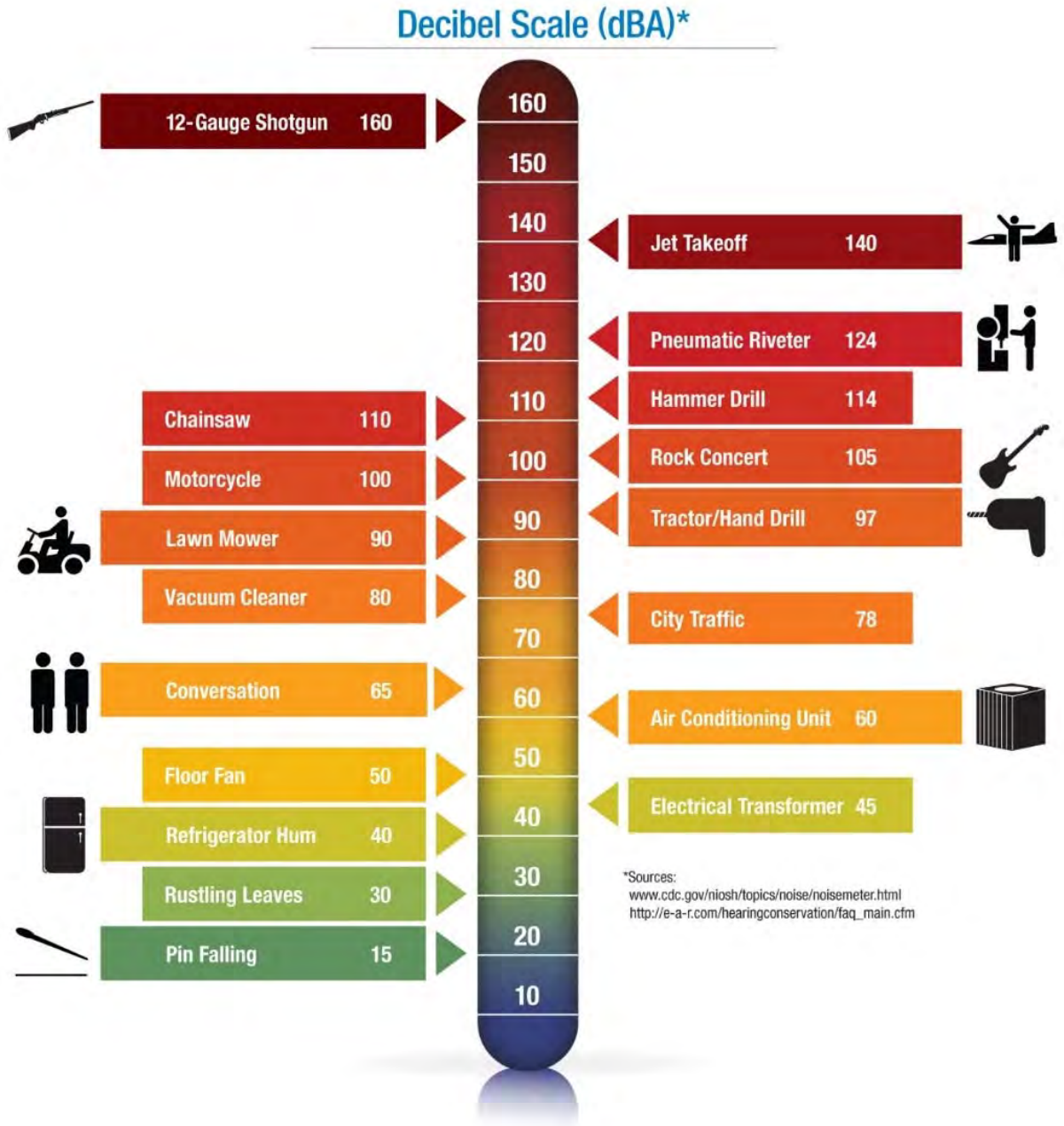


Figure 3
Typical A-Weighted Sound Levels of Common Noise Sources



Impact 1 – Railroad Noise

Criteria for Acceptable Noise Exposure

The City of Davis General Plan, Chapter 21: Noise, Table 20, requires that interior noise exposure from exterior noise sources within residential dwellings not exceed 45 dB L_{dn} (or CNEL), regardless of exterior noise exposure. This standard is increased to 55 dB L_{dn} or less for office (commercial) uses.

Chapter 21, Table 19 of the City of Davis General Plan establishes an exterior noise level criterion of less than 60 dB L_{dn} (or CNEL) within outdoor activity areas of residential land uses. This standard is adjusted to a level less than 65 dB L_{dn} for commercial uses. These are considered to be the Normally Acceptable criteria, and may be adjusted upward (60-70 dB L_{dn} for residential, 65-75 dB L_{dn} for office/professional) based on compliance with the interior noise criterion and the City's discretion. Furthermore, Policy NOISE 1.2 of the City of Davis General Plan discourages the construction of sound walls whenever there are alternative mitigation measures feasible.

Railroad Noise Environment

To quantify the railroad noise environment at the project site, BAC conducted continuous noise monitoring on the project site from a position 60 feet from the railroad tracks on September 23-28, 2015. The noise monitoring location is shown in Figure 1.

A Larson Davis Laboratories (LDL) Model 831 precision integrating sound level meter was used for the railroad noise level measurements. Additionally, the sound level meter was programmed to identify train passbys by recording audio files when noise levels exceeded a threshold well above ambient noise levels. The meter was calibrated before 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 results of the railroad noise measurements indicate that there were an average of four (4) train passbys on the tracks adjacent to the project site each weekday. No railroad activity occurred during the weekend. Two of the trains were typically during the 6-8 am hours, with the other two occurring during the 9-11 pm period. Analysis of the audio files captured for each train passby indicate that the noise generation of the train passbys was dominated by the warning horn usage. While noise from trains on the main east-west line approximately 700 feet to the south was audible, it was insignificant relative to the noise generation of the trains immediately adjacent to the project site.

The data collected on September 23-28, 2015 indicated an average freight train passby SEL of 116 dB at a distance of 60 feet, with 2 daytime passbys and 2 nighttime passbys per day during the monitoring period. Based on this data, the predicted railroad noise level was calculated at the nearest proposed building facades, approximately 60 feet from the centerline of the tracks. The results of these calculations are shown below in Table 1. The continuous noise level measurement results are provided in tabular format in Appendix B and graphically in Appendix C.

Table 1				
Predicted Future Railroad Noise Levels at Nearest Proposed Building Facade¹				
Trackside Mixed Use Development – Davis, California				
Location¹	SEL at Facade (dB)	Number of Train Passbys		Predicted Noise Level, (L_{dn}, dB)²
Daytime	Nighttime			
First floor - Retail	115	2	2	79
Upper floors - Residential	115	2	2	79

Notes:
¹ See Figure 2 for retail and residential floor plans.
² Predicted noise level at proposed building facade exterior.
Source: Bollard Acoustical Consultants, Inc. (2015)

As shown in Table 1, the predicted future railroad noise level at the nearest proposed building facades would be 79 dB L_{dn}, with single-event SEL of 115 dB per freight train passby. These levels are used in the following section to determine interior noise exposure at the proposed retail and residential floors.

Railroad Noise Levels at Interior Spaces of Project

First Floor – Retail

As shown in Table 1, the predicted railroad noise level at the nearest proposed building facade is 79 dB L_{dn} at first-floor retail stores. To achieve compliance with the City of Davis commercial interior standard of 55 dB L_{dn}, exterior-to-interior noise reduction of at least 24 dB would be required of the first-floor building facades.

Standard store-front retail construction typically results in an exterior to interior noise reduction of approximately 25 dB. Standard construction practices would, therefore, be adequate for the proposed first-floor retail stores in achieving compliance with the City standard of 55 dB L_{dn}. However, in order to provide a margin of safety, BAC recommends that all windows and doors, from which railroad tracks can be seen, be upgraded to have a Sound Transmission Class (STC) rating of at least 30.

Upper Floors – Residential

Table 1 indicates that the predicted future railroad noise level at the nearest proposed residential facade would be 79 dB L_{dn}. Therefore, to achieve compliance with the City of Davis residential interior standard of 45 dB L_{dn}, exterior-to-interior noise reduction of at least 34 dB would be required of the upper-floor building facades.

Standard residential construction typically results in an exterior to interior noise reduction of about 25 dB with windows closed, and approximately 15 dB with windows open. To reduce noise levels by 34 dB at the interiors of these residences, windows should be upgraded to at least a 35 STC rating.

Impact 2 – Increases in Off-Site Traffic Noise Levels

Criteria for Determining a Substantial Increase in Traffic Noise Levels

It is generally recognized that an increase of at least 3 dB for similar noise sources is usually required before most people will perceive a change in noise levels, and an increase of 6 dB is required before the change will be clearly noticeable (Egan, Architectural Acoustics, page 21, 1988, McGraw Hill).

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. Table 2 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The FICON standards have been used extensively in recent years by the authors of this section in the preparation of the noise sections of Environmental Impact Reports that have been certified in many California Cities and Counties.

