

Appendix E

Environmental Noise Assessment



Environmental Noise Assessment Crossroads West Specific Plan

City of Riverbank, California

February 12, 2018

jcb Project # 2017-111

Prepared for:



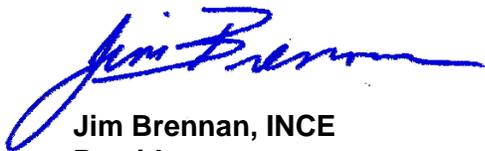
DE NOVO
PLANNING GROUP

Attn:

Steve McMurtry
1020 Suncastr Lane, Suite 106
El Dorado Hills, California 95762

Prepared by:

j.c. brennan & associates, Inc.



Jim Brennan, INCE
President
Member, Institute of Noise Control Engineering (INCE)

This section provides a general description of the existing noise sources in the Project vicinity, a discussion of the regulatory setting, and identifies potential noise impacts associated with the proposed Project. Project impacts are evaluated relative to applicable noise level criteria and to the existing ambient noise environment. Mitigation measures have been identified for significant noise-related impacts.

3.11.1 ENVIRONMENTAL SETTING

KEY TERMS

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given area 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 noise.
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, defined as ten times the logarithm of the ratio of the sound pressure squared over the reference pressure squared.
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 acoustic signal, expressed in cycles per second or Hertz.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
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 percent of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.

Noise	Unwanted sound.
SEL	Sound exposure levels. A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.

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, but are expressed as dB, unless otherwise noted.

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

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

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. CNEL is similar to L_{dn} , but includes a +5 dB penalty for evening noise. Table 3.11-1 lists several examples of the noise levels associated with common situations.

TABLE 3.11-1: TYPICAL NOISE LEVELS

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

SOURCE: CALTRANS, TECHNICAL NOISE SUPPLEMENT, TRAFFIC NOISE ANALYSIS PROTOCOL. SEPTEMBER 2013.

EFFECTS OF NOISE ON PEOPLE

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

- Subjective effects of annoyance, nuisance, and dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- 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 1-dBA change cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

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

EXISTING NOISE LEVELS

Existing and Surrounding Land Uses

The approximately 390-acre Crossroads West Specific Plan (CWSP) area (also-known-as “Project site” or “Plan Area”) is located in the unincorporated area of Stanislaus County. The area is bounded by the Modesto Irrigation District (MID) Main Canal and the City of Riverbank city limits to the north, Claribel Road to the south, and Oakdale Road to the east. The western boundary of the Plan Area is identified by property lines approximately 0.5-miles west of Oakdale Road.

The Plan Area is comprised of nine parcels, which are primarily used for agricultural operations. These parcels also include seven residences and the Riverbank Sports Complex. Most of the residences include on-site storage, shops, and barn structures. The Riverbank Sports Complex is an 11-acre regional City park located near the intersection of Morrill Road and Oakdale Road. MID Lateral 6 traverses the Plan Area south of Crawford Road, from southwest to northeast.

Agricultural and residential uses area located to the west and south of the Plan Area. These uses include ranchettes and large estates. Residential subdivisions are located to the north and east of the Plan Area. A commercial shopping center is located southeast of the Plan Area, at the intersection of Claribel Road and Oakdale Road.

Existing Ambient Noise Levels

To quantify the existing ambient noise environment in the Project vicinity, short-term and continuous (24-hour) noise level measurements were conducted on the Project site between April 25th and 26th, 2017. The noise measurement locations are shown on Figure 3.11-1. The noise level measurement survey results are provided in Table 3.11-2. Appendix E shows the complete results of the noise monitoring survey.

TABLE 3.11-2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

SITE	LOCATION	DATE/TIME	L_{DN} DB	AVERAGE MEASURED HOURLY NOISE LEVELS, DB					
				DAYTIME (7AM-10PM)			NIGHTTIME (10PM-7AM)		
				L_{EQ}	L_{50}	L_{MAX}	L_{EQ}	L_{50}	L_{MAX}
<i>CONTINUOUS (24-HOUR) NOISE LEVEL MEASUREMENTS</i>									
A	190 feet from Oakdale Rd. centerline	4/25/17-4/26/17 24-hour	64	62	60	76	56	46	72
B	125 feet from Oakdale Rd. centerline	4/25/17-4/26/17 24-hour	65	62	59	77	57	50	77
<i>SHORT-TERM NOISE LEVEL MEASUREMENTS</i>									
1	69 feet from Patterson Rd. centerline	4/25/17– 12:59 p.m.	N/A	68	67	75	Primary noise source is Patterson Road		
	66 feet from Patterson Rd. centerline	4/27/17– 9:22 a.m.	N/A	70	69	76			
2	45 feet from Morrill Rd. centerline	4/25/17– 1:30 p.m.	N/A	65	52	80	Primary noise source is Morrill Road.		
	54 feet from Morrill Rd. centerline	4/27/17– 9:47 a.m.	N/A	60	56	73			
3	15 feet from Crawford Rd. centerline	4/25/17– 1:57 p.m.	N/A	55	49	77	Primary noise source is a tractor from a near by farm and Crawford Road.		
	53 feet from Crawford Rd. centerline	4/27/17– 10:08 a.m.	N/A	54	50	69			
4	66 feet from Claribel Rd. centerline	4/25/17– 2:28 p.m.	N/A	66	63	83	Primary source of noise is traffic on Claribel Road.		
	130 feet from Claribel Rd. centerline	4/27/17– 10:31 a.m.	N/A	67	65	78			

SOURCE: J.C. BRENNAN & ASSOCIATES, INC., 2017.

The sound level meters were programmed to collect hourly noise level intervals at each site during the survey. The maximum value (L_{max}) represents the highest noise level measured during an interval. The average value (L_{eq}) represents the energy average of all of the noise measured during an interval. The median value (L_{50}) represents the sound level exceeded 50 percent of the time during an interval.

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

EXISTING ROADWAY NOISE LEVELS

To predict existing noise levels due to traffic, the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the Calveno reference noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and

3.11 NOISE

the acoustical characteristics of the site. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions.

Traffic volumes for existing conditions were obtained from the traffic data prepared for the Project (KDAnderson & Associates, Inc., 2017). Truck percentages and vehicle speeds on the local area roadways were estimated from field observations.

Traffic noise levels are predicted at 75-feet from the centerline along each roadway segment. Sensitive receptors may be located at distances which vary from the assumed calculation distance and may experience shielding from intervening barriers or sound walls. Where barriers exist, a -5 dB correction has been included in the traffic noise prediction model calculations. The traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the Project-area roadway segments analyzed in this report.

Table 3.11-3 shows the existing traffic noise levels in terms of L_{dn} at 75-feet from the centerline along each roadway segment. A complete listing of the FHWA Model input data is contained in Appendix E.

TABLE 3.11-3: EXISTING TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	EXTERIOR TRAFFIC NOISE LEVEL, DB L_{DN}
Patterson Road (SR 108)	McHenry Avenue to Coffee Road	67.9
Patterson Road (SR 108)	Coffee Road to Oakdale Road	62.3 ¹
Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	63.9
Morrill Road	Coffee Road to Oakdale Road	54.1
Crawford Road	Coffee Road to Oakdale Road	49.3
Crawford Road	Oakdale Road to Squire Wells Road	54.4 ¹
Claribel Road	McHenry Avenue to Coffee Road	70.3
Claribel Road	Coffee Road to N-S Collector	65.2 ¹
Claribel Road	N-S Collector to Oakdale Road	70.2
Claribel Road	Oakdale Road to Roselle Avenue	67.7
Claribel Road	Roselle Avenue to Claus Road	67.6
Coffee Road	Patterson Road to Morrill Road	61.6
Coffee Road	Morrill Road to Crawford Road	62.9
Coffee Road	Crawford Road to Claribel Road	64.7
Coffee Road	Claribel Road to Claratina Avenue	64.3
Oakdale Road	Patterson Road to Morrill Road	59.4 ¹
Oakdale Road	Morrill Road to Crawford Road	60.6 ¹
Oakdale Road	Crawford Road to Claribel Road	62.5 ¹
Oakdale Road	Claribel Road to Claratina Avenue	65.6
Roselle Avenue	Claribel Road to Claratina Avenue	59.4

NOTE: ¹ ASSUMES A -5 DB SHIELDING DUE TO PRESENCE OF A SOUND WALL.

SOURCE: FHWA-RD-77-108 WITH INPUTS FROM KDANDERSON & ASSOCIATES, INC., AND J.C. BRENNAN & ASSOCIATES, INC. 2017.

3.11.2 REGULATORY SETTING

STATE

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines, Appendix G, indicate that a significant noise impact may occur if a project exposes persons to noise or vibration levels in excess of local general plans or noise ordinance standards, or cause a substantial permanent or temporary increase in ambient noise levels. CEQA standards are discussed more below under the Thresholds of Significance section.

Governor's Office of Planning and Research (OPR)

The State of California General Plan Guidelines (State of California 1998), published by OPR, provides guidance for the acceptability of projects within specific CNEL contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

LOCAL

City of Riverbank General Plan

The City of Riverbank General Plan Noise Element contains goals, policies, and implementation measures for assessing noise impacts within the City. Listed below are the noise goals, policies, and implementation. The overarching goal for the environment is to ensure that noise does not substantially reduce the quality of urban life.

GOALS: NOISE

- NOISE-1. Create land use patterns and transportation networks that minimize noise problems.
- NOISE-2. Minimize noise impacts associated with development projects and other land use change.

POLICIES: NOISE

- NOISE-1.1. Large-scale commercial land uses requiring frequent large truck deliveries shall not be developed within new or existing neighborhoods.
- NOISE-1.2. New growth areas shall avoid the use of large-volume, high-speed roadways within neighborhoods and instead disperse vehicular traffic onto a network of fully connected smaller roadways.
- NOISE-1.3. Industrial and other noise-generating land uses shall be located away from noise-sensitive land uses or shall enclose any substantial noise sources completely within buildings or structures.

3.11 NOISE

- NOISE-1.4. Development of noise-sensitive land uses in areas exposed to existing or projected levels of noise from transportation, stationary sources, or agricultural operations exceeding, or estimated to exceed, levels specified in Table N-1 of the General Plan [Table 3.11-4 of this section] shall require transportation planning, traffic calming, site planning, buffering, sound insulation, or other methods to reduce noise exposure in outdoor activity areas and interior spaces to the levels specified in Table N-1 of the General Plan [Table 3.11-4 of this section].

TABLE 3.11-4: MAXIMUM ALLOWABLE NOISE EXPOSURE FROM TRANSPORTATION NOISE SOURCES AT NOISE-SENSITIVE LAND USES [FROM CITY OF RIVERBANK GENERAL PLAN TABLE N-1]

LAND USE	OUTDOOR ACTIVITY AREAS ($DB L_{EQ}$)	INTERIOR SPACES	
		$DB L_{DN}$	$DB L_{EQ}$
Residential	60	45	--
Transient Lodging	60	45	--
Hospitals, Nursing Homes	60	45	--
Theatres, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	60	--	45
Playgrounds, Neighborhood Parks	70	--	--

NOTES: NOISE-SENSITIVE LAND USES INCLUDE SCHOOLS, HOSPITALS, REST HOMES, LONG-TERM CARE, MENTAL CARE FACILITIES, RESIDENCES, AND OTHER SIMILAR LAND USES. OUTDOOR ACTIVITY AREAS ARE CONSIDERED TO BE THE PORTION OF A NOISE-SENSITIVE PROPERTY WHERE OUTDOOR ACTIVITIES WOULD NORMALLY BE EXPECTED (I.E., PATIOS OF RESIDENCES AND OUTDOOR INSTRUCTIONAL AREAS OF SCHOOLS). OUTDOOR ACTIVITY AREAS FOR THE PURPOSES OF THIS ELEMENT DO NOT INCLUDE GATHERING SPACES ALONGSIDE TRANSPORTATION CORRIDORS OR ASSOCIATED PUBLIC RIGHTS-OF-WAY. WHERE DEVELOPMENT PROJECTS OR ROADWAY IMPROVEMENT PROJECTS COULD POTENTIALLY CREATE NOISE IMPACTS, AN ACOUSTICAL ANALYSIS SHALL BE REQUIRED AS PART OF THE ENVIRONMENTAL REVIEW PROCESS SO THAT NOISE MITIGATION MAY BE INCLUDED IN THE PROJECT DESIGN. SUCH ANALYSIS SHALL BE THE FINANCIAL RESPONSIBILITY OF THE APPLICANT AND BE PREPARED BY A QUALIFIED PERSON EXPERIENCED IN THE FIELDS OF ENVIRONMENTAL NOISE ASSESSMENT AND ARCHITECTURAL ACOUSTICS. MITIGATION STRATEGIES SHALL INCLUDE SITE PLANNING AND DESIGN OVER OTHER TYPES OF MITIGATION.

SOURCE: CITY OF RIVERBANK GENERAL PLAN, NOISE ELEMENT, TABLE N-1.

- NOISE-1.5. Sound walls are prohibited as a method for reducing noise exposure that could be addressed through other means.
- NOISE-2.1. Development projects and roadway improvement projects that increase traffic noise levels shall be mitigated to achieve acceptable levels specified in Table N-1 of the General Plan [Table 3.11-4 of this section] as measured at outdoor activity areas and interior spaces of existing and planned noise sensitive land uses. If existing noise levels exceed allowable levels in Table N-1 of the General Plan [Table 3.11-4 of this section] at noise sensitive land uses, then:
 - Where existing exterior noise levels are between 60 and 65 dB L_{dn} at outdoor activity areas of noise-sensitive uses, an increase of 3 dB L_{dn} or greater is considered significant and requires mitigation to achieve allowable levels.
 - Where existing exterior noise levels are greater than 65 dB L_{dn} at outdoor activity areas of noise-sensitive uses, an increase of 1.5 dB L_{dn} or greater is considered significant and requires mitigation to achieve allowable levels.

- Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn} or less using practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{dn} may be allowed, provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with Table N-1 of the General Plan [Table 3.11-4 of this section].
- NOISE-2.2. Development projects that produce, or are affected by, non-transportation related noise shall be mitigated to achieve acceptable levels specified in Table N-2 of the General Plan [Table 3.11-5 of this section], as measured at outdoor activity areas of existing and planned noise-sensitive land uses. If existing noise levels exceed acceptable levels in Table N-2 of the General Plan [Table 3.11-5 of this section] as measured at outdoor activity areas of noise sensitive land uses:
 - Where existing exterior noise levels are between 60 and 65 dB L_{eq} at outdoor activity areas of noise-sensitive uses, an increase of 3 dB L_{eq} or greater is considered significant and requires mitigation to achieve acceptable levels.
 - Where existing exterior noise levels are greater than 65 dB L_{eq} at outdoor activity areas of noise-sensitive uses, an increase of 1.5 dB L_{eq} or greater is considered significant and requires mitigation to achieve acceptable levels.
 - Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{eq} or less using practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{eq} may be allowed, provided that available exterior noise level reduction measures have been implemented.