The rationale for the graduated scale used in the FICON standards is that test subjects' reactions to increases in noise levels varied depending on the starting level of noise. Specifically, with lower ambient noise environments, such as those below 60 dB L_{dn} , a larger increase in noise levels was required to achieve a negative reaction than was necessary in more elevated noise environments.

The use of the FICON standards are considered conservative relative to thresholds used by other agencies in the State of California. For example, the California Department of Transportation (Caltrans) requires a project-related traffic noise level increase of 12 dB for a finding of significance, and the California Energy Commission (CEC) considers project-related noise level increases between 5-10 dB significant, depending on local factors. Therefore, the use of the FICON standards, which set the threshold for finding of significant noise impacts as low as 1.5 dB, provides a very conservative approach to impact assessment for this project.

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, as shown in Table 2, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB L_{dn} . Where pre-project ambient conditions are between 60 and 65 dB L_{dn} , a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels, specifically pre-project noise levels in excess of 65 dB L_{dn} , a 1.5 dB increase is considered by FICON as the threshold of significance.

This graduated scale indicates that in quieter noise environments, test subjects tolerated a higher increase in noise levels due to a project before the onset of adverse noise impacts than did test subjects in louder environments.

According to the FICON study, if screening analysis shows that noise-sensitive areas will be at or above DNL 65 dB and will have an increase of DNL 1.5 or more, further analysis should be conducted. The FICON study also reported the following: Every change in the noise environment does not necessarily impact public health and welfare.

Audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered unacceptable according to CEQA. Because every physical process creates noise, whether by the addition of a single vehicle on a roadway, or a tractor in an agricultural field, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

Existing Traffic Noise Conditions

To predict existing noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD 77 108) was used. The Model uses the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks. The Model considers vehicle volume and speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the sound propagation path.

Table 3 summarizes the calculated existing traffic noise levels in terms of L_{dn} at a reference distance of 50 feet from the centerlines of existing project-area roadways. The table also includes the distances to existing traffic noise contours. Appendices D - F contain the detailed FHWA Model inputs, predicted traffic noise levels, and distances to traffic noise contours.

**Table 3
Existing Traffic Noise Levels
Trackside Mixed Use Development – Davis, California**

Roadway ¹	From	To	L _{dn} at 50 ft (dB)	Distances to Traffic Noise Contours, L _{dn} (dB)		
				60	55	50
4 th Street	West of F Street		57	29	64	137
4 th Street	F Street	G Street	57	32	68	147
4 th Street	G Street	Alley	58	34	74	159
4 th Street	Alley	I Street	58	34	74	158
4 th Street	I Street	J Street	57	32	69	148
4 th Street	East of J Street		57	31	67	145
3 rd Street	West of F Street		58	38	83	178
3 rd Street	F Street	G Street	58	38	82	177
3 rd Street	G Street	Alley	61	55	118	254
3 rd Street	Alley	I Street	61	55	118	254
3 rd Street	I Street	J Street	60	50	107	231
3 rd Street	East of J Street		60	48	102	221
F Street	North of 4 th Street		60	51	111	238
F Street	4 th Street	3 rd Street	59	46	100	215
F Street	South of 4 th Street		59	44	94	203
G Street	North of 4 th Street		59	41	89	191
G Street	4 th Street	3 rd Street	58	39	85	182
G Street	South of 4 th Street		59	41	89	192
Alley	North of 4 th Street		47	7	16	33
Alley	4 th Street	3 rd Street	46	6	13	27
I Street	North of 4 th Street		51	13	28	59
I Street	4 th Street	3 rd Street	50	11	25	53
I Street	South of 4 th Street		52	14	31	67
J Street	North of 4 th Street		52	15	33	70
J Street	4 th Street	3 rd Street	51	12	26	57
J Street	South of 4 th Street		46	6	13	28

Notes:

¹ The roadway referred to as *Alley* is located immediately east of the project area, between 4th Street and 3rd Street.

Source: FHWA-RD-77-108 with Calveno vehicle emission curves and inputs from KD Andersons & Associates, Inc.; Caltrans; and BAC.

Increases in Off-Site Traffic Noise Levels

To assess noise impacts due to project-related traffic increases on the local roadway network, traffic noise levels are predicted at a representative distance for both existing and future, project and no-project conditions. The project proposes to change the current two-way alley into a one-way alley in order to improve the roadway environment for motorists, cyclist, and pedestrians. Therefore, future traffic was assessed for both a one-way and two-way alley denoted as project 1 (P1) and project 2 (P2), respectively. Noise impacts are identified at existing noise-sensitive areas if the noise level increases, due to the project, exceed the FICON standards.

To describe existing and projected noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict traffic noise levels in terms of L_{dn} , it is necessary to adjust the input volume to account for the day/night distribution of traffic.

FHWA Model inputs are provided for all scenarios in Appendix D. Table 4 shows the predicted increases in traffic noise levels on the local roadway network for existing conditions which would result from the project. Table 5 shows the increases in traffic for and future (cumulative) conditions. These tables are provided in terms of L_{dn} at a standard distance of 50 feet from the centerlines of the project-area roadways.

The intent of Table 4 and 5 is to determine project-related noise level increases. It is recognized that there are many factors which could cause actual traffic noise levels to differ from those provided in these tables, including shielding by existing noise barriers, buildings, or topography, variations in vehicle speeds, truck percentages, day/night distribution of traffic, etc. It is not feasible to account for every such variation, nor is it necessary to satisfy the intent of this analysis. By holding such variables constant, and only varying the traffic volumes to reflect the additional traffic generated by the project, then the project-related increase in noise levels can be isolated.

Table 4
Project-Related Increases in Existing Traffic Noise Levels
Trackside Mixed Use Development – Davis, California

Roadway ¹	From	To	Existing	E+P1 ²	Increase	E+P2 ³	Increase
4 th Street	West of F Street		57	57	0.1	57	0.1
4 th Street	F Street	G Street	57	57	0.3	57	0.3
4 th Street	G Street	Alley	58	58	0.4	58	0.3
4 th Street	Alley	I Street	58	58	0.3	58	0.2
4 th Street	I Street	J Street	57	57	0.3	57	0.2
4 th Street	East of J Street		57	57	0.3	57	0.2
3 rd Street	West of F Street		58	58	0.1	58	0.1
3 rd Street	F Street	G Street	58	58	0.2	59	0.3
3 rd Street	G Street	Alley	61	61	0.2	61	0.2
3 rd Street	Alley	I Street	61	61	0.0	61	0.1
3 rd Street	I Street	J Street	60	60	0.1	60	0.1
3 rd Street	East of J Street		60	60	0.1	60	0.1
F Street	North of 4 th Street		60	60	0.1	60	0.1
F Street	4 th Street	3 rd Street	59	60	0.1	59	0.0
F Street	South of 4 th Street		59	59	0.2	59	0.1
G Street	North of 4 th Street		59	59	0.1	59	0.1
G Street	4 th Street	3 rd Street	58	59	0.3	58	0.0
G Street	South of 4 th Street		59	59	0.0	59	0.0
Alley	North of 4 th Street		47	47	0.0	47	0.1
Alley	4 th Street	3 rd Street	46	50	3.9	50	4.1
I Street	North of 4 th Street		51	51	0.0	51	0.0
I Street	4 th Street	3 rd Street	50	51	0.2	50	0.0
I Street	South of 4 th Street		52	52	0.0	52	0.0
J Street	North of 4 th Street		52	52	0.0	52	0.0
J Street	4 th Street	3 rd Street	51	51	0.1	51	0.0
J Street	South of 4 th Street		46	46	0.0	46	0.0

Notes:

¹ The roadway referred to as *Alley* is located immediately east of the project area, between 4th Street and 3rd Street.

² Existing plus Project 1 (one-way alley)

³ Existing plus Project 2 (two-way alley)

Source: FHWA Model with inputs from BAC & Project Traffic Study.