TABLE 3.11-5: NOISE LEVEL PERFORMANCE STANDARDS FOR NEW PROJECTS AFFECTED BY, OR INCLUDING NON-TRANSPORTATION NOISE SOURCES [FROM THE CITY OF RIVERBANK GENERAL PLAN TABLE N-2]

NOISE LEVEL DESCRIPTOR	DAYTIME (7 AM – 10 PM)	NIGHTTIME (10 PM – 7 AM)
Hourly L_{eq} , dB	60	45
L_{max} , dB	75	65

NOTES: EACH OF THE NOISE LEVELS SPECIFIED SHALL BE LOWERED BY FIVE DB FOR SIMPLE TONE NOISES, NOISES CONSISTING PRIMARILY OF SPEECH, OR MUSIC, OR FOR RECURRING IMPULSIVE NOISES. THESE NOISE LEVEL STANDARDS DO NOT APPLY TO RESIDENTIAL UNITS ESTABLISHED IN CONJUNCTION WITH INDUSTRIAL OR COMMERCIAL USES (E.G., CARETAKER DWELLINGS).

SOURCE: CITY OF RIVERBANK GENERAL PLAN, NOISE ELEMENT, TABLE N-2.

- NOISE-2.3. The City shall require all feasible noise mitigation to reduce construction and other short-term noise and vibration impacts as a condition of approval for development projects by applying the performance standards outlined in Table N-3 of the General Plan [Table 3.11-6 of this section]. The total noise level resulting from new sources and ambient noise shall not exceed the standards in Table N-3 of the General Plan [Table 3.11-6 of this section], as measured at outdoor activity areas of any affected noise sensitive land use except:
 - If the ambient noise level exceeds the standard in Table N-3, the standard becomes the ambient level plus 5 dB(A).
 - Reduce the applicable standards in Table N-3 by 5 decibels if they exceed the ambient level by 10 or more decibels.

3.11 NOISE

TABLE 3.11-6: NOISE LEVEL PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES [FROM THE CITY OF RIVERBANK GENERAL PLAN TABLE N-3]

CUMULATIVE DURATION OF A NOISE EVENT ¹ (MINUTES)	MAXIMUM EXTERIOR NOISE LEVEL STANDARDS ²	
	DAY ^{3,5}	NIGHT ^{4,5}
30-60	50	45
15-30	55	50
5-15	60	55
1-5	65	60
0-1	70	65

NOTES:

1. CUMULATIVE DURATION REFERS TO TIME WITHIN ANY ONE-HOUR PERIOD.

2. NOISE LEVEL STANDARDS MEASURED IN DB.

3. DAYTIME = HOURS BETWEEN 7:00 A.M. AND 10:00 P.M.

4. NIGHTTIME = HOURS BETWEEN 10:00 P.M. AND 7:00 A.M.

5. EACH OF THE NOISE LEVEL STANDARDS SPECIFIED MAY BE REDUCED BY 5 DBA FOR TONAL NOISE (I.E., A SIGNAL WHICH HAS A PARTICULAR AND UNUSUAL PITCH) OR FOR NOISES CONSISTING PRIMARILY OF SPEECH OR FOR RECURRING IMPULSIVE NOISES (I.E., SOUNDS OF SHORT DURATION, USUALLY LESS THAN ONE SECOND, WITH AN ABRUPT ONSET AND RAPID DECAY SUCH AS THE DISCHARGE OF FIREARMS).

SOURCE: CITY OF RIVERBANK GENERAL PLAN, NOISE ELEMENT, TABLE N-3.

City of Riverbank Municipal Code

Chapter 93 of the City of Riverbank Municipal Code prohibits excessive or annoying noise or vibration to residential and commercial properties in the City. The following general rules are outlined in the Municipal Code:

93.04 EXTERIOR NOISE STANDARDS

- A. It is unlawful for any person at any location within the incorporated area of the city to create any noise, or to allow the creation of any noise, on property owned, leased, occupied or otherwise controlled by such person which causes the exterior noise level when measured at any affected single- or multiple-family residence, school, church, hospital or public library situated in either the incorporated or unincorporated area to exceed the noise level standards as set forth in [Table 3.11-7 of this section].
- B. In the event the measured ambient noise level exceeds the applicable noise level standard, the applicable standard shall be adjusted so as to equal the ambient noise level.
- C. Each of the noise level standards specified above shall be reduced by five dB(A) for simple tone noises, noises consisting primarily of speech or music or for recurring impulsive noises.
- D. If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period so that the ambient noise level can be measured, the noise level measured while the source is in operation shall be compared to the noise level standards specified above.

TABLE 3.11-7: EXTERIOR NOISE LEVEL STANDARDS

TIME PERIOD	ALLOWABLE EQUIVALENT HOUR SOUND LEVEL (L_{EQ})	ALLOWABLE MAXIMUM SOUND LEVEL (L_{MAX})
7 a.m. – 10 p.m.	50 dBA	70 dBA
10 p.m. – 7 a.m.	45 dBA	65 dBA

SOURCE: RIVERBANK, CALIFORNIA CODE OF ORDINANCES, TITLE IX: GENERAL REGULATIONS, CHAPTER 93: NOISE

93.05 INTERIOR NOISE STANDARDS

- A. It is unlawful for any person, at any location within the city, to operate or cause to be operated within a dwelling unit, any source of sound or to allow the creation of any noise which causes the noise level when measured inside a receiving dwelling unit situated in the area either within the city or adjacent to the city to exceed the noise level standards as set forth in [Table 3.11-8 of this section]:
- B. In the event the measured ambient noise level exceeds the applicable noise level standard, the applicable standard shall be adjusted so as to equal the ambient noise level.
- C. Each of the noise level standards specified above shall be reduced by five dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.
- D. If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period so that the ambient noise level can be measured, the noise level measured while the source is in operation shall be compared to the noise level standards specified above.

TABLE 3.11-8: INTERIOR NOISE LEVEL STANDARDS

TIME PERIOD	ALLOWABLE EQUIVALENT HOUR SOUND LEVEL (L_{EQ})	ALLOWABLE MAXIMUM SOUND LEVEL (L_{MAX})
7 a.m. – 10 p.m.	40 dBA	60 dBA
10 p.m. – 7 a.m.	35 dBA	55 dBA

SOURCE: RIVERBANK, CALIFORNIA CODE OF ORDINANCES, TITLE IX: GENERAL REGULATIONS, CHAPTER 93: NOISE

93.07 NOISE SOURCE EXEMPTIONS

The following activities shall be exempt from the provisions of this chapter:

- A. Activities conducted in unlighted public parks, public playgrounds and public or private school grounds, during the hours of 7:00 a.m. to 10:00 p.m., and in lighted public parks, public playgrounds and public or private school grounds, during the hours of 7:00 am. to 11:00 p.m., including but not limited to school athletic and school entertainment events.
- B. Any mechanical device, apparatus or equipment used, related to or connected with emergency activities or emergency work
- C. Noise sources associated with construction provided such activities do not take place between 6:30 p.m. and 6:00 a.m. on weekdays or 5:00 p.m. and 8:00 a.m. on weekends and legal holidays.
- D. Noise sources associated with agricultural activities on agricultural zoned property.
- E. Noise sources associated with the collection of waste, garbage, and street sweeping.

3.11 NOISE

- F. Any activity to the extent regulation thereof has been preempted by state or federal law.
- G. Noise sources associated with work performed by private or public utilities in the maintenance or modification of its facilities.
- H. Noise sources associated with the maintenance of residential property provided such activities take place between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday or 8:00 a.m. and 7:00 p.m., Saturday, Sunday, and holidays.
- I. Noise sources associated with public supported events (that is, Farmers Market, Cheese and Wine Festival, parades, and similar events.)

VIBRATION STANDARDS

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

The City of Riverbank does not have specific policies pertaining to vibration levels. However, vibration levels associated with construction activities and railroad operations are addressed as potential noise impacts associated with Project implementation.

Human and structural response to different vibration levels is influenced by several factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 3.11-9 indicates that the threshold for damage to structures ranges from 0.2 to 0.6 peak particle velocity in inches per second (in/sec p.p.v). One-half this minimum threshold or 0.1 in/sec p.p.v. is considered a safe criterion that would protect against architectural or structural damage. The general threshold at which human annoyance could occur is noted as 0.1 in/sec p.p.v.

TABLE 3.11-9: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

PEAK PARTICLE VELOCITY		HUMAN REACTION	EFFECT ON BUILDINGS
MM/SEC.	IN./SEC.		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of “architectural” damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of “architectural” damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize “architectural” damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage.

SOURCE: CALTRANS. TRANSPORTATION RELATED EARTHBOURN VIBRATIONS. TAV-02-01-R9601 FEBRUARY 20, 2002.

3.11.3 IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Consistent with Appendix G of the CEQA Guidelines, the Project will have a significant impact related to noise if it will result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project;
- A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without Project;
- For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the Project area to excessive noise levels within two miles of a public airport or public use airport; or
- For a Project within the vicinity of a private airstrip, expose people residing or working in the Project area to excessive noise levels.

The Project site is not located within two miles of a public or private airport or airstrip. The nearest airport, the Modesto City-County Airport, is located approximately 5.75 miles south of the Project site. Therefore, airports and airport noise are not discussed further in this analysis.

3.11 NOISE

NOISE STANDARDS

The noise standards applicable to the Project include the relevant portions of the City of Riverbank General Plan, the Regulatory Setting section (Section 3.11.2), and the following standards. Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is barely perceptible;
- A 5-dB change is clearly perceptible; and
- A 10-dB change is perceived as being twice or half as loud.

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project-noise conditions. Table 3.11-10 is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn} .

TABLE 3.11-10: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

<i>AMBIENT NOISE LEVEL WITHOUT PROJECT, L_{DN}</i>	<i>INCREASE REQUIRED FOR SIGNIFICANT IMPACT</i>
<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 Table 3.11-10 data, an increase in the traffic noise level of 5 dB or more would be significant where the pre-project noise levels are less than 60 dB L_{dn} , or 3 dB or more where existing noise levels are between 60 to 65 dB L_{dn} . Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dB or more may be significant where the pre-project traffic noise level exceeds 65 dB L_{dn} . The rationale for the Table 3.11-10 criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

IMPACTS AND MITIGATION MEASURES

Impact 3.11-1: Construction of the proposed Project may generate significant noise. (Less Than Significant with Mitigation)

The proposed development, maintenance of roadways during construction, installation of public utilities, and infrastructure improvements associated with the Project will require construction activities. These activities include the use of heavy equipment and impact tools. Table 3.11-11 provides a list of the types of equipment which may be associated with construction activities and the associated noise levels.

TABLE 3.11-11: CONSTRUCTION EQUIPMENT NOISE

TYPE OF EQUIPMENT	PREDICTED NOISE LEVELS, L_{MAX} DB				DISTANCES TO NOISE CONTOURS (FEET)	
	NOISE LEVEL AT 50'	NOISE LEVEL AT 100'	NOISE LEVEL AT 200'	NOISE LEVEL AT 400'	70 DB L_{MAX} CONTOUR	65 DB L_{MAX} CONTOUR
Backhoe	78	72	66	60	126	223
Compactor	83	77	71	65	223	397
Compressor (air)	78	72	66	60	126	223
Concrete Saw	90	84	78	72	500	889
Dozer	82	76	70	64	199	354
Dump Truck	76	70	64	58	100	177
Excavator	81	75	69	63	177	315
Generator	81	75	69	63	177	315
Jackhammer	89	83	77	71	446	792
Pneumatic Tools	85	79	73	67	281	500

SOURCE: ROADWAY CONSTRUCTION NOISE MODEL USER'S GUIDE. FEDERAL HIGHWAY ADMINISTRATION. FHWA-HEP-05-054. JANUARY 2006. J.C. BRENNAN & ASSOCIATES, INC. 2012.

Activities involved in Project construction would typically generate maximum noise levels ranging from 70 to 84 dB at a distance of 100-feet. The nearest sensitive receptor would be located approximately 100-feet or more to the west of on-site construction activities.

Construction could result in periods of elevated ambient noise levels and the potential for annoyance. Policy 2.3 of the City of Riverbank General Plan restricts maximum noise levels from construction to the standards listed in Table 3.11-6. Because the existing ambient noise level exceeds the standards in Table 3.11-6, Policy 2.3 states that the applicable standard becomes the ambient level plus 5 dB(A). In addition, the Section 93.07 of the City Municipal Code exempts noise from construction provided that the construction occurs during the allowable hours of operation, as follows:

Noise sources associated with construction provided such activities do not take place between 6:30 p.m. and 6:00 a.m. on weekdays or 5:00 p.m. and 8:00 a.m. on weekends and legal holidays.

Implementation of the following mitigation measures will ensure that these potential impacts are reduced to a **less-than-significant** level.

3.11 NOISE

MITIGATION MEASURE(S)

Mitigation Measure 3.11-1: Construction activities shall not occur between 6:30 p.m. and 6:00 a.m. on weekdays or 5:00 p.m. and 8:00 a.m. on weekends and legal holidays, as required by the City of Riverbank Municipal Code. This requirement shall be noted in the improvements plans prior to approval by the City's Public Works Department.

Mitigation Measure 3.11-2: In an effort to comply with the City General Plan standards contained in Table 3.11-6 (Table N-3 of the General Plan), all equipment shall be fitted with factory equipped mufflers, and in good working order. In addition, all staging areas shall be located as far as feasibly possible from residential areas. This requirement shall be noted in the improvements plans prior to approval by the City's Public Works Department.

Impact 3.11-2: Construction of the proposed Project may result in vibration impacts. (Less than Significant)

The primary vibration-generating activities associated with the proposed Project would occur during construction when activities such as demolition, grading, utilities placement, and parking lot construction occur. Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are located approximately 100-feet or further from the on-site construction activities. At distances of 100-feet or more, construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural. Table 3.11-12 shows the typical vibration levels produced by construction equipment.

TABLE 3.11-12: VIBRATION LEVELS FOR VARYING CONSTRUCTION EQUIPMENT

TYPE OF EQUIPMENT	PEAK PARTICLE VELOCITY @ 25 FEET (INCHES/SECOND)	PEAK PARTICLE VELOCITY @ 50 FEET (INCHES/SECOND)	PEAK PARTICLE VELOCITY @ 100 FEET (INCHES/SECOND)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210	0.074	0.026

SOURCE: FEDERAL TRANSIT ADMINISTRATION, TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT GUIDELINES, MAY 2006

The Table 3.11-12 data indicate that construction vibration levels anticipated for the Project are less than the 0.2 in/sec p.p.v. threshold of damage to buildings and less than the 0.1 in/sec threshold of annoyance criteria at distances of 50-feet. Therefore, construction vibrations are not

predicted to cause damage to existing buildings or cause annoyance to sensitive receptors provided that the compactor/roller is located a minimum distance of 50-feet from other structures. Therefore, this impact would be considered **less than significant**.

Impact 3.11-3: The proposed Project may generate unacceptable traffic noise levels at existing receptors. (Significant and Unavoidable)

The FHWA traffic noise prediction model was used for determining traffic noise levels. Where sound walls exist, a -5 dB correction was used in the modeling to account for shielding. Figure 3.11-2 shows the locations of the existing sound walls in the Project vicinity. Tables 3.11-13 and 3.11-14 show the predicted increases in traffic noise levels due to the Project at existing residences. Table 3.11-13 shows increases in traffic noise levels based upon Existing and Existing Plus CWSP conditions, and Table 3.11-14 shows the traffic noise level increases based upon Cumulative and Cumulative Plus CWSP conditions. Predicted traffic noise levels are based upon a typical distance of 75-feet from the roadway centerlines.