Table 5
Project-Related Increases in Future Traffic Noise Levels
Trackside Mixed Use Development – Davis, California

Roadway ¹	From	To	Future	F+P1 ²	Increase	F+P2 ³	Increase
4 th Street	West of F Street		58	58	0.1	58	0.1
4 th Street	F Street	G Street	58	58	0.3	58	0.3
4 th Street	G Street	Alley	58	59	0.3	59	0.3
4 th Street	Alley	I Street	58	59	0.2	59	0.2
4 th Street	I Street	J Street	58	58	0.3	58	0.3
4 th Street	East of J Street		57	58	0.9	58	0.9
3 rd Street	West of F Street		60	60	0.1	60	0.1
3 rd Street	F Street	G Street	59	60	0.2	60	0.3
3 rd Street	G Street	Alley	61	61	0.1	61	0.2
3 rd Street	Alley	I Street	61	61	0.0	61	0.1
3 rd Street	I Street	J Street	61	61	0.1	61	0.1
3 rd Street	East of J Street		61	61	0.1	61	0.1
F Street	North of 4 th Street		61	61	0.1	61	0.1
F Street	4 th Street	3 rd Street	61	61	0.1	61	0.0
F Street	South of 4 th Street		60	60	0.1	60	0.1
G Street	North of 4 th Street		59	59	0.1	59	0.1
G Street	4 th Street	3 rd Street	59	59	0.3	59	0.0
G Street	South of 4 th Street		60	60	0.0	60	0.0
Alley	North of 4 th Street		47	47	0.0	47	0.0
Alley	4 th Street	3 rd Street	46	51	4.3	51	4.3
I Street	North of 4 th Street		52	52	0.0	52	0.0
I Street	4 th Street	3 rd Street	51	52	0.2	51	0.0
I Street	South of 4 th Street		52	52	0.0	52	0.0
J Street	North of 4 th Street		52	52	0.0	52	0.0
J Street	4 th Street	3 rd Street	51	51	0.1	51	0.0
J Street	South of 4 th Street		47	47	0.0	47	0.0

Notes:

¹ The roadway referred to as *Alley* is located immediately east of the project area, between 4th Street and 3rd Street.

² Future plus Project 1 (one-way alley)

³ Future plus Project 2 (two-way alley)

Source: FHWA Model with inputs from BAC & Project Traffic Study.

Inspection of the Table 4 & 5 data indicate that the project-related increases in both existing (baseline) and future (cumulative) traffic noise levels would not exceed 4.3 dB L_{dn} on all project area roadways. Because this range of traffic noise level increases is below the FICON thresholds shown in Table 2, this increase is considered **less than significant**.

Impact 3 – Effect of Proposed Trackside Building on Railroad Noise in the Community

Shielding of Existing Uses from Railroad Noise by Proposed Trackside Center Building

The Trackside Center building will provide both shielding of railroad noise to existing uses to the east of the building, and reflection of railroad noise to existing uses located on the west side of the building.

The degree of shielding provided by the proposed Trackside Center building depends on the location of the receptor relative to the new building. Residences on the east side of the alley which will be completely shielded from view of railroad passbys would be expected to experience a reduction in railroad noise exposure between 5 and 10 dB L_{dn} . The decrease in railroad noise caused by this shielding would subjectively be perceived as ranging from a clearly noticeable decrease to a halving of loudness. This reduction in railroad noise exposure at existing uses which will be in the shadow zone of the building is considered **a positive impact of the project**, and would not warrant any consideration of noise mitigation measures.

Reflection of Railroad Noise off of Trackside Center Building towards Existing Uses to the West

When sound impacts a building surface, it can reflect off of that surface back in the opposite direction. Whether or not reflected sound will result in adverse noise impacts depends on several factors.

The first factor is the sensitivity of the receiving use which would be subjected to the reflected sound. For this project, the receiving uses which would be exposed to increased noise due to reflections are the existing uses located on the west side of the railroad tracks, primarily between 3rd and 4th Streets. Existing uses in this area which are located adjacent to the railroad tracks are not particularly noise-sensitive. Specifically, the existing use located on the opposite side of the railroad tracks from the Trackside Center building primarily consists of an ACE Hardware store. This use is considered less sensitive to noise than residential uses. Nonetheless, excessive levels of reflected sound from the Trackside Center building could have an adverse effect on the outdoor garden area of the ACE Hardware store.

The intensity of the reflected sound depends on the distance the sound must travel along the reflected path to reach the nearest receiver versus the direct path from source to receiver.

For this project, the approximate distance of the direct path from the centerline of the railroad tracks to the Ace Hardware Store is approximately 30 feet. Because the reflected sound must travel approximately 50 feet from the railroad tracks prior to impacting the proposed Trackside Center Building, then 80 feet from the building back across the tracks to the Ace Hardware Store, the total path length of the reflected sound is 130 feet. Thus, the reflected sound path is over four (4) times the distance of the direct sound path.

Because railroad noise decreases at a rate of 4.5 dB for each doubling of distance from the tracks, the reflected sound would arrive at the store on the opposite side of the tracks approximately 10 dB lower than sound arriving at the store directly (assuming a 100% reflective building surface). When added together, the theoretical combined noise of direct and reflected sound would be approximately 0.4 dB higher than the direct sound level by itself.

Because a sound level increase of less than 1 dB for a similar noise source (railroad noise in this case) is imperceptible, no adverse effects associated with sound reflected off of the Trackage Center buildings are anticipated for this project, and this impact is considered **less than significant**.

Conclusions

The proposed Trackage Mixed Use Development at 901 3rd Street will result in perceptibly lower noise levels at existing residences which will be shielded from view of the railroad tracks without resulting in appreciably higher reflected noise levels at the existing uses on the opposite side of the railroad tracks. In addition, noise impacts associated with off-site traffic generated by the project would similarly be less than significant. However, the mixed-use development will be exposed to railroad noise levels in excess of the City of Davis noise standards. To reduce noise levels to a state of compliance within the City noise standards within the proposed retail and residential interiors, and to minimize potential sleep disturbances resulting from individual train passbys, BAC recommends the following mitigation measures are included in project construction:

1. First-floor windows within the proposed retail units from which the railroad tracks are visible should be upgraded to an STC rating of 30 or higher to reduce interior noise levels.
2. Upper-floor windows in the proposed residential units with a view of the railroad tracks should be upgraded to an STC rating of 35 or higher to reduce interior noise levels to compliance with City standards and to reduce potential sleep disturbances resulting from train passbys.
3. Mechanical ventilation (air conditioning) should be provided for all residences in this development to allow the occupants to close doors and windows as desired to achieve compliance with the applicable interior noise level criteria.
4. Disclosure statement should be provided to all prospective commercial tenants and residents of this development notifying them of brief periods of elevated noise exposure during railroad warning horn usage on the adjacent tracks.

These conclusions are based on railroad noise data collected for the tracks adjacent to the project site, on noise reduction data for standard residential and commercial structures, and on the assumptions contained herein. Deviations from the current railroad configuration or the project site plans shown in Figure 2 could cause future railroad noise levels to differ from those predicted in this analysis. In addition, Bollard Acoustical Consultants, Inc. is not responsible for degradation in acoustic performance of the residential construction due to poor construction practices, failure to comply with applicable building code requirements, or for failure to adhere to the minimum building practices cited in this report.

This concludes BAC's noise assessment for the proposed Trackage Mixed Use Development at 901 3rd Street in Davis, CA. Please contact BAC at (916) 663-0500 or paulb@bacnoise.com with any questions regarding this assessment.

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.
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
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 Maximum level, which is the highest RMS level.
RT₆₀	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	A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.
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.



Appendix B-1
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Thursday, September 24, 2015

Hour	Leq	Lmax	L50	L90
0:00	51	72	49	46
1:00	50	69	47	45
2:00	48	65	47	44
3:00	53	76	49	46
4:00	52	72	50	47
5:00	52	73	50	48
6:00	78	105	50	47
7:00	74	103	55	50
8:00	64	84	55	50
9:00	55	69	52	47
10:00	56	75	52	48
11:00	55	72	53	47
12:00	57	85	52	48
13:00	56	79	52	47
14:00	55	70	52	48
15:00	56	74	53	49
16:00	57	75	54	51
17:00	57	71	55	52
18:00	56	72	53	48
19:00	55	73	51	48
20:00	54	69	52	49
21:00	85	114	54	50
22:00	79	108	54	52
23:00	56	76	54	52

Statistical Summary						
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	85	54	74	79	48	72
Lmax (Maximum)	114	69	79	108	65	79
L50 (Median)	55	51	53	54	47	50
L90 (Background)	52	47	49	52	44	47

Computed Ldn, dB	79
% Daytime Energy	73%
% Nighttime Energy	27%

Appendix B-2
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Friday, September 25, 2015

Hour	Leq	Lmax	L50	L90
0:00	54	67	52	50
1:00	55	78	53	50
2:00	52	69	50	46
3:00	51	68	48	45
4:00	51	72	47	45
5:00	54	75	50	46
6:00	80	107	52	47
7:00	67	89	51	47
8:00	57	75	54	50
9:00	57	77	53	49
10:00	56	73	52	48
11:00	58	85	53	49
12:00	55	75	53	48
13:00	55	67	53	49
14:00	57	80	54	50
15:00	57	77	55	51
16:00	57	73	55	52
17:00	57	72	55	52
18:00	56	77	54	52
19:00	56	70	54	52
20:00	86	114	55	52
21:00	82	109	55	53
22:00	55	69	54	52
23:00	54	72	53	51

Statistical Summary						
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	86	55	76	80	51	70
Lmax (Maximum)	114	67	81	107	67	75
L50 (Median)	55	51	54	54	47	51
L90 (Background)	53	47	50	52	45	48

Computed Ldn, dB	78
% Daytime Energy	85%
% Nighttime Energy	15%

**Appendix B-3
 Trackside Mixed Use Development
 Ambient Noise Monitoring Results - Site 1
 Saturday, September 26, 2015**