TABLE 3.11-13: EXISTING AND EXISTING PLUS CWSP TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	NOISE LEVELS (L_{DN} , DB) AT 75-FEET FROM CENTERLINE				
		EXISTING	EXISTING + CWSP	CHANGE	CRITERIA ¹	SIGNIFICANT?
Patterson Road	McHenry Avenue to Coffee Road	67.9	68.3	+0.4	+1.5	No
Patterson Road	Coffee Road to Oakdale Road	62.3	62.3	+0.0	+3.0	No
Patterson Road	Oakdale Road to Jackson Avenue	63.9	64.3	+0.4	+3.0	No
Morrill Road	Coffee Road to Oakdale Road	54.1	54.1	+0.0	+5.0	No
Crawford Road	N-S Collector to Oakdale Road	49.3	59.0	+9.7	+5.0	Yes
Crawford Road	Oakdale Road to Squire Wells Road	54.4	54.7	+0.3	+5.0	No
Claribel Road	McHenry Avenue to Coffee Road	70.3	72.0	+1.7	+1.5	Yes
Claribel Road	Coffee Road to N-S Collector	65.2	66.7	+1.5	+1.5	Yes
Claribel Road	N-S Collector to Oakdale Road	70.2	71.3	+1.1	+1.5	No
Claribel Road	Oakdale Road to Roselle Avenue	67.7	69.2	+1.5	+1.5	Yes
Claribel Road	Roselle Avenue to Claus Road	67.6	69.1	+1.5	+1.5	Yes
Coffee Road	Patterson Road to Morrill Road	61.6	63.4	+1.8	+3.0	No
Coffee Road	Morrill Road to Crawford Road	62.9	65.4	+2.5	+3.0	No
Coffee Road	Crawford Road to Claribel Road	64.7	68.0	+3.3	+3.0	Yes
Coffee Road	Claribel Road to Claratina Avenue	64.3	66.1	+1.8	+3.0	No
Oakdale Road	Patterson Road to Morrill Road	59.4	60.3	+0.9	+5.0	No
Oakdale Road	Morrill Road to Crawford Road	60.6	62.0	+1.4	+3.0	No
Oakdale Road	Crawford Road to Claribel Road	62.5	64.3	+1.8	+3.0	No
Oakdale Road	Claribel Road to Claratina Avenue	65.6	66.7	+1.1	+1.5	No
Roselle Avenue	Claribel Road to Claratina Avenue	59.4	59.9	+0.5	+5.0	No

NOTE: ¹ WHERE EXISTING NOISE LEVELS ARE LESS THAN 60 DB AN INCREASE OF 5 DB WOULD BE A SIGNIFICANT INCREASE. ADDITIONALLY, ANY INCREASE CAUSING NOISE LEVELS TO EXCEED THE CITY'S NORMALLY ACCEPTABLE 60 DB L_{DN} NOISE LEVEL STANDARD AT AN EXISTING OUTDOOR ACTIVITY AREA OF A RESIDENTIAL USE WOULD ALSO BE SIGNIFICANT. WHERE EXISTING NOISE LEVELS EXCEED 60 DB BUT ARE LESS THAN 65 DB, AN INCREASE OF 3 DB OR MORE WOULD BE SIGNIFICANT. WHERE EXISTING NOISE LEVELS EXCEED 65 DB, AN INCREASE OF 1.5 DB OR MORE WOULD BE SIGNIFICANT.

3.11 NOISE

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2017.

The FHWA traffic noise prediction model was used for determining traffic noise levels. Where existing sound walls exist, a -5 dB correction was used in the modeling to account for shielding. Figure 3.11-2 shows the locations of the existing sound walls in the Project vicinity. Traffic noise levels are predicted at 75-feet from the centerline along each roadway segment. Appendix E provides the complete inputs and results of the FHWA traffic noise modeling.

TABLE 3.11-14: CUMULATIVE AND CUMULATIVE PLUS CWSP TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	NOISE LEVELS (L_{DN} , DB) AT 75-FEET FROM CENTERLINE				
		CUMULATIVE	CUMULATIVE + CWSP	CHANGE	CRITERIA ¹	SIGNIFICANT?
Patterson Road	McHenry Avenue to Coffee Road	69.0	69.3	+03	+1.5	No
Patterson Road	Coffee Road to Oakdale Road	63.2	63.2	+0.0	+3.0	No
Patterson Road	Oakdale Road to Jackson Avenue	65.4	65.7	+0.3	+1.5	No
Morrill Road	Coffee Road to Oakdale Road	58.9	61.3	+2.4	+5.0	No
Crawford Road	N-S Collector to Oakdale Road	53.7	59.0	+5.3	+5.0	Yes
Crawford Road	Oakdale Road to Squire Wells Road	54.1	55.1	+1.0	+5.0	No
Claribel Road	Coffee Road to N-S Collector	54.0	59.9	+5.9	+5.0	Yes
Claribel Road	N-S Collector to Oakdale Road	64.1	67.3	+3.2	+3.0	Yes
Claribel Road	Oakdale Road to Roselle Avenue	64.7	66.3	+1.6	+3.0	No
Claribel Road	Roselle Avenue to Claus Road	63.7	63.8	+0.1	+3.0	No
Coffee Road	Patterson Road to Morrill Road	64.3	65.3	+1.0	+3.0	No
Coffee Road	Morrill Road to Crawford Road	66.9	67.9	+1.0	+1.5	No
Coffee Road	Crawford Road to Claribel Road	67.9	69.6	+1.7	+1.5	Yes
Coffee Road	Claribel Road to NCC	66.1	69.6	+3.5	+1.5	Yes
Coffee Road	NCC to Claratina Avenue	66.3	67.3	+1.0	+1.5	No
Oakdale Road	Patterson Road to Morrill Road	60.8	61.4	+0.6	+3.0	No
Oakdale Road	Morrill Road to Crawford Road	60.1	61.7	+1.6	+3.0	No
Oakdale Road	Crawford Road to Claribel Road	61.0	63.9	+2.9	+3.0	No
Oakdale Road	Claribel Road to NCC	69.6	71.7	+2.1	+1.5	Yes
Oakdale Road	NCC to Claratina Avenue	55.4	56.8	+1.4	+5.0	No
Roselle Avenue	Claribel Road to NCC	60.4	61.3	+0.9	+3.0	No

NOTE: ¹ WHERE EXISTING NOISE LEVELS ARE LESS THAN 60 DB AN INCREASE OF 5 DB WOULD BE A SIGNIFICANT INCREASE. ADDITIONALLY, ANY INCREASE CAUSING NOISE LEVELS TO EXCEED THE CITY'S NORMALLY ACCEPTABLE 60 DB L_{DN} NOISE LEVEL STANDARD AT AN EXISTING OUTDOOR ACTIVITY AREA OF A RESIDENTIAL USE WOULD ALSO BE SIGNIFICANT. WHERE EXISTING NOISE LEVELS EXCEED 60 DB BUT ARE LESS THAN 65 DB, AN INCREASE OF 3 DB OR MORE WOULD BE SIGNIFICANT. WHERE EXISTING NOISE LEVELS EXCEED 65 DB, AN INCREASE OF 1.5 DB OR MORE WOULD BE SIGNIFICANT.

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2017.

The data in Table 3.11-13 indicates that some noise-sensitive receptors located along Project-area roadways are currently exposed to exterior traffic noise levels exceeding the City of Riverbank 60 dB L_{dn} exterior noise level standard for residential uses (shown in Table 3.11-4). These receptors would continue to experience elevated exterior noise levels with implementation of the proposed Project. Under Existing Conditions, sensitive receptors located adjacent to Patterson Road, Claribel

Road, Coffee Road, and Oakdale Road exceed the City's 60 dB L_{dn} exterior noise level standard for transportation noise sources. Under Existing Plus CWSP conditions, these roadways will continue to exceed the City standards. The Project's contributions range between 0 dB and 3.3 dB L_{dn}. In some cases, the increases also exceed the FICON and City of Riverbank criteria of +1.5 dB where existing noise levels exceed 65 dB.

Under Cumulative conditions, sensitive receptors located adjacent to Patterson Road, Claribel Road, Coffee Road, and Oakdale Road exceed the City's 60 dB L_{dn} exterior noise level standard for transportation noise sources. Under Cumulative Plus CWSP conditions, these roadways will continue to exceed the City standards. The Project's contributions range between 0 dB and 5.9 dB L_{dn}. In some cases, the increases also exceed the FICON and City of Riverbank criteria of +1.5 dB where existing noise levels exceed 65 dB.

Tables 3.11-13 and 3.11-14 indicate where increases in traffic noise levels due to the Project exceed the City standards and the FICON criteria for increases in traffic noise. Therefore, this would be a significant impact at these locations.

In some locations, the proposed Project is predicted to cause increases in traffic noise levels which would cause a new exceedance of the City's noise level standards in Table 3.11-4, or exceed the FICON allowable increase criteria outlined in Table 3.11-10. The greatest number of significant traffic noise increases would occur under the Cumulative Plus CWSP condition.

Table 3.11-15 indicates where significant traffic noise increases will occur, and the segments which the Project would result in an exceedance of the City of Riverbank exterior noise levels standard, under the Cumulative Plus CSWP condition.

TABLE 3.11-15: SIGNIFICANT TRAFFIC NOISE INCREASES - CUMULATIVE AND CUMULATIVE PLUS CWSP TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	NOISE LEVELS (L _{DN} , DB) AT 75-FEET FROM CENTERLINE				
		CUMULATIVE	CUMULATIVE + CWSP	CHANGE	SIGNIFICANT? ¹	CREATES NEW EXCEEDANCE? ²
Morrill Road	Coffee Road to Oakdale Road	58.9	61.3	+2.4	No	Yes
Claribel Road	Coffee Road to N-S Collector	54.0	59.9	+5.9	Yes	No
Claribel Road	N-S Collector to Oakdale Road	64.1	67.3	+3.2	Yes	No
Coffee Road	Crawford Road to Claribel Road	67.9	69.6	+1.7	Yes	No
Coffee Road	Claribel Road to NCC	66.1	69.6	+3.5	Yes	No
Oakdale Road	Claribel Road to NCC	69.6	71.7	+2.1	Yes	No

NOTES:

1. A SIGNIFICANT IMPACT IS DETERMINED BY THE FICON CRITERIA IN TABLE 3.11-10

2. AN EXCEEDANCE OF CITY STANDARDS IS DETERMINED BY THE CITY OF RIVERBANK EXTERIOR NOISE LEVEL STANDARDS IN TABLE 3.11-4

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2017.

Based upon Tables 3.11-13, and 3.11-14, the Project would cause increased noise levels exceeding the City of Riverbank 60 dB L_{dn} exterior noise level standard for transportation noise sources at

3.11 NOISE

some existing residential receptors. Therefore, this would be a **potentially significant** impact. In addition, the traffic noise level increases would exceed the FICON substantial increase criteria shown in Table 3.11-10, which would be a **potentially significant** impact.

Potential mitigation measures would require increasing the height of existing sound walls, building new off-site sound walls, including traffic calming measures to reduce vehicle speeds, and/or using quieter pavement technologies. Generally, construction of new sound walls is not practical due to the openings for driveway accesses which would compromise any barrier effectiveness. Increasing the heights of existing sound walls requires additional engineering of footings and is also not practical. Traffic calming measures generally have not been found to reduce overall traffic noise levels by a significant amount. The use of quiet pavement technologies is the most practical mitigation measure and would generally reduce traffic noise levels between 4 and 5 dB. Under the Cumulative scenarios shown in Table 3.11-14, each roadway segment which shows a significant impact could include future overlays of alternative pavements such as rubberized asphalt or open gap asphalt. However, the implementation of these types of measures along six different roadway segments may not be considered practical due to overall costs and benefits at all locations. Therefore, this would be a **significant unavoidable** impact.

Impact 3.11-4: The proposed Project may result in traffic noise at new sensitive receptors. (Less Than Significant with Mitigation)

Based upon the analysis, traffic noise levels along Oakdale Road, Morrill Road and Claribel Road could exceed the City of Riverbank exterior noise level criteria, where residential development occurs. Site Plans and Tentative Maps depicting building locations, elevations, and floor plans are not currently available for the Project. Therefore, traffic noise levels at the typical building setbacks adjacent to Oakdale Road, Morrill Road, and Claribel Road are estimated at a distance of 75-feet from the roadway centerlines. Traffic noise levels from Crawford Road within the Project site do not exceed the noise level standards.

Table 3.11-16 shows the predicted Cumulative Plus CWSP condition noise levels at the building facades due to traffic on roadways adjacent to the Project site.

TABLE 3.11-16: PREDICTED CUMULATIVE PLUS CWSP TRAFFIC NOISE LEVELS

LOCATION	PREDICTED NOISE LEVELS	
	1ST FLOOR FACADES/OUTDOOR AREAS	2ND FLOOR FACADES
Oakdale Road	62 dB L _{dn}	65 dB L _{dn}
Morrill Road	62 dB L _{dn}	65 dB L _{dn}
Claribel Road	67 dB L _{dn}	70 dB L _{dn}

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. – 2017.

Based upon the data in Table 3.11-16, the predicted Cumulative Plus CWSP traffic noise levels for roadways adjacent to the Project site range between 62 dB and 67 dB L_{dn} at first floor locations, and between 65 dB and 70 dB L_{dn} at second floor locations. Mitigation measures can take the form of sound walls, berms, increased setbacks or shielding from building facades. With implementation of the following mitigation, a **less than significant** impact would result

MITIGATION MEASURE(S)

Mitigation Measure 3.11-3: *The Project applicant(s) shall determine the appropriate methods for reducing traffic noise levels at the Project site to within the City of Riverbank noise level criteria. Table 3.11-16 presented above concludes that traffic noise levels could exceed the City standards at residential areas adjacent to Oakdale Road, Morrill Road and Claribel Road. Mitigation can take the form of sound walls, berms, a combination of walls and berms, setbacks and shielding from building facades. The appropriate mitigation would be determined when site plans and tentative maps are available, subject to review and approval by the City of Riverbank.*

Impact 3.11-5: The proposed Project may result in noise from on-site activities at sensitive receptors. (Less Than Significant with Mitigation)

Figure 2.0-8 in Section 2.0, Project Description, depicts the conceptual land use plan, including where neighborhood parks, school sites and the expanded Riverbank Sports Complex would be located. Generally, neighborhood parks are considered passive in nature, with some small play areas. The site plan shows two separate neighborhood parks within the Project site: one north of Morrill Road, and one south of Crawford Road. These facilities are not considered to be significant noise-generators. Active play areas or sports fields and courts associated with schools or the Riverbank Sports Complex, could be a potential noise source. In addition, school sites include student drop-off areas, parking lots, and school bus loading areas. Because finalized site plans depicting school site designs, or where active play areas, ball fields or soccer fields would be located is not available, detailed analyses of noise impacts can not be determined. This is a **potentially significant** impact.

Noise sources associated with play areas or play fields would primarily be shouting and cheering adults or children during intermittent periods of the sporting events and practice sessions. The data indicate that average and maximum noise levels during games are approximately 60 dB L_{eq} and 75 dB L_{max} at a distance of 100 feet from the focal point of the playing fields. These reference noise levels are based upon crowd sizes of approximately 100 people.