Hour	Leq	Lmax	L50	L90
0:00	54	72	53	51
1:00	55	81	51	49
2:00	51	69	49	46
3:00	50	64	49	46
4:00	54	80	49	46
5:00	53	63	52	50
6:00	57	80	52	50
7:00	53	69	52	50
8:00	55	79	52	50
9:00	55	74	52	47
10:00	55	78	52	48
11:00	56	78	52	48
12:00	55	78	53	49
13:00	55	75	53	49
14:00	55	76	53	49
15:00	55	72	53	50
16:00	56	73	54	50
17:00	57	83	53	51
18:00	55	74	53	51
19:00	55	78	53	50
20:00	54	65	53	51
21:00	56	80	53	51
22:00	55	70	53	51
23:00	54	74	53	51

Statistical Summary						
Daytime (7 a.m. - 10 p.m.)				Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57	53	55	57	50	54
Lmax (Maximum)	83	65	76	81	63	73
L50 (Median)	54	52	53	53	49	51
L90 (Background)	51	47	49	51	46	49

Computed Ldn, dB	61
% Daytime Energy	69%
% Nighttime Energy	31%

**Appendix B-4
 Trackside Mixed Use Development
 Ambient Noise Monitoring Results - Site 1
 Sunday, September 27, 2015**

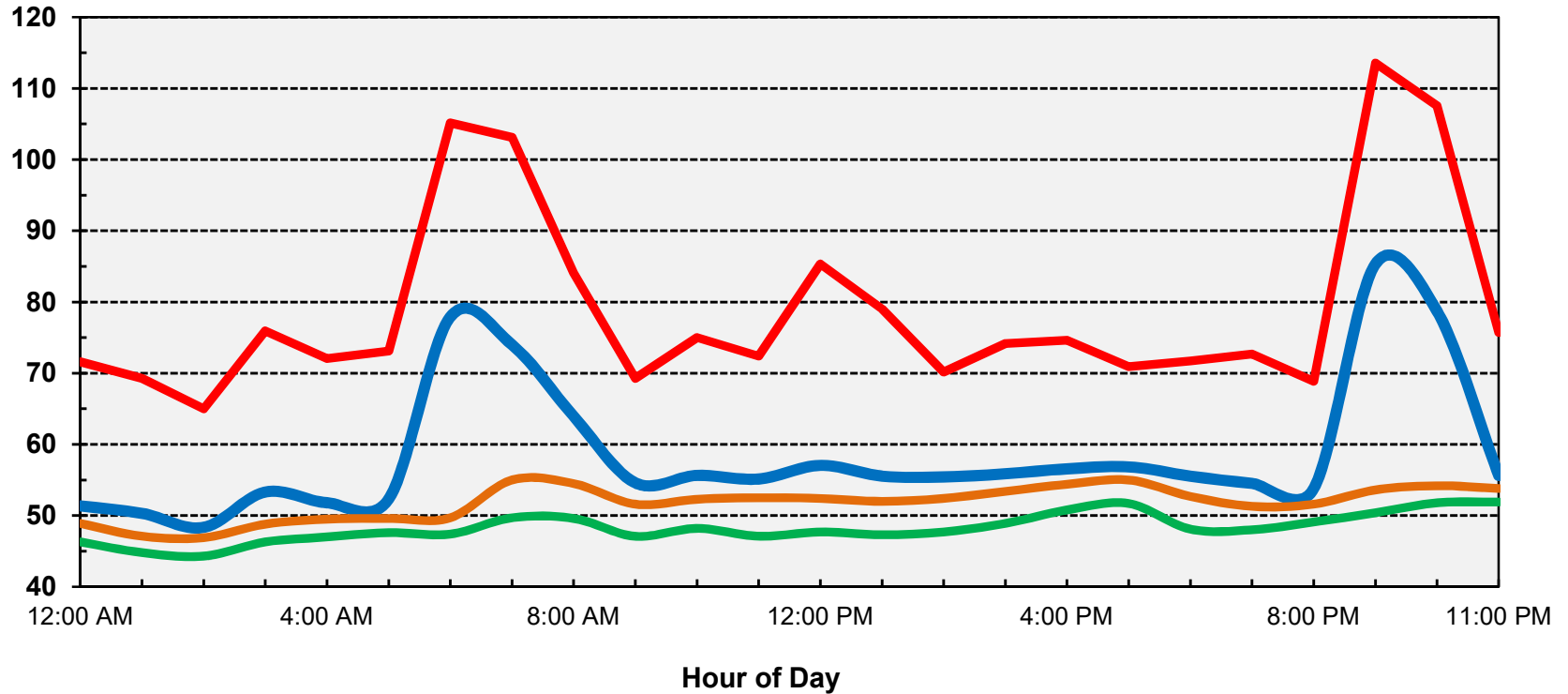
Hour	Leq	Lmax	L50	L90
0:00	53	69	52	50
1:00	52	71	49	47
2:00	52	72	47	44
3:00	47	64	44	42
4:00	44	61	42	40
5:00	45	63	42	40
6:00	48	76	43	41
7:00	50	76	44	41
8:00	51	66	46	41
9:00	53	71	50	44
10:00	54	70	51	46
11:00	53	68	50	45
12:00	54	71	52	46
13:00	54	72	51	47
14:00	54	76	51	46
15:00	55	78	52	47
16:00	56	75	53	49
17:00	55	78	53	50
18:00	55	71	54	51
19:00	57	80	54	51
20:00	56	67	55	53
21:00	56	74	54	52
22:00	53	69	53	51
23:00	52	73	50	49

Statistical Summary						
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57	50	55	53	44	51
Lmax (Maximum)	80	66	73	76	61	69
L50 (Median)	55	44	51	53	42	47
L90 (Background)	53	41	47	51	40	45

Computed Ldn, dB	58
% Daytime Energy	80%
% Nighttime Energy	20%

Appendix C-1
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Thursday, September 24, 2015

Sound Level, dBA

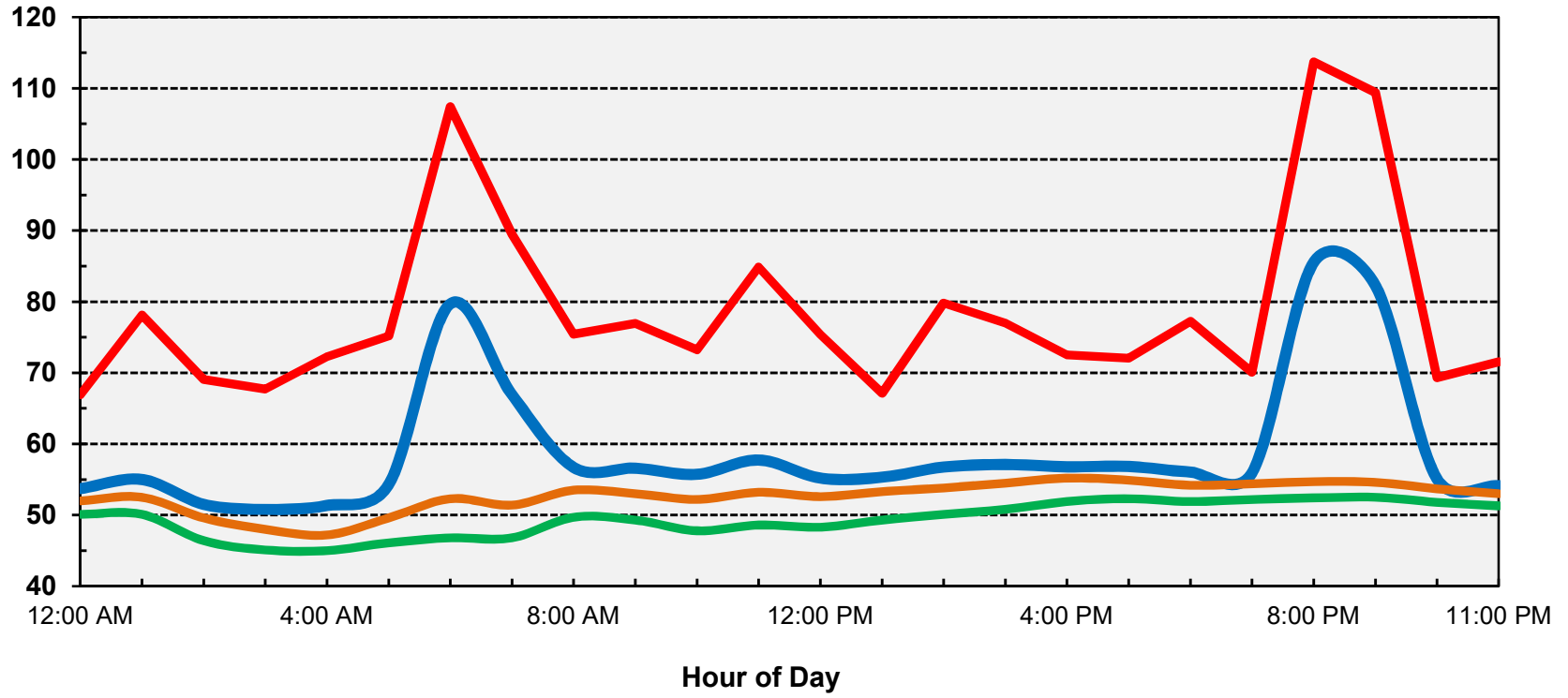


— Average (Leq)
 — Maximum (Lmax)
 — L50
 — L90

Ldn: 79 dB

Appendix C-2
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Friday, September 25, 2015