For playing fields or play areas, the focal point of noise varies with considerable excitement generated when the ball is near either goal, but with the sound of the participants generally spread out over the entire field and the sounds of spectators spread out along the sidelines and in the bleachers. Generally, the cumulative noise generation is analyzed at the approximate center of the playing fields or areas. As a means of achieving the exterior noise level standards of 50 dB L_{eq} and 70 dB L_{max} , the center of the play fields should be located at a distance of 275-feet from the nearest residences.

For school sites, noise levels associated with drop-off areas, parking areas or bus circulation areas is determined based upon the trip generation at those particular areas. The noise impacts can be identified when the site plans and detailed traffic studies have been developed.

The following mitigation measures will reduce playing field and school site noise levels to a **less than significant** level.

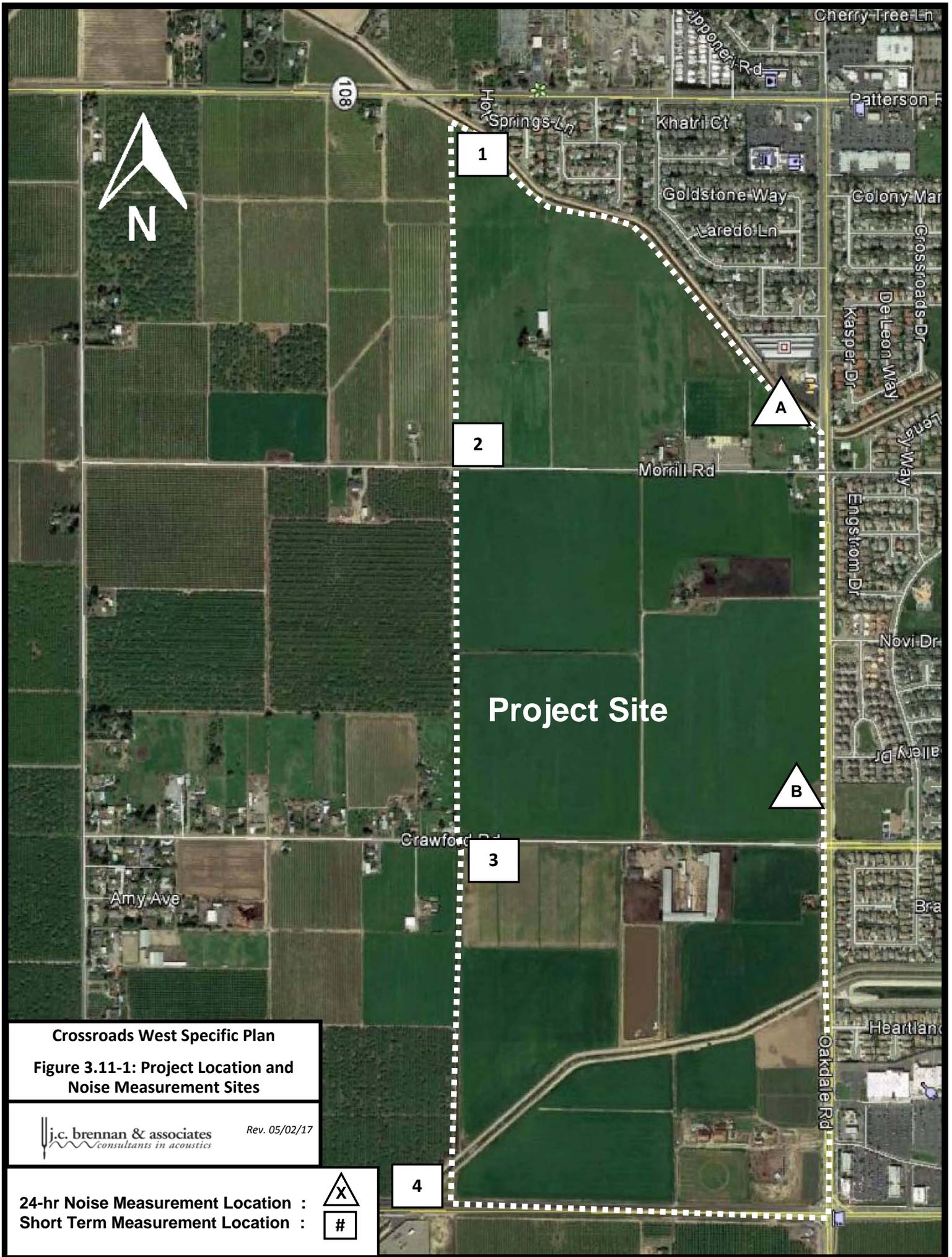
MITIGATION MEASURE(S)

Mitigation Measure 3.11-4: *The center of the play fields shall be located at a minimum distance of 275-feet from the nearest residences. This requirement shall be noted in the improvements plans prior to approval by the City's Public Works Department.*

Mitigation Measure 3.11-5: *Use of the play fields shall be restricted to the daytime hours of 7:00 a.m. to 10:00 p.m. This requirement shall be noted in the improvements plans prior to approval by the City's Public Works Department.*

Mitigation Measure 3.11-6: *When school site plans have been developed, a detailed analysis of school site noise impacts shall be identified and appropriate mitigation measures shall be included in the project designs proposed by the school district as well as the developer of CWSP. The City shall review and approve the analysis of school site noise impacts, as well as any mitigation measures resulting from the analysis*

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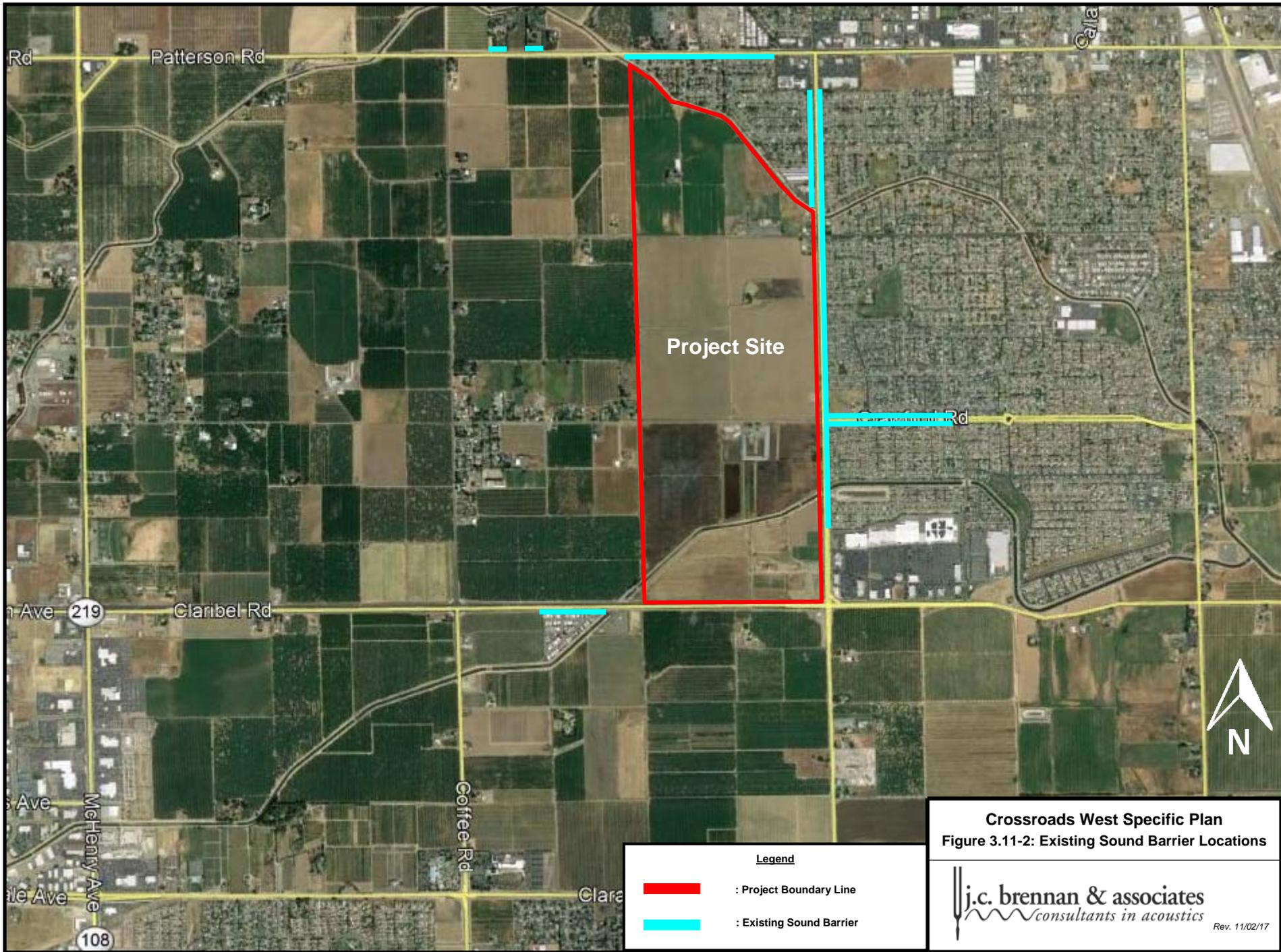


Crossroads West Specific Plan
Figure 3.11-1: Project Location and Noise Measurement Sites

j.c. brennan & associates Rev. 05/02/17
consultants in acoustics

24-hr Noise Measurement Location : 
 Short Term Measurement Location : 

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Crossroads West Specific Plan
Figure 3.11-2: Existing Sound Barrier Locations

Legend	
	: Project Boundary Line
	: Existing Sound Barrier

j.c. brennan & associates
consultants in acoustics
 Rev. 11/02/17

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Appendix A

Crossroads West Specific Plan

24hr Continuous Noise Monitoring - Site A

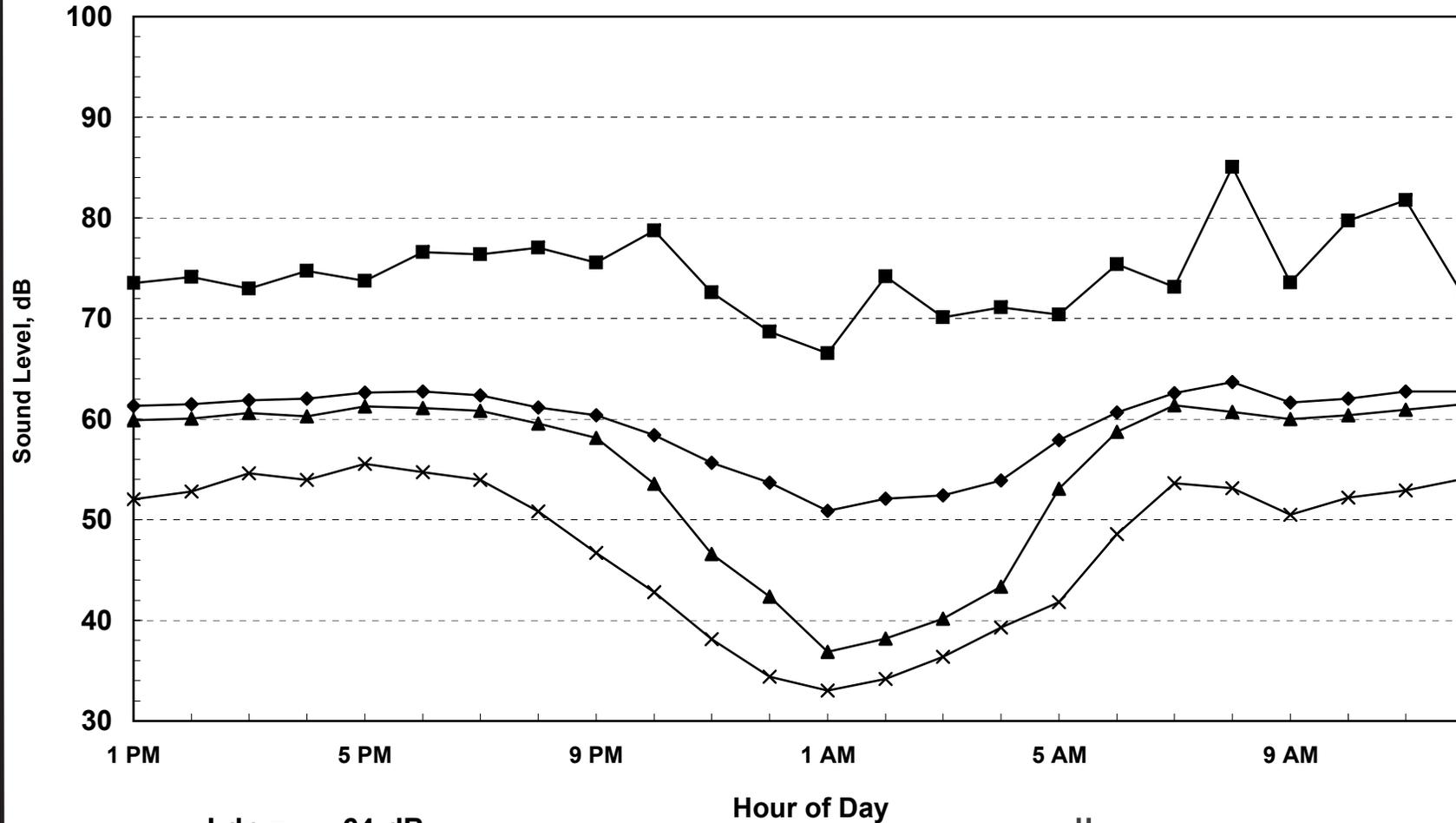
April 25th - 26th, 2017

Hour	Leq	Lmax	L50	L90
13:00:00	61	74	60	52
14:00:00	61	74	60	53
15:00:00	62	73	61	55
16:00:00	62	75	60	54
17:00:00	63	74	61	56
18:00:00	63	77	61	55
19:00:00	62	76	61	54
20:00:00	61	77	60	51
21:00:00	60	76	58	47
22:00:00	58	79	54	43
23:00:00	56	73	47	38
0:00:00	54	69	42	34
1:00:00	51	67	37	33
2:00:00	52	74	38	34
3:00:00	52	70	40	36
4:00:00	54	71	43	39
5:00:00	58	70	53	42
6:00:00	61	75	59	49
7:00:00	63	73	61	54
8:00:00	64	85	61	53
9:00:00	62	74	60	51
10:00:00	62	80	60	52
11:00:00	63	82	61	53
12:00:00	63	72	62	54

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	64	60	62	61	51	56
Lmax (Maximum)	85	72	76	79	67	72
L50 (Median)	62	58	60	59	37	46
L90 (Background)	56	47	53	49	33	39

Computed Ldn, dB	64
% Daytime Energy	87%
% Nighttime Energy	13%

Appendix A
 Crossroads West Specific Plan
 24hr Continuous Noise Monitoring - Site A
 April 25th - 26th, 2017



Ldn = 64 dB

—◆— Leq —■— Lmax —▲— L50 —×— L90



Appendix A

Crossroads West Specific Plan

24hr Continuous Noise Monitoring - Site B

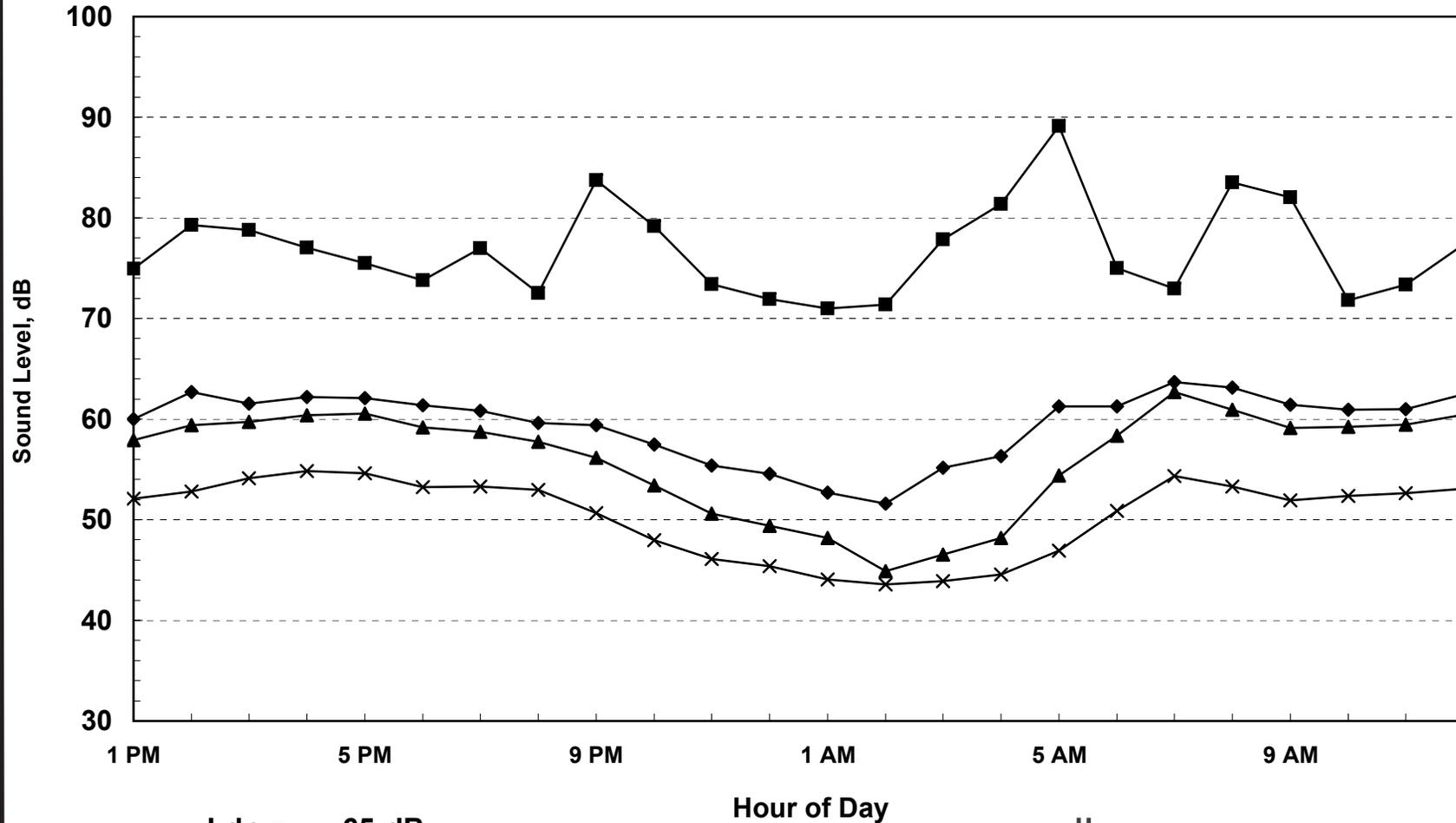
April 25th - 26th, 2017

Hour	Leq	Lmax	L50	L90
13:00:00	60	75	58	52
14:00:00	63	79	59	53
15:00:00	62	79	60	54
16:00:00	62	77	60	55
17:00:00	62	75	61	55
18:00:00	61	74	59	53
19:00:00	61	77	59	53
20:00:00	60	73	58	53
21:00:00	59	84	56	51
22:00:00	58	79	53	48
23:00:00	55	73	51	46
0:00:00	55	72	49	45
1:00:00	53	71	48	44
2:00:00	52	71	45	44
3:00:00	55	78	47	44
4:00:00	56	81	48	45
5:00:00	61	89	54	47
6:00:00	61	75	58	51
7:00:00	64	73	63	54
8:00:00	63	84	61	53
9:00:00	61	82	59	52
10:00:00	61	72	59	52
11:00:00	61	73	59	53
12:00:00	63	77	60	53

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	64	59	62	61	52	57
Lmax (Maximum)	84	72	77	89	71	77
L50 (Median)	63	56	59	58	45	50
L90 (Background)	55	51	53	51	44	46

Computed Ldn, dB	65
% Daytime Energy	82%
% Nighttime Energy	18%

Appendix A
 Crossroads West Specific Plan
 24hr Continuous Noise Monitoring - Site B
 April 25th - 26th, 2017



Ldn = 65 dB

—◆— Leq —■— Lmax —▲— L50 —×— L90



Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 1

Date: 4/25/2017

Time: 12:59 PM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 16 mph

Weather: Partly Cloudy, 46%, 67 F

Field Tech: AT

Measurement Results, dBA

Duration: 0:10

L_{eq}: 68.1 dBA

L_{max}: 74.8 dBA

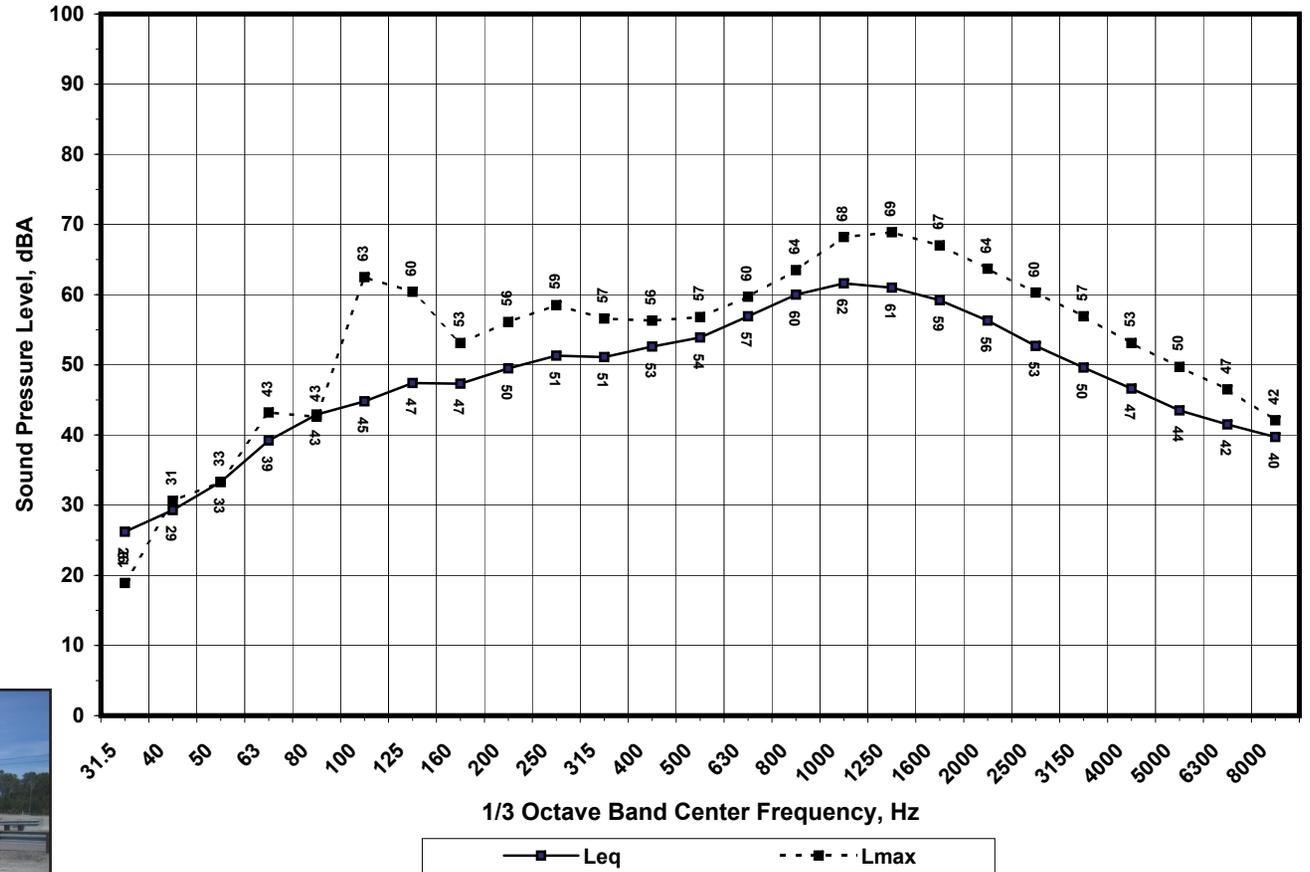
L_{min}: 52.9 dBA

L₅₀: 67.3 dBA

L₉₀: 60.1 dBA

Notes

Primary source of noise is Patterson Road. Small concrete barrier may provide some noise cancellation. Very strong wind at time of measurement may have impacted sound levels.



Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 1

Date: 4/27/2017

Time: 9:22 AM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 14 mph

Weather: Cloudy, 78%, 59 F

Field Tech: NTP

Measurement Results, dBA

Duration: 0:10

L_{eq}: 69.5 dBA

L_{max}: 76.4 dBA

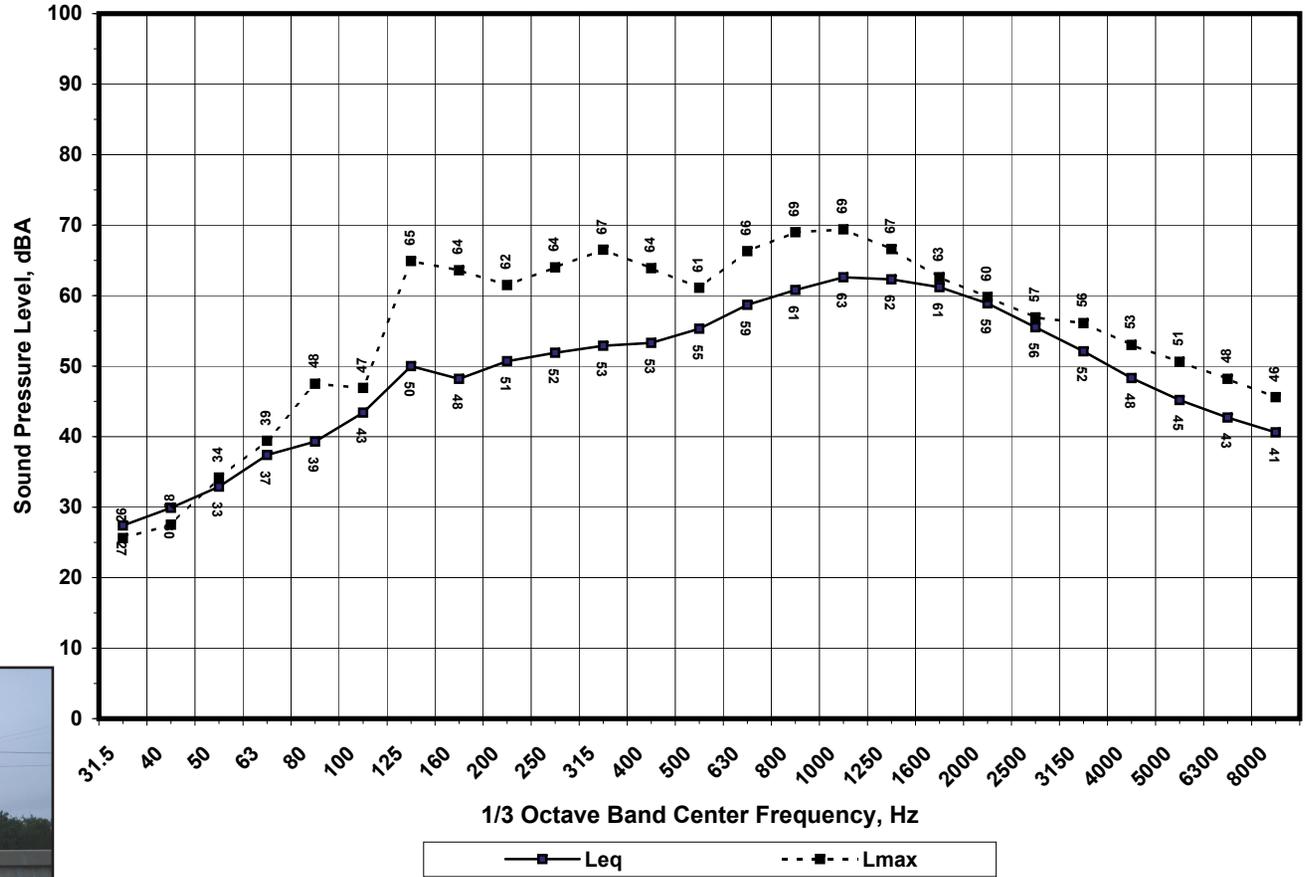
L_{min}: 51.8 dBA

L₅₀: 68.9 dBA

L₉₀: 61.6 dBA

Notes

Primary noise source is traffic on Patterson Road.



Noise Measurement Site

Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 2

Date: 4/25/2017

Time: 1:30 PM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 16 mph

Weather: Partly Cloudy, 46%, 67 F

Field Tech: AT

Measurement Results, dBA

Duration: 0:10

L_{eq}: 65.4 dBA

L_{max}: 79.8 dBA

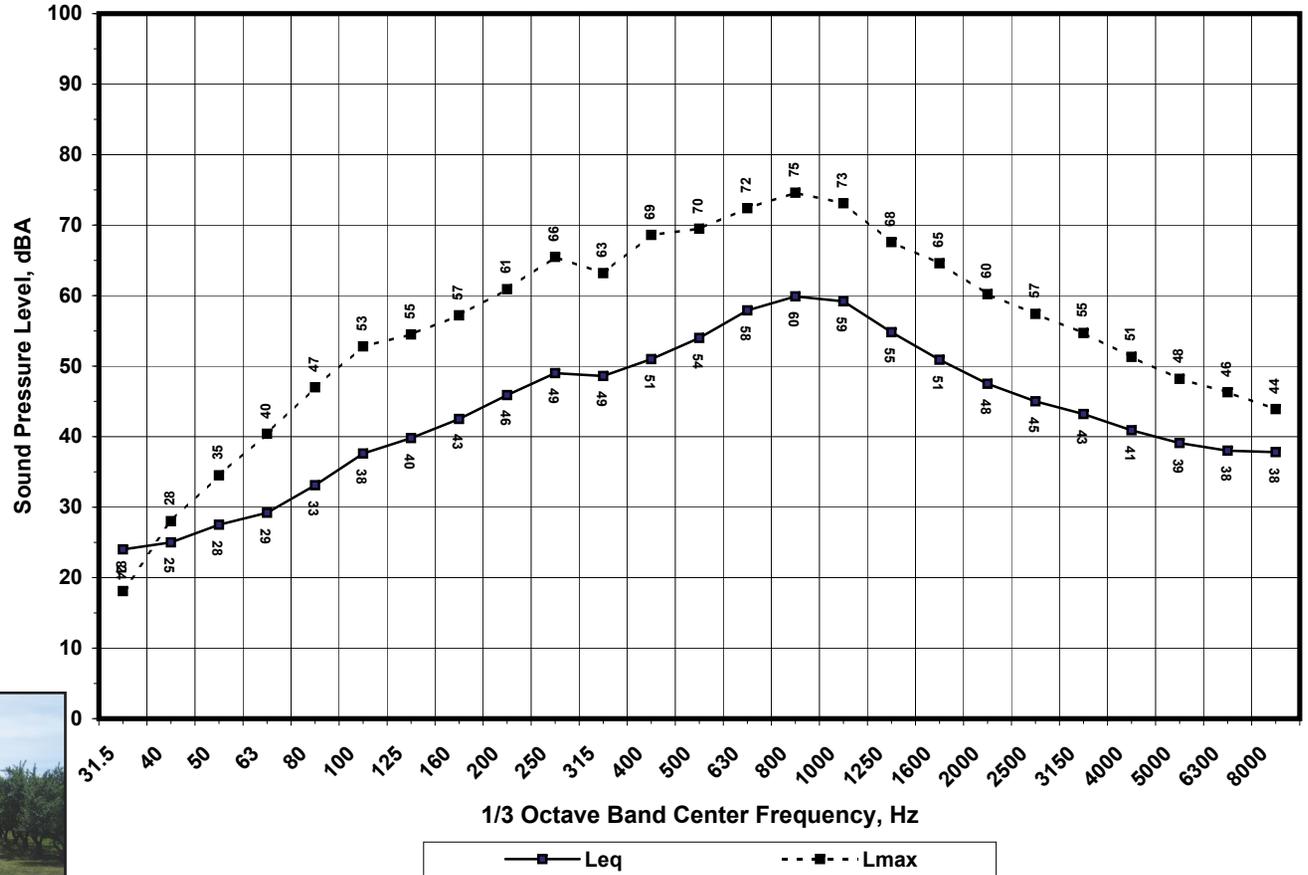
L_{min}: 49.5 dBA

L₅₀: 52.1 dBA

L₉₀: 50.1 dBA

Notes

Primary source of noise is traffic on Morrill Road. Poor state of road contributes to sound levels.