Sound Level, dBA

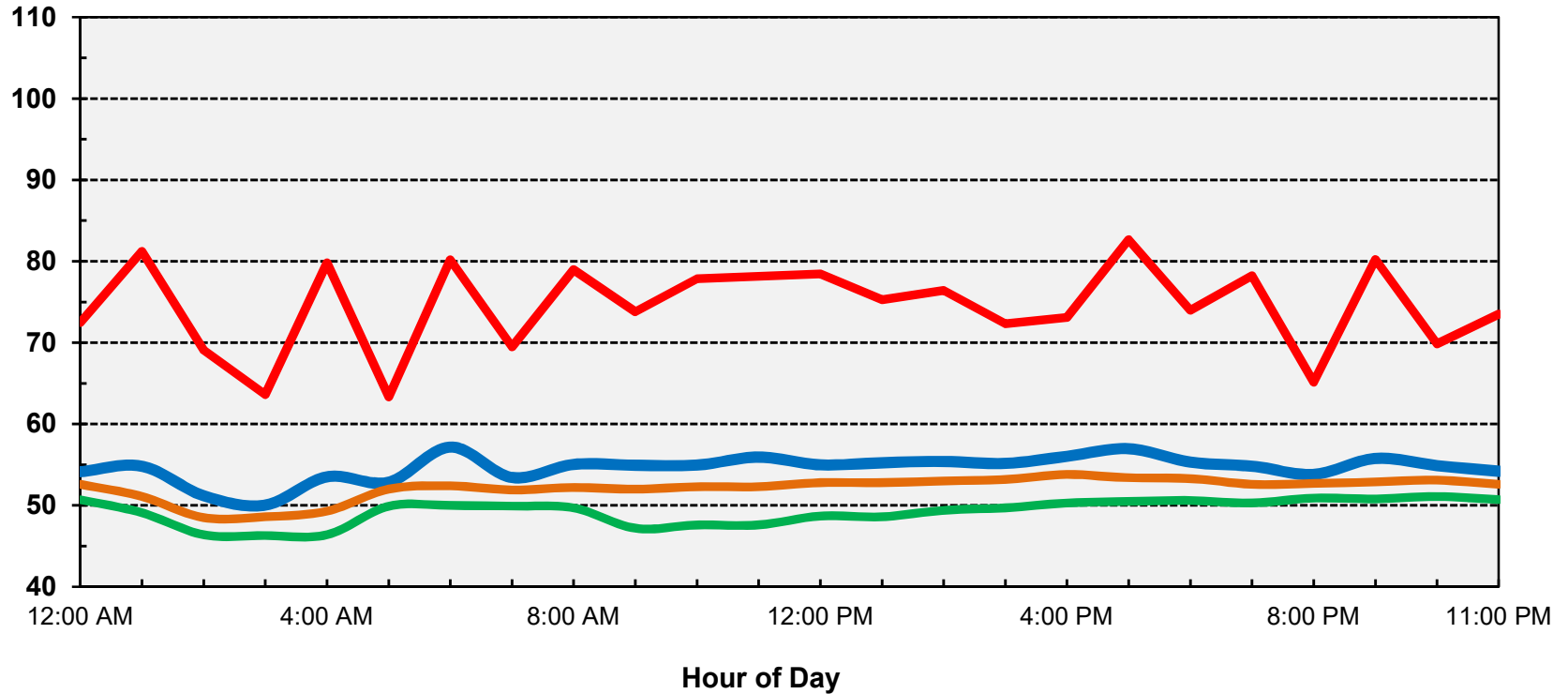


— Average (Leq) — Maximum (Lmax) — L50 — L90

Ldn: 78 dB

Appendix C-3
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Saturday, September 26, 2015

Sound Level, dBA

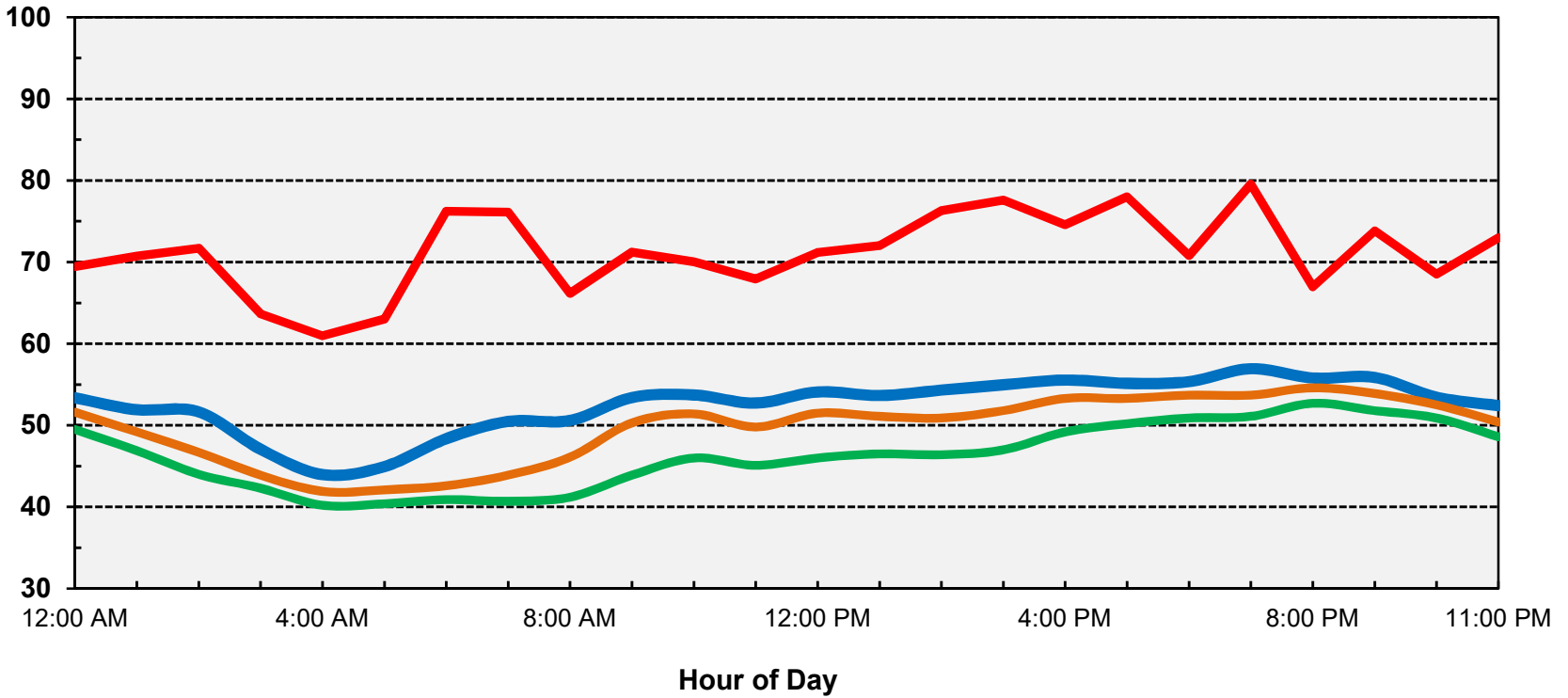


— Average (Leq) — Maximum (Lmax) — L50 — L90

Ldn: 61 dB

Appendix C-4
Trackside Mixed Use Development
Ambient Noise Monitoring Results - Site 1
Sunday, September 27, 2015

Sound Level, dBA



— Average (Leq) — Maximum (Lmax) — L50 — L90

Ldn: 58 dB

Appendix D-1
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2015-215 Trackside Mixed Use Development
Description: Existing (two-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	1,770	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	1,965	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,220	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,205	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,000	80		20	1	1	30	50	
6	4th Street	East of J Street	1,930	80		20	1	1	30	50	
7	3rd Street	West of F Street	2,635	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	2,610	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	4,465	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	4,465	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	3,880	80		20	1	1	30	50	
12	3rd Street	East of J Street	3,625	80		20	1	1	30	50	
13	F Street	North of 4th Street	4,070	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	3,480	80		20	1	1	30	50	
15	F Street	South of 4th Street	3,205	80		20	1	1	30	50	
16	G Street	North of 4th Street	2,920	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	2,725	80		20	1	1	30	50	
18	G Street	South of 4th Street	2,950	80		20	1	1	30	50	
19	Alley	North of 4th Street	310	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	230	80		20	1	1	25	50	
21	I Street	North of 4th Street	505	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	430	80		20	1	1	30	50	
23	I Street	South of 4th Street	600	80		20	1	1	30	50	
24	J Street	North of 4th Street	650	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	470	80		20	1	1	30	50	
26	J Street	South of 4th Street	165	80		20	1	1	30	50	