Noise Measurement Site

Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 2

Date: 4/27/2017

Time: 9:47 AM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 14 mph

Weather: Cloudy, 78%, 59 F

Field Tech: NTP

Measurement Results, dBA

Duration: 0:10

L_{eq}: 60.0 dBA

L_{max}: 73.3 dBA

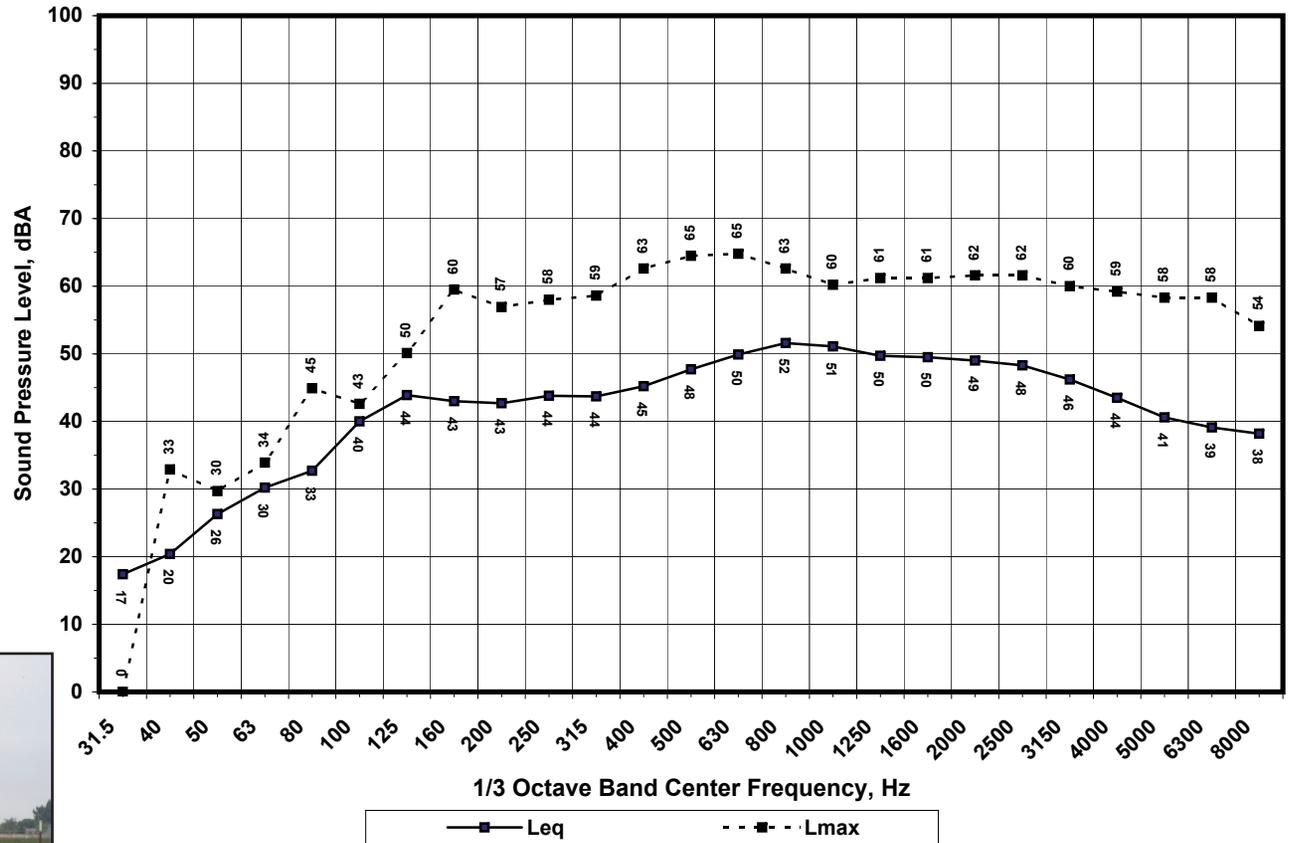
L_{min}: 50.6 dBA

L₅₀: 56.0 dBA

L₉₀: 52.2 dBA

Notes

Primary noise source is tractor/farm machinery adjacent to site. Secondary source is traffic on Morrill Road.



Appendix A

I-15 Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 3

Date: 4/25/2017

Time: 1:57 PM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 16 mph

Weather: Partly Cloudy, 46%, 67 F

Field Tech: AT

Measurement Results, dBA

Duration: 0:10

L_{eq}: 55.3 dBA

L_{max}: 77.2 dBA

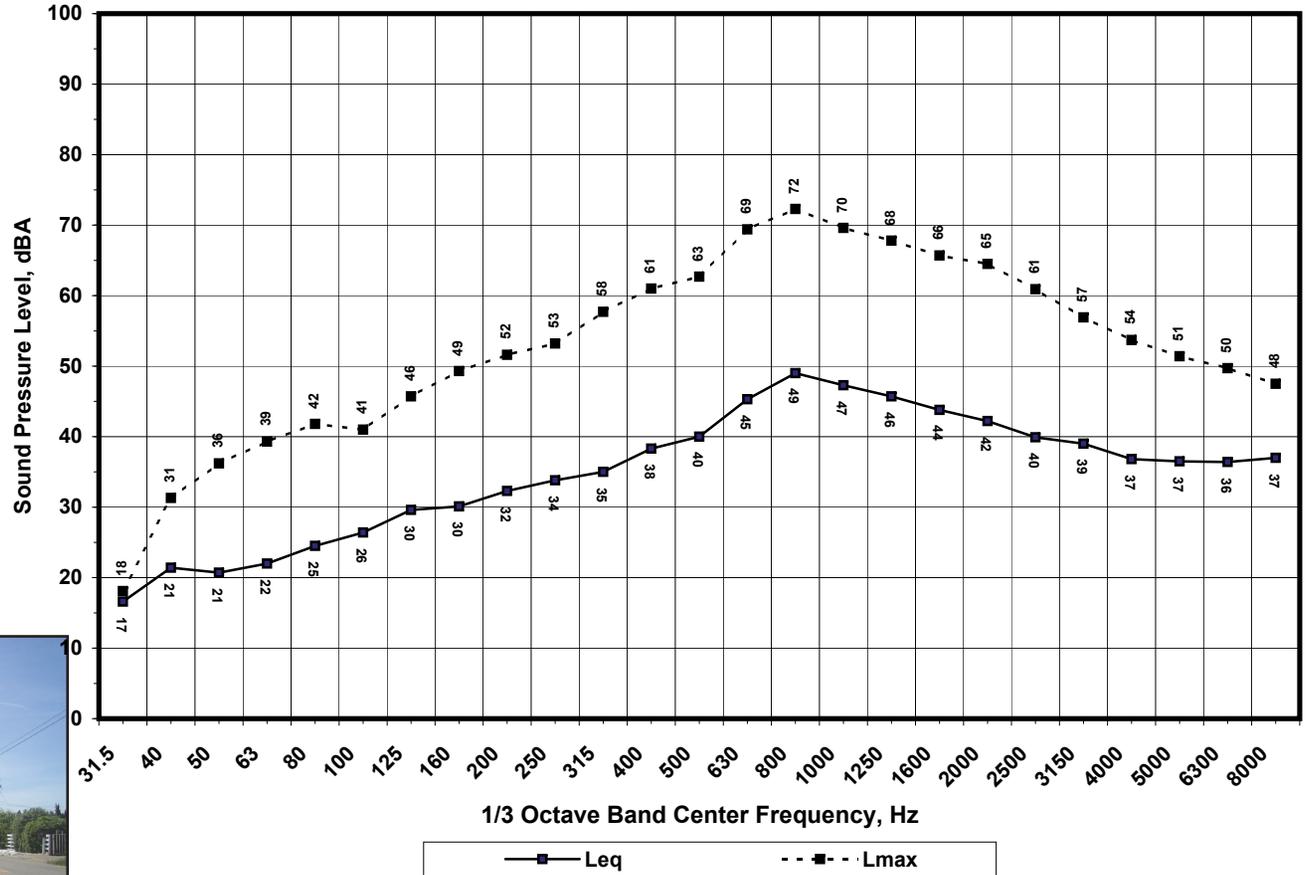
L_{min}: 49.1 dBA

L₅₀: 49.4 dBA

L₉₀: 49.2 dBA

Notes

Four cars total for entire duration of test measurement. Wind in grass provided a small amount of ambient noise.



Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 3

Date: 4/27/2017

Time: 10:08 AM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 14 mph

Weather: Cloudy, 78%, 59 F

Field Tech: NTP

Measurement Results, dBA

Duration: 0:10

L_{eq}: 53.6 dBA

L_{max}: 68.6 dBA

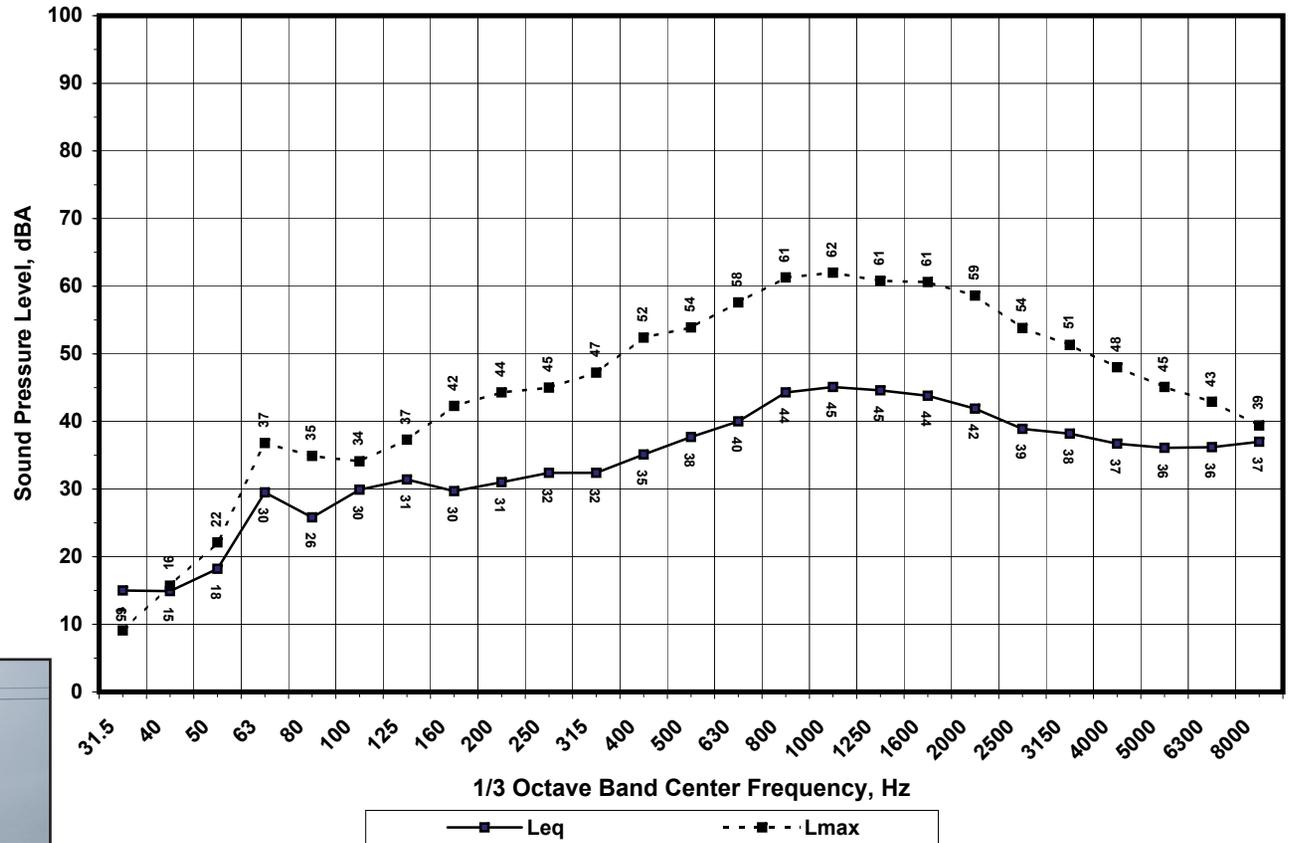
L_{min}: 49.6 dBA

L₅₀: 50.4 dBA

L₉₀: 49.8 dBA

Notes

Primary noise source is traffic on Crawford Road.



Noise Measurement Site

Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 4

Date: 4/25/2017

Time: 2:28 PM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 16 mph

Weather: Partly Cloudy, 46%, 67 F

Field Tech: AT

Measurement Results, dBA

Duration: 0:10

L_{eq}: 66.2 dBA

L_{max}: 83.0 dBA

L_{min}: 53.5 dBA

L₅₀: 62.6 dBA

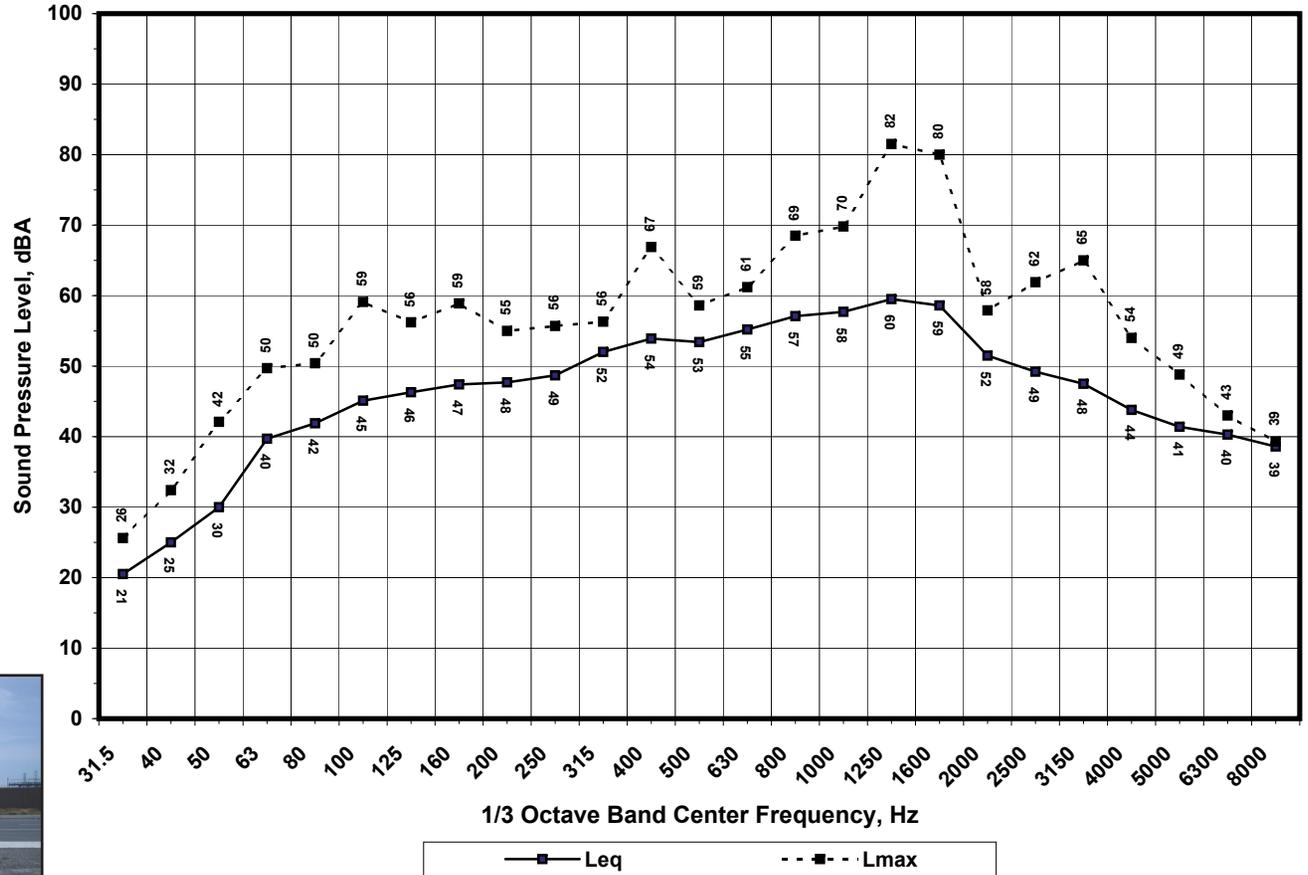
L₉₀: 56.3 dBA

Notes

Claribel road traffic is loudest sound. Sirens caused Lmax. SLM was paused momentarily until ambulance had passed. Small amounts of noise from canal water rushing.



Noise Measurement Site



Appendix A

I-1 S Short-Term Noise Monitoring Summary

Project: Crossroads West SP

Location: Site 4

Date: 4/27/2017

Time: 10:31 AM

SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200

Wind Speed: 14 mph

Weather: Cloudy, 78%, 59 F

Field Tech: NTP

Measurement Results, dBA

Duration: 0:10

L_{eq}: 67.4 dBA

L_{max}: 78.3 dBA

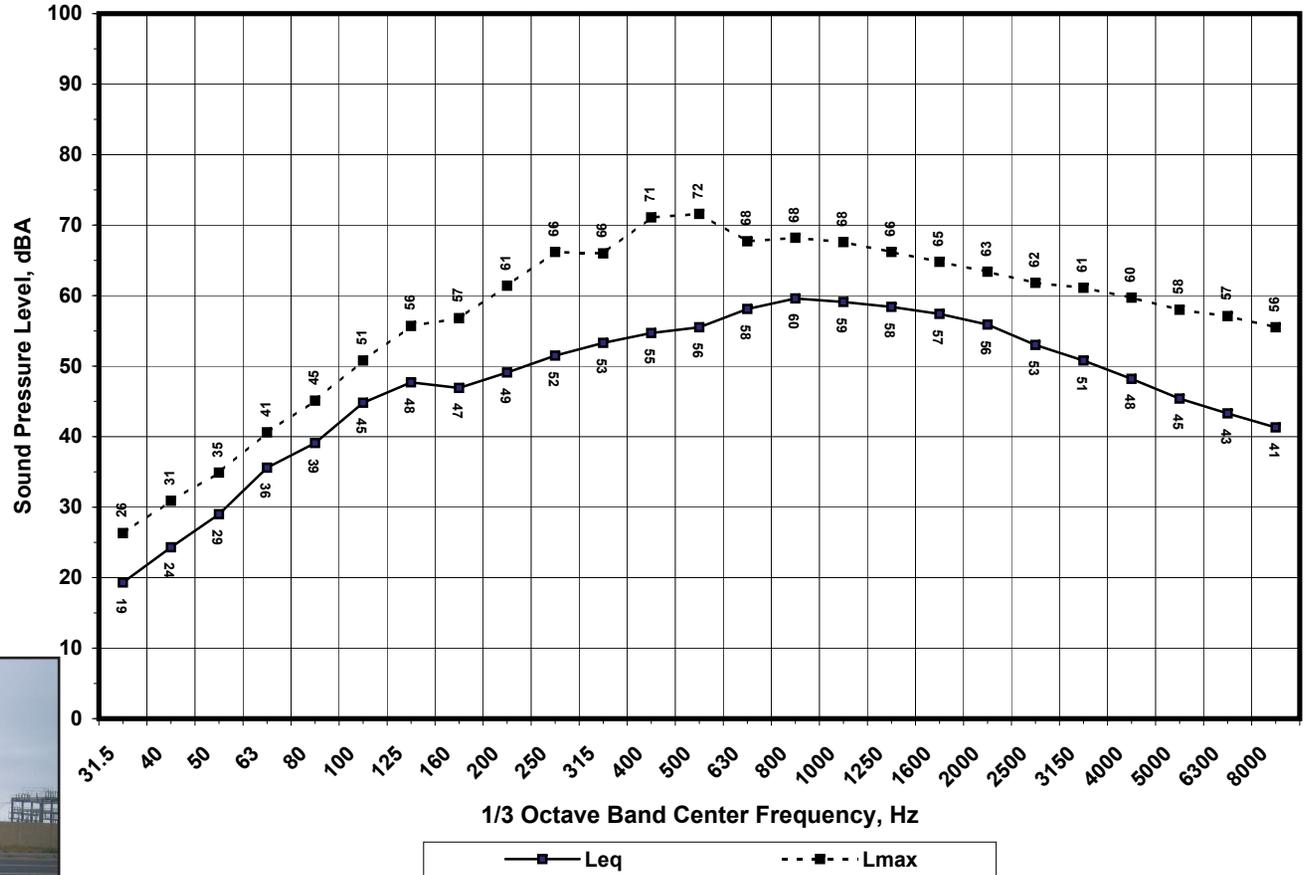
L_{min}: 55.7 dBA

L₅₀: 64.8 dBA

L₉₀: 57.3 dBA

Notes

Primary noise source is traffic on Claribel Road.
Canal is secondary source @ 45 dB.



Noise Measurement Site

Appendix B

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

Data Input Sheet

Project #: 2017-111

Description: Existing

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	14,100	87		13	2.0	1	55	75	
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	15,600	87		13	2.0	1	50	75	-5
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	16,700	87		13	2.0	1	35	75	
4	Morrill Road	Coffee Road to Oakdale Road	1,770	87		13	2.0	1	35	75	
5	Crawford Road	Coffee Road to Oakdale Road	480	82		18	2.0	1	35	75	
6	Crawford Road	Oakdale Road to Squire Wells Ro:	4,890	82		18	2.0	1	35	75	-5
7	Claribel Road	McHenry Avenue to Coffee Road	20,080	82		18	2.0	1	55	75	
8	Claribel Road	Coffee Road to N-S Collector	19,720	82		18	2.0	1	55	75	-5
9	Claribel Road	N-S Collector to Oakdale Road	19,720	82		18	2.0	1	55	75	
10	Claribel Road	Oakdale Road to Roselle Avenue	14,250	82		18	2.0	1	50	75	
11	Claribel Road	Rosell Avenue to Claus Road	10,930	82		18	2.0	1	55	75	
12	Coffee Road	Patterson Road to Morrill Road	3,300	87		13	2.0	1	55	75	
13	Coffee Road	Morrill Road to Crawford Road	4,420	87		13	2.0	1	55	75	
14	Coffee Road	Crawford Road to Claribel Road	5,610	82		18	2.0	1	55	75	
15	Coffee Road	Claribel Road to Claratina Avenue	5,070	82		18	2.0	1	55	75	
16	Oakdale Road	Patterson Road to Morrill Road	13,790	87		13	2.0	1	40	75	-5
17	Oakdale Road	Morrill Road to Crawford Road	13,620	87		13	2.0	1	45	75	-5
18	Oakdale Road	Crawford Road to Claribel Road	17,510	82		18	2.0	1	45	75	-5
19	Oakdale Road	Claribel Road to Claratina Avenue	8,610	82		18	2.0	1	50	75	
20	Roselle Avenue	Claribel Road to Claratina Avenue	4,880	82		18	2.0	1	35	75	
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32											
33											
34											

Appendix B

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

Predicted Levels

Project #: 2017-111

Description: Existing

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	67.0	57.3	58.2	67.9
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	61.3	52.0	53.2	62.3
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	62.1	54.9	57.1	63.9
4	Morrill Road	Coffee Road to Oakdale Road	52.3	45.2	47.4	54.1
5	Crawford Road	Coffee Road to Oakdale Road	47.5	40.3	42.5	49.3
6	Crawford Road	Oakdale Road to Squire Wells Road	52.6	45.4	47.6	54.4
7	Claribel Road	McHenry Avenue to Coffee Road	69.4	59.6	60.5	70.3
8	Claribel Road	Coffee Road to N-S Collector	64.3	54.5	55.5	65.2
9	Claribel Road	N-S Collector to Oakdale Road	69.3	59.5	60.5	70.2
10	Claribel Road	Oakdale Road to Roselle Avenue	66.7	57.5	58.7	67.7
11	Claribel Road	Rosell Avenue to Claus Road	66.7	57.0	57.9	67.6
12	Coffee Road	Patterson Road to Morrill Road	60.7	50.9	51.9	61.6
13	Coffee Road	Morrill Road to Crawford Road	62.0	52.2	53.1	62.9
14	Coffee Road	Crawford Road to Claribel Road	63.8	54.1	55.0	64.7
15	Coffee Road	Claribel Road to Claratina Avenue	63.4	53.6	54.6	64.3
16	Oakdale Road	Patterson Road to Morrill Road	57.9	50.0	51.8	59.4
17	Oakdale Road	Morrill Road to Crawford Road	59.3	50.7	52.2	60.6
18	Oakdale Road	Crawford Road to Claribel Road	61.3	52.7	54.1	62.5
19	Oakdale Road	Claribel Road to Claratina Avenue	64.5	55.3	56.5	65.6
20	Roselle Avenue	Claribel Road to Claratina Avenue	57.6	50.4	52.6	59.4

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

Project #: 2017-111

Description: Existing

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			75	70	65	60	55
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	25	55	118	253	546
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	11	23	50	107	231
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	14	29	63	136	293
4	Morrill Road	Coffee Road to Oakdale Road	3	7	14	30	66
5	Crawford Road	Coffee Road to Oakdale Road	1	3	7	14	31
6	Crawford Road	Oakdale Road to Squire Wells Road	3	7	15	32	68
7	Claribel Road	McHenry Avenue to Coffee Road	36	78	169	364	784
8	Claribel Road	Coffee Road to N-S Collector	17	36	77	167	359
9	Claribel Road	N-S Collector to Oakdale Road	36	77	167	359	774
10	Claribel Road	Oakdale Road to Roselle Avenue	25	53	114	246	531
11	Claribel Road	Rosell Avenue to Claus Road	24	52	113	243	522
12	Coffee Road	Patterson Road to Morrill Road	10	21	45	96	207
13	Coffee Road	Morrill Road to Crawford Road	12	25	54	117	252
14	Coffee Road	Crawford Road to Claribel Road	16	33	72	155	335
15	Coffee Road	Claribel Road to Claratina Avenue	15	31	67	145	313
16	Oakdale Road	Patterson Road to Morrill Road	7	15	32	68	148
17	Oakdale Road	Morrill Road to Crawford Road	8	18	38	82	177
18	Oakdale Road	Crawford Road to Claribel Road	11	24	51	110	237
19	Oakdale Road	Claribel Road to Claratina Avenue	18	38	82	176	379
20	Roselle Avenue	Claribel Road to Claratina Avenue	7	15	32	68	146

Appendix B

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

Data Input Sheet

Project #: 2017-111

Description: Existing Plus CWSP [Existing plus Project]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	15,500	87		13	2.0	1	55	75	
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	15,680	87		13	2.0	1	50	75	-5
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	18,525	87		13	2.0	1	35	75	
4	Morrill Road	Coffee Road to Oakdale Road	1,770	87		13	2.0	1	35	75	
5	Crawford Road	Coffee Road to Oakdale Road	4,505	82		18	2.0	1	35	75	
6	Crawford Road	Oakdale Road to Squire Wells Ro:	5,240	82		18	2.0	1	35	75	-5
7	Claribel Road	McHenry Avenue to Coffee Road	29,980	82		18	2.0	1	55	75	
8	Claribel Road	Coffee Road to N-S Collector	27,845	82		18	2.0	1	55	75	-5
9	Claribel Road	N-S Collector to Oakdale Road	25,195	82		18	2.0	1	55	75	
10	Claribel Road	Oakdale Road to Roselle Avenue	19,775	82		18	2.0	1	50	75	
11	Claribel Road	Rosell Avenue to Claus Road	15,280	82		18	2.0	1	55	75	
12	Coffee Road	Patterson Road to Morrill Road	4,960	87		13	2.0	1	55	75	
13	Coffee Road	Morrill Road to Crawford Road	7,850	87		13	2.0	1	55	75	
14	Coffee Road	Crawford Road to Claribel Road	11,990	82		18	2.0	1	55	75	
15	Coffee Road	Claribel Road to Claratina Avenue	7,680	82		18	2.0	1	55	75	
16	Oakdale Road	Patterson Road to Morrill Road	16,940	87		13	2.0	1	40	75	-5
17	Oakdale Road	Morrill Road to Crawford Road	18,695	87		13	2.0	1	45	75	-5
18	Oakdale Road	Crawford Road to Claribel Road	26,700	82		18	2.0	1	45	75	-5
19	Oakdale Road	Claribel Road to Claratina Avenue	11,170	82		18	2.0	1	50	75	
20	Roselle Avenue	Claribel Road to Claratina Avenue	5,470	82		18	2.0	1	35	75	
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Appendix B