Appendix D-2

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

Data Input Sheet

Project #: 2015-215 Trakside Mixed Use Development

Description: Existing + Project 1 (one-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	1,795	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	2,115	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,445	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,370	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,145	80		20	1	1	30	50	
6	4th Street	East of J Street	2,060	80		20	1	1	30	50	
7	3rd Street	West of F Street	2,690	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	2,750	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	4,625	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	4,505	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	3,965	80		20	1	1	30	50	
12	3rd Street	East of J Street	3,725	80		20	1	1	30	50	
13	F Street	North of 4th Street	4,170	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	3,565	80		20	1	1	30	50	
15	F Street	South of 4th Street	3,320	80		20	1	1	30	50	
16	G Street	North of 4th Street	2,995	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	2,915	80		20	1	1	30	50	
18	G Street	South of 4th Street	2,980	80		20	1	1	30	50	
19	Alley	North of 4th Street	310	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	560	80		20	1	1	25	50	
21	I Street	North of 4th Street	505	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	455	80		20	1	1	30	50	
23	I Street	South of 4th Street	600	80		20	1	1	30	50	
24	J Street	North of 4th Street	650	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	485	80		20	1	1	30	50	
26	J Street	South of 4th Street	165	80		20	1	1	30	50	

Appendix D-3

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

Data Input Sheet

Project #: 2015-215 Trakside Mixed Use Development

Description: Existing + Project 2 (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	1,800	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	2,095	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,395	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,300	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,100	80		20	1	1	30	50	
6	4th Street	East of J Street	2,030	80		20	1	1	30	50	
7	3rd Street	West of F Street	2,690	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	2,775	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	4,670	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	4,550	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	3,970	80		20	1	1	30	50	
12	3rd Street	East of J Street	3,715	80		20	1	1	30	50	
13	F Street	North of 4th Street	4,170	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	3,480	80		20	1	1	30	50	
15	F Street	South of 4th Street	3,315	80		20	1	1	30	50	
16	G Street	North of 4th Street	2,970	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	2,725	80		20	1	1	30	50	
18	G Street	South of 4th Street	2,980	80		20	1	1	30	50	
19	Alley	North of 4th Street	315	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	590	80		20	1	1	25	50	
21	I Street	North of 4th Street	505	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	430	80		20	1	1	30	50	
23	I Street	South of 4th Street	600	80		20	1	1	30	50	
24	J Street	North of 4th Street	650	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	470	80		20	1	1	30	50	
26	J Street	South of 4th Street	165	80		20	1	1	30	50	

Appendix D-4

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

Data Input Sheet

Project #: 2015-215 Trackside Mixed Use Development

Description: Cumulative (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	2,525	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	2,410	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,755	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,740	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,325	80		20	1	1	30	50	
6	4th Street	East of J Street	1,975	80		20	1	1	30	50	
7	3rd Street	West of F Street	3,810	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	3,445	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	5,230	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	5,220	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	4,760	80		20	1	1	30	50	
12	3rd Street	East of J Street	4,500	80		20	1	1	30	50	
13	F Street	North of 4th Street	5,230	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	4,515	80		20	1	1	30	50	
15	F Street	South of 4th Street	4,245	80		20	1	1	30	50	
16	G Street	North of 4th Street	3,395	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	3,280	80		20	1	1	30	50	
18	G Street	South of 4th Street	4,120	80		20	1	1	30	50	
19	Alley	North of 4th Street	315	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	240	80		20	1	1	25	50	
21	I Street	North of 4th Street	640	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	535	80		20	1	1	30	50	
23	I Street	South of 4th Street	640	80		20	1	1	30	50	
24	J Street	North of 4th Street	660	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	480	80		20	1	1	30	50	
26	J Street	South of 4th Street	205	80		20	1	1	30	50	

Appendix D-5
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2015-215 Trackside Mixed Use Development
Description: Cumulative + Project 1 (one-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	2,555	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	2,605	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,985	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,890	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,505	80		20	1	1	30	50	
6	4th Street	East of J Street	2,410	80		20	1	1	30	50	
7	3rd Street	West of F Street	3,870	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	3,615	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	5,410	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	5,270	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	4,865	80		20	1	1	30	50	
12	3rd Street	East of J Street	4,620	80		20	1	1	30	50	
13	F Street	North of 4th Street	5,355	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	4,620	80		20	1	1	30	50	
15	F Street	South of 4th Street	4,380	80		20	1	1	30	50	
16	G Street	North of 4th Street	3,460	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	3,480	80		20	1	1	30	50	
18	G Street	South of 4th Street	4,155	80		20	1	1	30	50	
19	Alley	North of 4th Street	315	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	640	80		20	1	1	25	50	
21	I Street	North of 4th Street	640	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	560	80		20	1	1	30	50	
23	I Street	South of 4th Street	640	80		20	1	1	30	50	
24	J Street	North of 4th Street	660	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	495	80		20	1	1	30	50	
26	J Street	South of 4th Street	205	80		20	1	1	30	50	

Appendix D-6
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2015-215 Trackside Mixed Use Development
Description: Cumulative + Project 2 (two-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	4th Street	West of F Street	2,560	80		20	1	1	30	50	
2	4th Street	Between F Street and G Street	2,565	80		20	1	1	30	50	
3	4th Street	Between G Street and Alley	2,970	80		20	1	1	30	50	
4	4th Street	Between Alley and I Street	2,870	80		20	1	1	30	50	
5	4th Street	Between I Street and J Street	2,485	80		20	1	1	30	50	
6	4th Street	East of J Street	2,405	80		20	1	1	30	50	
7	3rd Street	West of F Street	3,875	80		20	1	1	30	50	
8	3rd Street	Between F Street and G Street	3,650	80		20	1	1	30	50	
9	3rd Street	Between G Street and Alley	5,475	80		20	1	1	30	50	
10	3rd Street	Between Alley and I Street	5,315	80		20	1	1	30	50	
11	3rd Street	Between I Street and J Street	4,860	80		20	1	1	30	50	
12	3rd Street	East of J Street	4,600	80		20	1	1	30	50	
13	F Street	North of 4th Street	5,360	80		20	1	1	30	50	
14	F Street	Between 4th Street and 3rd Street	4,515	80		20	1	1	30	50	
15	F Street	South of 4th Street	4,385	80		20	1	1	30	50	
16	G Street	North of 4th Street	3,460	80		20	1	1	30	50	
17	G Street	Between 4th Street and 3rd Street	3,280	80		20	1	1	30	50	
18	G Street	South of 4th Street	4,155	80		20	1	1	30	50	
19	Alley	North of 4th Street	315	80		20	1	1	25	50	
20	Alley	Between 4th Street and 3rd Street	650	80		20	1	1	25	50	
21	I Street	North of 4th Street	640	80		20	1	1	30	50	
22	I Street	Between 4th Street and 3rd Street	535	80		20	1	1	30	50	
23	I Street	South of 4th Street	640	80		20	1	1	30	50	
24	J Street	North of 4th Street	660	80		20	1	1	30	50	
25	J Street	Between 4th Street and 3rd Street	480	80		20	1	1	30	50	
26	J Street	South of 4th Street	205	80		20	1	1	30	50	

Appendix E-1**FHWA-RD-77-108 Highway Traffic Noise Prediction Model****Predicted Levels**

Project #: 2015-215 Trackage Mixed Use Development

Description: Existing (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	54	45	52	57
2	4th Street	Between F Street and G Street	55	45	52	57
3	4th Street	Between G Street and Alley	55	46	53	58
4	4th Street	Between Alley and I Street	55	46	53	58
5	4th Street	Between I Street and J Street	55	45	53	57
6	4th Street	East of J Street	55	45	52	57
7	3rd Street	West of F Street	56	47	54	58
8	3rd Street	Between F Street and G Street	56	47	54	58
9	3rd Street	Between G Street and Alley	58	49	56	61
10	3rd Street	Between Alley and I Street	58	49	56	61
11	3rd Street	Between I Street and J Street	58	48	55	60
12	3rd Street	East of J Street	57	48	55	60
13	F Street	North of 4th Street	58	48	56	60
14	F Street	Between 4th Street and 3rd Street	57	48	55	59
15	F Street	South of 4th Street	57	47	55	59
16	G Street	North of 4th Street	56	47	54	59
17	G Street	Between 4th Street and 3rd Street	56	47	54	58
18	G Street	South of 4th Street	56	47	54	59
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	43	35	42	46
21	I Street	North of 4th Street	49	39	47	51
22	I Street	Between 4th Street and 3rd Street	48	39	46	50
23	I Street	South of 4th Street	50	40	47	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	48	39	46	51
26	J Street	South of 4th Street	44	35	42	46

Appendix E-2
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2015-215 Trackage Mixed Use Development
 Description: Existing + Project 1 (one-way alley)
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	54	45	52	57
2	4th Street	Between F Street and G Street	55	46	53	57
3	4th Street	Between G Street and Alley	56	46	53	58
4	4th Street	Between Alley and I Street	55	46	53	58
5	4th Street	Between I Street and J Street	55	46	53	57
6	4th Street	East of J Street	55	46	53	57
7	3rd Street	West of F Street	56	47	54	58
8	3rd Street	Between F Street and G Street	56	47	54	58
9	3rd Street	Between G Street and Alley	58	49	56	61
10	3rd Street	Between Alley and I Street	58	49	56	61
11	3rd Street	Between I Street and J Street	58	48	55	60
12	3rd Street	East of J Street	57	48	55	60
13	F Street	North of 4th Street	58	49	56	60
14	F Street	Between 4th Street and 3rd Street	57	48	55	60
15	F Street	South of 4th Street	57	48	55	59
16	G Street	North of 4th Street	56	47	54	59
17	G Street	Between 4th Street and 3rd Street	56	47	54	59
18	G Street	South of 4th Street	56	47	54	59
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	47	39	46	50
21	I Street	North of 4th Street	49	39	47	51
22	I Street	Between 4th Street and 3rd Street	48	39	46	51
23	I Street	South of 4th Street	50	40	47	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	49	39	46	51
26	J Street	South of 4th Street	44	35	42	46

Appendix E-3
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2015-215 Trackage Mixed Use Development
 Description: Existing + Project 2 (two-way alley)
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	54	45	52	57
2	4th Street	Between F Street and G Street	55	46	53	57
3	4th Street	Between G Street and Alley	56	46	53	58
4	4th Street	Between Alley and I Street	55	46	53	58
5	4th Street	Between I Street and J Street	55	46	53	57
6	4th Street	East of J Street	55	45	53	57
7	3rd Street	West of F Street	56	47	54	58
8	3rd Street	Between F Street and G Street	56	47	54	59
9	3rd Street	Between G Street and Alley	58	49	56	61
10	3rd Street	Between Alley and I Street	58	49	56	61
11	3rd Street	Between I Street and J Street	58	48	56	60
12	3rd Street	East of J Street	57	48	55	60
13	F Street	North of 4th Street	58	49	56	60
14	F Street	Between 4th Street and 3rd Street	57	48	55	59
15	F Street	South of 4th Street	57	48	55	59
16	G Street	North of 4th Street	56	47	54	59
17	G Street	Between 4th Street and 3rd Street	56	47	54	58
18	G Street	South of 4th Street	56	47	54	59
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	47	39	46	50
21	I Street	North of 4th Street	49	39	47	51
22	I Street	Between 4th Street and 3rd Street	48	39	46	50
23	I Street	South of 4th Street	50	40	47	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	48	39	46	51
26	J Street	South of 4th Street	44	35	42	46

Appendix E-4
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2015-215 Trackage Mixed Use Development
Description: Cumulative (two-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	56	46	54	58
2	4th Street	Between F Street and G Street	56	46	53	58
3	4th Street	Between G Street and Alley	56	47	54	58
4	4th Street	Between Alley and I Street	56	47	54	58
5	4th Street	Between I Street and J Street	55	46	53	58
6	4th Street	East of J Street	55	45	52	57
7	3rd Street	West of F Street	58	48	55	60
8	3rd Street	Between F Street and G Street	57	48	55	59
9	3rd Street	Between G Street and Alley	59	50	57	61
10	3rd Street	Between Alley and I Street	59	50	57	61
11	3rd Street	Between I Street and J Street	59	49	56	61
12	3rd Street	East of J Street	58	49	56	61
13	F Street	North of 4th Street	59	50	57	61
14	F Street	Between 4th Street and 3rd Street	58	49	56	61
15	F Street	South of 4th Street	58	49	56	60
16	G Street	North of 4th Street	57	48	55	59
17	G Street	Between 4th Street and 3rd Street	57	48	55	59
18	G Street	South of 4th Street	58	49	56	60
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	43	35	43	46
21	I Street	North of 4th Street	50	40	48	52
22	I Street	Between 4th Street and 3rd Street	49	40	47	51
23	I Street	South of 4th Street	50	40	48	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	49	39	46	51
26	J Street	South of 4th Street	45	36	43	47

Appendix E-5
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2015-215 Trackage Mixed Use Development
Description: Cumulative + Project 1 (one-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	56	46	54	58
2	4th Street	Between F Street and G Street	56	47	54	58
3	4th Street	Between G Street and Alley	56	47	54	59
4	4th Street	Between Alley and I Street	56	47	54	59
5	4th Street	Between I Street and J Street	56	46	54	58
6	4th Street	East of J Street	56	46	53	58
7	3rd Street	West of F Street	58	48	55	60
8	3rd Street	Between F Street and G Street	57	48	55	60
9	3rd Street	Between G Street and Alley	59	50	57	61
10	3rd Street	Between Alley and I Street	59	50	57	61
11	3rd Street	Between I Street and J Street	59	49	56	61
12	3rd Street	East of J Street	58	49	56	61
13	F Street	North of 4th Street	59	50	57	61
14	F Street	Between 4th Street and 3rd Street	58	49	56	61
15	F Street	South of 4th Street	58	49	56	60
16	G Street	North of 4th Street	57	48	55	59
17	G Street	Between 4th Street and 3rd Street	57	48	55	59
18	G Street	South of 4th Street	58	49	56	60
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	48	39	47	51
21	I Street	North of 4th Street	50	40	48	52
22	I Street	Between 4th Street and 3rd Street	49	40	47	52
23	I Street	South of 4th Street	50	40	48	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	49	39	46	51
26	J Street	South of 4th Street	45	36	43	47

Appendix E-6

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

Predicted Levels

Project #: 2015-215 Trackage Mixed Use Development

Description: Cumulative + Project 2 (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	4th Street	West of F Street	56	46	54	58
2	4th Street	Between F Street and G Street	56	46	54	58
3	4th Street	Between G Street and Alley	56	47	54	59
4	4th Street	Between Alley and I Street	56	47	54	59
5	4th Street	Between I Street and J Street	56	46	53	58
6	4th Street	East of J Street	56	46	53	58
7	3rd Street	West of F Street	58	48	55	60
8	3rd Street	Between F Street and G Street	57	48	55	60
9	3rd Street	Between G Street and Alley	59	50	57	61
10	3rd Street	Between Alley and I Street	59	50	57	61
11	3rd Street	Between I Street and J Street	59	49	56	61
12	3rd Street	East of J Street	58	49	56	61
13	F Street	North of 4th Street	59	50	57	61
14	F Street	Between 4th Street and 3rd Street	58	49	56	61
15	F Street	South of 4th Street	58	49	56	60
16	G Street	North of 4th Street	57	48	55	59
17	G Street	Between 4th Street and 3rd Street	57	48	55	59
18	G Street	South of 4th Street	58	49	56	60
19	Alley	North of 4th Street	44	36	44	47
20	Alley	Between 4th Street and 3rd Street	48	39	47	51
21	I Street	North of 4th Street	50	40	48	52
22	I Street	Between 4th Street and 3rd Street	49	40	47	51
23	I Street	South of 4th Street	50	40	48	52
24	J Street	North of 4th Street	50	41	48	52
25	J Street	Between 4th Street and 3rd Street	49	39	46	51
26	J Street	South of 4th Street	45	36	43	47

Appendix F-1**FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output**

Project #: 2015-215 Trackage Mixed Use Development

Description: Existing (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	6	14	29	64	137
2	4th Street	Between F Street and G Street	7	15	32	68	147
3	4th Street	Between G Street and Alley	7	16	34	74	159
4	4th Street	Between Alley and I Street	7	16	34	74	158
5	4th Street	Between I Street and J Street	7	15	32	69	148
6	4th Street	East of J Street	7	14	31	67	145
7	3rd Street	West of F Street	8	18	38	83	178
8	3rd Street	Between F Street and G Street	8	18	38	82	177
9	3rd Street	Between G Street and Alley	12	25	55	118	254
10	3rd Street	Between Alley and I Street	12	25	55	118	254
11	3rd Street	Between I Street and J Street	11	23	50	107	231
12	3rd Street	East of J Street	10	22	48	102	221
13	F Street	North of 4th Street	11	24	51	111	238
14	F Street	Between 4th Street and 3rd Street	10	21	46	100	215
15	F Street	South of 4th Street	9	20	44	94	203
16	G Street	North of 4th Street	9	19	41	89	191
17	G Street	Between 4th Street and 3rd Street	8	18	39	85	182
18	G Street	South of 4th Street	9	19	41	89	192
19	Alley	North of 4th Street	2	3	7	16	33
20	Alley	Between 4th Street and 3rd Street	1	3	6	13	27
21	I Street	North of 4th Street	3	6	13	28	59
22	I Street	Between 4th Street and 3rd Street	2	5	11	25	53
23	I Street	South of 4th Street	3	7	14	31	67
24	J Street	North of 4th Street	3	7	15	33	70
25	J Street	Between 4th Street and 3rd Street	3	6	12	26	57
26	J Street	South of 4th Street	1	3	6	13	28