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

Predicted Levels

Project #: 2017-111

Description: Existing Plus CWSP [Existing plus Project]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	67.4	57.7	58.6	68.3
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	61.3	52.1	53.3	62.3
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	62.5	55.4	57.6	64.3
4	Morrill Road	Coffee Road to Oakdale Road	52.3	45.2	47.4	54.1
5	Crawford Road	Coffee Road to Oakdale Road	57.2	50.1	52.2	59.0
6	Crawford Road	Oakdale Road to Squire Wells Road	52.9	45.7	47.9	54.7
7	Claribel Road	McHenry Avenue to Coffee Road	71.1	61.3	62.3	72.0
8	Claribel Road	Coffee Road to N-S Collector	65.8	56.0	57.0	66.7
9	Claribel Road	N-S Collector to Oakdale Road	70.3	60.6	61.5	71.3
10	Claribel Road	Oakdale Road to Roselle Avenue	68.1	58.9	60.1	69.2
11	Claribel Road	Rosell Avenue to Claus Road	68.2	58.4	59.3	69.1
12	Coffee Road	Patterson Road to Morrill Road	62.5	52.7	53.6	63.4
13	Coffee Road	Morrill Road to Crawford Road	64.5	54.7	55.6	65.4
14	Coffee Road	Crawford Road to Claribel Road	67.1	57.4	58.3	68.0
15	Coffee Road	Claribel Road to Claratina Avenue	65.2	55.4	56.4	66.1
16	Oakdale Road	Patterson Road to Morrill Road	58.8	50.9	52.7	60.3
17	Oakdale Road	Morrill Road to Crawford Road	60.7	52.1	53.6	62.0
18	Oakdale Road	Crawford Road to Claribel Road	63.1	54.5	56.0	64.3
19	Oakdale Road	Claribel Road to Claratina Avenue	65.6	56.4	57.6	66.7
20	Roselle Avenue	Claribel Road to Claratina Avenue	58.1	50.9	53.1	59.9

Appendix B

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

Noise Contour Output

Project #: 2017-111

Description: Existing Plus CWSP [Existing plus Project]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			75	70	65	60	55
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	27	58	125	270	582
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	11	23	50	107	232
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	15	31	68	146	314
4	Morrill Road	Coffee Road to Oakdale Road	3	7	14	30	66
5	Crawford Road	Coffee Road to Oakdale Road	6	14	30	64	139
6	Crawford Road	Oakdale Road to Squire Wells Road	3	7	15	33	71
7	Claribel Road	McHenry Avenue to Coffee Road	48	102	221	475	1024
8	Claribel Road	Coffee Road to N-S Collector	21	45	97	210	452
9	Claribel Road	N-S Collector to Oakdale Road	42	91	196	423	912
10	Claribel Road	Oakdale Road to Roselle Avenue	31	66	142	306	660
11	Claribel Road	Rosell Avenue to Claus Road	30	65	141	303	653
12	Coffee Road	Patterson Road to Morrill Road	13	27	59	126	272
13	Coffee Road	Morrill Road to Crawford Road	17	37	80	172	370
14	Coffee Road	Crawford Road to Claribel Road	26	56	120	258	556
15	Coffee Road	Claribel Road to Claratina Avenue	19	41	89	192	413
16	Oakdale Road	Patterson Road to Morrill Road	8	17	36	79	169
17	Oakdale Road	Morrill Road to Crawford Road	10	22	47	101	219
18	Oakdale Road	Crawford Road to Claribel Road	15	31	68	146	314
19	Oakdale Road	Claribel Road to Claratina Avenue	21	45	97	209	451
20	Roselle Avenue	Claribel Road to Claratina Avenue	7	16	34	73	158

Appendix B

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

Data Input Sheet

Project #: 2017-111
 Description: Year 2042 Projects [Cumulative]
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	17,825	87		13	2.0	1	55	75	
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	18,925	87		13	2.0	1	50	75	-5
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	23,525	87		13	2.0	1	35	75	
4	Morrill Road	Coffee Road to Oakdale Road	5,325	87		13	2.0	1	35	75	
5	Crawford Road	Coffee Road to Oakdale Road	1,325	82		18	2.0	1	35	75	
6	Crawford Road	Oakdale Road to Squire Wells Ro:	4,550	82		18	2.0	1	35	75	-5
7	Claribel Road	Coffee Road to N-S Collector	1,500	82		18	2.0	1	55	75	-5
8	Claribel Road	N-S Collector to Oakdale Road	4,800	82		18	2.0	1	55	75	
9	Claribel Road	Oakdale Road to Roselle Avenue	5,600	82		18	2.0	1	55	75	
10	Claribel Road	Roselle Avenue to Claus Road	5,575	82		18	2.0	1	50	75	
11	Coffee Road	Patterson Road to Morrill Road	5,100	82		18	2.0	1	55	75	
12	Coffee Road	Morrill Road to Crawford Road	11,050	87		13	2.0	1	55	75	
13	Coffee Road	Crawford Road to Claribel Road	11,475	82		18	2.0	1	55	75	
14	Coffee Road	Claribel Road to NCC	7,725	82		18	2.0	1	55	75	
15	Coffee Road	NCC to Claratina Avenue	8,010	82		18	2.0	1	55	75	
16	Oakdale Road	Patterson Road to Morrill Road	19,100	87		13	2.0	1	40	75	-5
17	Oakdale Road	Morrill Road to Crawford Road	12,225	87		13	2.0	1	45	75	-5
18	Oakdale Road	Crawford Road to Claribel Road	12,300	82		18	2.0	1	45	75	-5
19	Oakdale Road	Claribel Road to NCC	21,675	82		18	2.0	1	50	75	
20	Oakdale Road	NCC to Claratina Avenue	839	82		18	2.0	1	50	75	
21	Roselle Avenue	Claribel Road to NCC	6,270	82		18	2.0	1	35	75	
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Appendix B

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

Predicted Levels

Project #: 2017-111

Description: Year 2042 Projects [Cumulative]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	68.0	58.3	59.2	69.0
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	62.1	52.9	54.1	63.2
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	63.6	56.4	58.6	65.4
4	Morrill Road	Coffee Road to Oakdale Road	57.1	50.0	52.1	58.9
5	Crawford Road	Coffee Road to Oakdale Road	51.9	44.7	46.9	53.7
6	Crawford Road	Oakdale Road to Squire Wells Road	52.3	45.1	47.3	54.1
7	Claribel Road	Coffee Road to N-S Collector	53.1	43.3	44.3	54.0
8	Claribel Road	N-S Collector to Oakdale Road	63.1	53.4	54.3	64.1
9	Claribel Road	Oakdale Road to Roselle Avenue	63.8	54.1	55.0	64.7
10	Claribel Road	Roselle Avenue to Claus Road	62.6	53.4	54.6	63.7
11	Coffee Road	Patterson Road to Morrill Road	63.4	53.7	54.6	64.3
12	Coffee Road	Morrill Road to Crawford Road	66.0	56.2	57.1	66.9
13	Coffee Road	Crawford Road to Claribel Road	66.9	57.2	58.1	67.9
14	Coffee Road	Claribel Road to NCC	65.2	55.5	56.4	66.1
15	Coffee Road	NCC to Claratina Avenue	65.4	55.6	56.5	66.3
16	Oakdale Road	Patterson Road to Morrill Road	59.3	51.4	53.2	60.8
17	Oakdale Road	Morrill Road to Crawford Road	58.9	50.3	51.8	60.1
18	Oakdale Road	Crawford Road to Claribel Road	59.7	51.1	52.6	61.0
19	Oakdale Road	Claribel Road to NCC	68.5	59.3	60.5	69.6
20	Oakdale Road	NCC to Claratina Avenue	54.4	45.2	46.4	55.4
21	Roselle Avenue	Claribel Road to NCC	58.7	51.5	53.7	60.4

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

Project #: 2017-111

Description: Year 2042 Projects [Cumulative]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			75	70	65	60	55
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	30	64	138	296	638
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	12	26	57	122	262
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	17	37	79	171	368
4	Morrill Road	Coffee Road to Oakdale Road	6	14	29	64	137
5	Crawford Road	Coffee Road to Oakdale Road	3	6	13	28	61
6	Crawford Road	Oakdale Road to Squire Wells Road	3	6	14	30	65
7	Claribel Road	Coffee Road to N-S Collector	3	6	14	30	65
8	Claribel Road	N-S Collector to Oakdale Road	14	30	65	140	302
9	Claribel Road	Oakdale Road to Roselle Avenue	16	33	72	155	335
10	Claribel Road	Roselle Avenue to Claus Road	13	28	61	132	284
11	Coffee Road	Patterson Road to Morrill Road	15	31	68	146	314
12	Coffee Road	Morrill Road to Crawford Road	22	46	100	215	464
13	Coffee Road	Crawford Road to Claribel Road	25	54	116	251	540
14	Coffee Road	Claribel Road to NCC	19	41	89	192	415
15	Coffee Road	NCC to Claratina Avenue	20	42	91	197	425
16	Oakdale Road	Patterson Road to Morrill Road	9	18	40	85	183
17	Oakdale Road	Morrill Road to Crawford Road	8	16	35	76	165
18	Oakdale Road	Crawford Road to Claribel Road	9	19	40	87	188
19	Oakdale Road	Claribel Road to NCC	33	70	151	326	702
20	Oakdale Road	NCC to Claratina Avenue	4	8	17	37	80
21	Roselle Avenue	Claribel Road to NCC	8	17	37	80	173

Appendix B

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

Data Input Sheet

Project #: 2017-111
 Description: Year 2042 Projects Plus CWSP [Cumulative plus Project]
 Ldn/CNEL: Ldn
 Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	19,200	87		13	2.0	1	55	75	
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	19,000	87		13	2.0	1	50	75	-5
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	25,300	87		13	2.0	1	35	75	
4	Morrill Road	Coffee Road to Oakdale Road	9,200	87		13	2.0	1	35	75	
5	Crawford Road	Coffee Road to Oakdale Road	4,500	82		18	2.0	1	35	75	
6	Crawford Road	Oakdale Road to Squire Wells Ro:	5,800	82		18	2.0	1	35	75	-5
7	Claribel Road	Coffee Road to N-S Collector	5,800	82		18	2.0	1	55	75	-5
8	Claribel Road	N-S Collector to Oakdale Road	10,000	82		18	2.0	1	55	75	
9	Claribel Road	Oakdale Road to Roselle Avenue	8,000	82		18	2.0	1	55	75	
10	Claribel Road	Roselle Avenue to Claus Road	5,700	82		18	2.0	1	50	75	
11	Coffee Road	Patterson Road to Morrill Road	6,400	82		18	2.0	1	55	75	
12	Coffee Road	Morrill Road to Crawford Road	14,100	87		13	2.0	1	55	75	
13	Coffee Road	Crawford Road to Claribel Road	17,000	82		18	2.0	1	55	75	
14	Coffee Road	Claribel Road to NCC	17,000	82		18	2.0	1	55	75	
15	Coffee Road	NCC to Claratina Avenue	10,200	82		18	2.0	1	55	75	
16	Oakdale Road	Patterson Road to Morrill Road	21,800	87		13	2.0	1	40	75	-5
17	Oakdale Road	Morrill Road to Crawford Road	17,500	87		13	2.0	1	45	75	-5
18	Oakdale Road	Crawford Road to Claribel Road	23,900	82		18	2.0	1	45	75	-5
19	Oakdale Road	Claribel Road to NCC	35,500	82		18	2.0	1	50	75	
20	Oakdale Road	NCC to Claratina Avenue	1,150	82		18	2.0	1	50	75	
21	Roselle Avenue	Claribel Road to NCC	7,700	82		18	2.0	1	35	75	
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Appendix B

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

Predicted Levels

Project #: 2017-111

Description: Year 2042 Projects Plus CWSP [Cumulative plus Project]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	68.4	58.6	59.5	69.3
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	62.1	52.9	54.1	63.2
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	63.9	56.7	58.9	65.7
4	Morrill Road	Coffee Road to Oakdale Road	59.5	52.3	54.5	61.3
5	Crawford Road	Coffee Road to Oakdale Road	57.2	50.0	52.2	59.0
6	Crawford Road	Oakdale Road to Squire Wells Road	53.3	46.2	48.3	55.1
7	Claribel Road	Coffee Road to N-S Collector	59.0	49.2	50.1	59.9
8	Claribel Road	N-S Collector to Oakdale Road	66.3	56.6	57.5	67.3
9	Claribel Road	Oakdale Road to Roselle Avenue	65.4	55.6	56.5	66.3
10	Claribel Road	Roselle Avenue to Claus Road	62.7	53.5	54.7	63.8
11	Coffee Road	Patterson Road to Morrill Road	64.4	54.6	55.6	65.3
12	Coffee Road	Morrill Road to Crawford Road	67.0	57.3	58.2	67.9
13	Coffee Road	Crawford Road to Claribel Road	68.6	58.9	59.8	69.6
14	Coffee Road	Claribel Road to NCC	68.6	58.9	59.8	69.6
15	Coffee Road	NCC to Claratina Avenue	66.4	56.7	57.6	67.3
16	Oakdale Road	Patterson Road to Morrill Road	59.9	52.0	53.8	61.4
17	Oakdale Road	Morrill Road to Crawford Road	60.4	51.8	53.3	61.7
18	Oakdale Road	Crawford Road to Claribel Road	62.6	54.0	55.5	63.9
19	Oakdale Road	Claribel Road to NCC	70.6	61.4	62.6	71.7
20	Oakdale Road	NCC to Claratina Avenue	55.8	46.5	47.7	56.8
21	Roselle Avenue	Claribel Road to NCC	59.5	52.4	54.6	61.3

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

Project #: 2017-111

Description: Year 2042 Projects Plus CWSP [Cumulative plus Project]

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway Name	Segment Description	----- Distances to Traffic Noise Contours -----				
			75	70	65	60	55
1	Patterson Road (SR 108)	McHenry Avenue to Coffee Road	31	67	145	311	671
2	Patterson Road (SR 108)	Coffee Road to Oakdale Road	12	26	57	122	263
3	Patterson Road (SR 108)	Oakdale Road to Jackson Avenue	18	39	83	179	387
4	Morrill Road	Coffee Road to Oakdale Road	9	20	42	91	197
5	Crawford Road	Coffee Road to Oakdale Road	6	14	30	64	139
6	Crawford Road	Oakdale Road to Squire Wells Road	4	8	16	35	76
7	Claribel Road	Coffee Road to N-S Collector	7	16	34	74	159
8	Claribel Road	N-S Collector to Oakdale Road	23	49	106	229	492
9	Claribel Road	Oakdale Road to Roselle Avenue	20	42	91	197	424
10	Claribel Road	Roselle Avenue to Claus Road	13	29	62	134	288
11	Coffee Road	Patterson Road to Morrill Road	17	37	79	170	366
12	Coffee Road	Morrill Road to Crawford Road	25	55	118	253	546
13	Coffee Road	Crawford Road to Claribel Road	33	70	151	326	701
14	Coffee Road	Claribel Road to NCC	33	70	151	326	701
15	Coffee Road	NCC to Claratina Avenue	23	50	107	232	499
16	Oakdale Road	Patterson Road to Morrill Road	9	20	43	93	200
17	Oakdale Road	Morrill Road to Crawford Road	10	21	45	97	209
18	Oakdale Road	Crawford Road to Claribel Road	14	29	63	136	292
19	Oakdale Road	Claribel Road to NCC	45	98	210	453	975
20	Oakdale Road	NCC to Claratina Avenue	5	10	21	46	99
21	Roselle Avenue	Claribel Road to NCC	9	20	43	92	198