Appendix F-2
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2015-215 Trackage Mixed Use Development
 Description: Existing + Project 1 (one-way alley)
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	6	14	30	64	138
2	4th Street	Between F Street and G Street	7	15	33	72	154
3	4th Street	Between G Street and Alley	8	17	37	79	170
4	4th Street	Between Alley and I Street	8	17	36	77	166
5	4th Street	Between I Street and J Street	7	16	34	72	156
6	4th Street	East of J Street	7	15	33	70	151
7	3rd Street	West of F Street	8	18	39	84	181
8	3rd Street	Between F Street and G Street	9	18	40	85	184
9	3rd Street	Between G Street and Alley	12	26	56	120	260
10	3rd Street	Between Alley and I Street	12	26	55	118	255
11	3rd Street	Between I Street and J Street	11	23	50	109	234
12	3rd Street	East of J Street	10	22	48	104	225
13	F Street	North of 4th Street	11	24	52	112	242
14	F Street	Between 4th Street and 3rd Street	10	22	47	101	218
15	F Street	South of 4th Street	10	21	45	97	208
16	G Street	North of 4th Street	9	19	42	90	194
17	G Street	Between 4th Street and 3rd Street	9	19	41	89	191
18	G Street	South of 4th Street	9	19	42	90	194
19	Alley	North of 4th Street	2	3	7	16	33
20	Alley	Between 4th Street and 3rd Street	2	5	11	23	50
21	I Street	North of 4th Street	3	6	13	28	59
22	I Street	Between 4th Street and 3rd Street	3	6	12	26	55
23	I Street	South of 4th Street	3	7	14	31	67
24	J Street	North of 4th Street	3	7	15	33	70
25	J Street	Between 4th Street and 3rd Street	3	6	12	27	58
26	J Street	South of 4th Street	1	3	6	13	28

Appendix F-3
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2015-215 Trackage Mixed Use Development
 Description: Existing + Project 2 (two-way alley)
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	6	14	30	64	138
2	4th Street	Between F Street and G Street	7	15	33	71	153
3	4th Street	Between G Street and Alley	8	17	36	78	167
4	4th Street	Between Alley and I Street	8	16	35	76	163
5	4th Street	Between I Street and J Street	7	15	33	71	153
6	4th Street	East of J Street	7	15	32	70	150
7	3rd Street	West of F Street	8	18	39	84	181
8	3rd Street	Between F Street and G Street	9	18	40	86	185
9	3rd Street	Between G Street and Alley	12	26	56	121	261
10	3rd Street	Between Alley and I Street	12	26	55	119	257
11	3rd Street	Between I Street and J Street	11	23	51	109	234
12	3rd Street	East of J Street	10	22	48	104	224
13	F Street	North of 4th Street	11	24	52	112	242
14	F Street	Between 4th Street and 3rd Street	10	21	46	100	215
15	F Street	South of 4th Street	10	21	45	96	208
16	G Street	North of 4th Street	9	19	42	90	193
17	G Street	Between 4th Street and 3rd Street	8	18	39	85	182
18	G Street	South of 4th Street	9	19	42	90	194
19	Alley	North of 4th Street	2	3	7	16	34
20	Alley	Between 4th Street and 3rd Street	2	5	11	24	51
21	I Street	North of 4th Street	3	6	13	28	59
22	I Street	Between 4th Street and 3rd Street	2	5	11	25	53
23	I Street	South of 4th Street	3	7	14	31	67
24	J Street	North of 4th Street	3	7	15	33	70
25	J Street	Between 4th Street and 3rd Street	3	6	12	26	57
26	J Street	South of 4th Street	1	3	6	13	28

Appendix F-4

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

Project #: 2015-215 Trackage Mixed Use Development

Description: Cumulative (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	8	17	37	80	173
2	4th Street	Between F Street and G Street	8	17	36	78	168
3	4th Street	Between G Street and Alley	9	18	40	85	184
4	4th Street	Between Alley and I Street	8	18	39	85	183
5	4th Street	Between I Street and J Street	8	16	35	76	164
6	4th Street	East of J Street	7	15	32	68	147
7	3rd Street	West of F Street	11	23	49	106	228
8	3rd Street	Between F Street and G Street	10	21	46	99	213
9	3rd Street	Between G Street and Alley	13	28	61	131	282
10	3rd Street	Between Alley and I Street	13	28	61	131	281
11	3rd Street	Between I Street and J Street	12	26	57	123	265
12	3rd Street	East of J Street	12	25	55	118	255
13	F Street	North of 4th Street	13	28	61	131	282
14	F Street	Between 4th Street and 3rd Street	12	26	55	119	255
15	F Street	South of 4th Street	11	25	53	114	245
16	G Street	North of 4th Street	10	21	46	98	211
17	G Street	Between 4th Street and 3rd Street	10	21	44	96	206
18	G Street	South of 4th Street	11	24	52	112	240
19	Alley	North of 4th Street	2	3	7	16	34
20	Alley	Between 4th Street and 3rd Street	1	3	6	13	28
21	I Street	North of 4th Street	3	7	15	32	69
22	I Street	Between 4th Street and 3rd Street	3	6	13	29	62
23	I Street	South of 4th Street	3	7	15	32	69
24	J Street	North of 4th Street	3	7	15	33	71
25	J Street	Between 4th Street and 3rd Street	3	6	12	27	57
26	J Street	South of 4th Street	2	3	7	15	33

Appendix F-5
FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2015-215 Trackage Mixed Use Development
Description: Cumulative + Project 1 (one-way alley)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	8	17	38	81	175
2	4th Street	Between F Street and G Street	8	18	38	82	177
3	4th Street	Between G Street and Alley	9	19	42	90	194
4	4th Street	Between Alley and I Street	9	19	41	88	190
5	4th Street	Between I Street and J Street	8	17	37	80	172
6	4th Street	East of J Street	8	17	36	78	168
7	3rd Street	West of F Street	11	23	50	107	230
8	3rd Street	Between F Street and G Street	10	22	47	102	220
9	3rd Street	Between G Street and Alley	13	29	62	134	288
10	3rd Street	Between Alley and I Street	13	28	61	131	283
11	3rd Street	Between I Street and J Street	12	27	58	125	268
12	3rd Street	East of J Street	12	26	56	120	259
13	F Street	North of 4th Street	13	29	62	133	286
14	F Street	Between 4th Street and 3rd Street	12	26	56	120	259
15	F Street	South of 4th Street	12	25	54	116	250
16	G Street	North of 4th Street	10	21	46	99	214
17	G Street	Between 4th Street and 3rd Street	10	21	46	100	215
18	G Street	South of 4th Street	11	24	52	112	242
19	Alley	North of 4th Street	2	3	7	16	34
20	Alley	Between 4th Street and 3rd Street	3	5	12	25	54
21	I Street	North of 4th Street	3	7	15	32	69
22	I Street	Between 4th Street and 3rd Street	3	6	14	29	64
23	I Street	South of 4th Street	3	7	15	32	69
24	J Street	North of 4th Street	3	7	15	33	71
25	J Street	Between 4th Street and 3rd Street	3	6	13	27	59
26	J Street	South of 4th Street	2	3	7	15	33

Appendix F-6

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

Project #: 2015-215 Trackage Mixed Use Development

Description: Cumulative + Project 2 (two-way alley)

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			70	65	60	55	50
1	4th Street	West of F Street	8	17	38	81	175
2	4th Street	Between F Street and G Street	8	18	38	81	175
3	4th Street	Between G Street and Alley	9	19	42	90	193
4	4th Street	Between Alley and I Street	9	19	41	88	189
5	4th Street	Between I Street and J Street	8	17	37	80	172
6	4th Street	East of J Street	8	17	36	78	168
7	3rd Street	West of F Street	11	23	50	107	231
8	3rd Street	Between F Street and G Street	10	22	48	103	222
9	3rd Street	Between G Street and Alley	13	29	63	135	290
10	3rd Street	Between Alley and I Street	13	28	61	132	285
11	3rd Street	Between I Street and J Street	12	27	58	125	268
12	3rd Street	East of J Street	12	26	56	120	259
13	F Street	North of 4th Street	13	29	62	133	286
14	F Street	Between 4th Street and 3rd Street	12	26	55	119	255
15	F Street	South of 4th Street	12	25	54	116	250
16	G Street	North of 4th Street	10	21	46	99	214
17	G Street	Between 4th Street and 3rd Street	10	21	44	96	206
18	G Street	South of 4th Street	11	24	52	112	242
19	Alley	North of 4th Street	2	3	7	16	34
20	Alley	Between 4th Street and 3rd Street	3	5	12	25	55
21	I Street	North of 4th Street	3	7	15	32	69
22	I Street	Between 4th Street and 3rd Street	3	6	13	29	62
23	I Street	South of 4th Street	3	7	15	32	69
24	J Street	North of 4th Street	3	7	15	33	71
25	J Street	Between 4th Street and 3rd Street	3	6	12	27	57
26	J Street	South of 4th Street	2	3	7	15	33