NOISE AND VIBRATION IMPACT ANALYSIS

MADISON PLAZA

CITY OF RIVERSIDE, COUNTY OF RIVERSIDE, CALIFORNIA

LSA

December 2016

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Project No. PRP1501

LSA

December 2016

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LIST OF ABBREVIATIONS AND ACRONYMS

µin/sec	microinches per second
µPa	micropascals
ac	acre/acres
ADT	average daily traffic
APN	Assessor's Parcel Number
Caltrans	California Department of Transportation
City	City of Riverside
CMU	concrete masonry unit
CNEL	Community Noise Equivalent Level
County	Riverside County
dB	decibels
dBA	A-weighted decibels
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
ft	feet/foot
FTA	Federal Transit Administration
HP	horsepower
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
in/sec	inches per second
kVA	kilovolt-ampere
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous noise level
LSA	LSA Associates, Inc.
L_V	vibration velocity in decibels
OSHA	Occupational Safety and Health Administration
PPV	peak particle velocity
project	Madison Plaza project
project	Madison Plaza project
RCNM	Roadway Construction Noise Model
RMS	root-mean-square (velocity)
SBBM	San Bernardino Baseline and Meridian
sf	square feet/square foot
SR-91	State Route 91
STC	Sound Transmission Class
USGS	United States Geological Survey
VdB	vibration velocity decibels
VMS	variable message sign
V_{ref}	reference velocity amplitude

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise impacts and mitigation measures associated with the proposed Madison Plaza Project (project) in the City of Riverside (City), County of Riverside (County), California. This report is intended to satisfy the City and State requirement for a project-specific noise and vibration impact analysis by examining the impacts of the proposed uses on adjacent noise-sensitive uses, as well as the noise impacts on the proposed uses on the project site, and evaluating the mitigation measures required as part of the project design.

Project Description

The project site is on the northwest corner of the intersection of Madison Street and State Route 91 (SR-91), as shown on Figure 1. Access is provided by two driveways from Madison Street..

The proposed project includes the construction of an 84,859 sf shopping center. The project site is at 3530 Madison Street in the City in western Riverside County. The project site consists of 8.21 acres and currently contains a fully operational Denny's restaurant. The existing 3,943 sf Denny's restaurant building would be retained on site and incorporated into the future project. The Mobil Station, car wash, and convenience store are not a part of the project and are on a separate parcel. The western portion of the project site is not developed and is currently a dirt lot.

The proposed project would construct two attached structures on the back side of the site consisting of a 41,117 sf market and a 37,849 sf health and fitness center. The proposed project includes a 1,950 sf restaurant with drive-through on the eastern portion of the site along the Madison Street frontage between the existing Denny's restaurant and Mobil Station. The proposed project also includes modifications to the Denny's restaurant drive aisles and parking lots. The proposed project would result in a building coverage of 23.6%. The project will also include 432 parking stalls.

In addition to the commercial development, the project would also construct three retention basins and an infiltration basin for runoff, and modify the existing California Department of Transportation (Caltrans) retention basin located along the westbound SR 91 on-ramp. The project site is further identified by Assessor's Parcel Numbers (APNs) 230-090-002, 230-090-003, 230-090-004, and 230-090-005, and United States Geological Survey (USGS) map, Riverside West quadrangle, T3S, R5W, Section 4 of the San Bernardino Baseline and Meridian (SBBM). The proposed project is anticipated to be completed in 2017. A site plan of the proposed project is provided on Figure 2.

The proposed project is consistent with the current City General Plan designation for the project site and would not require a General Plan Amendment.

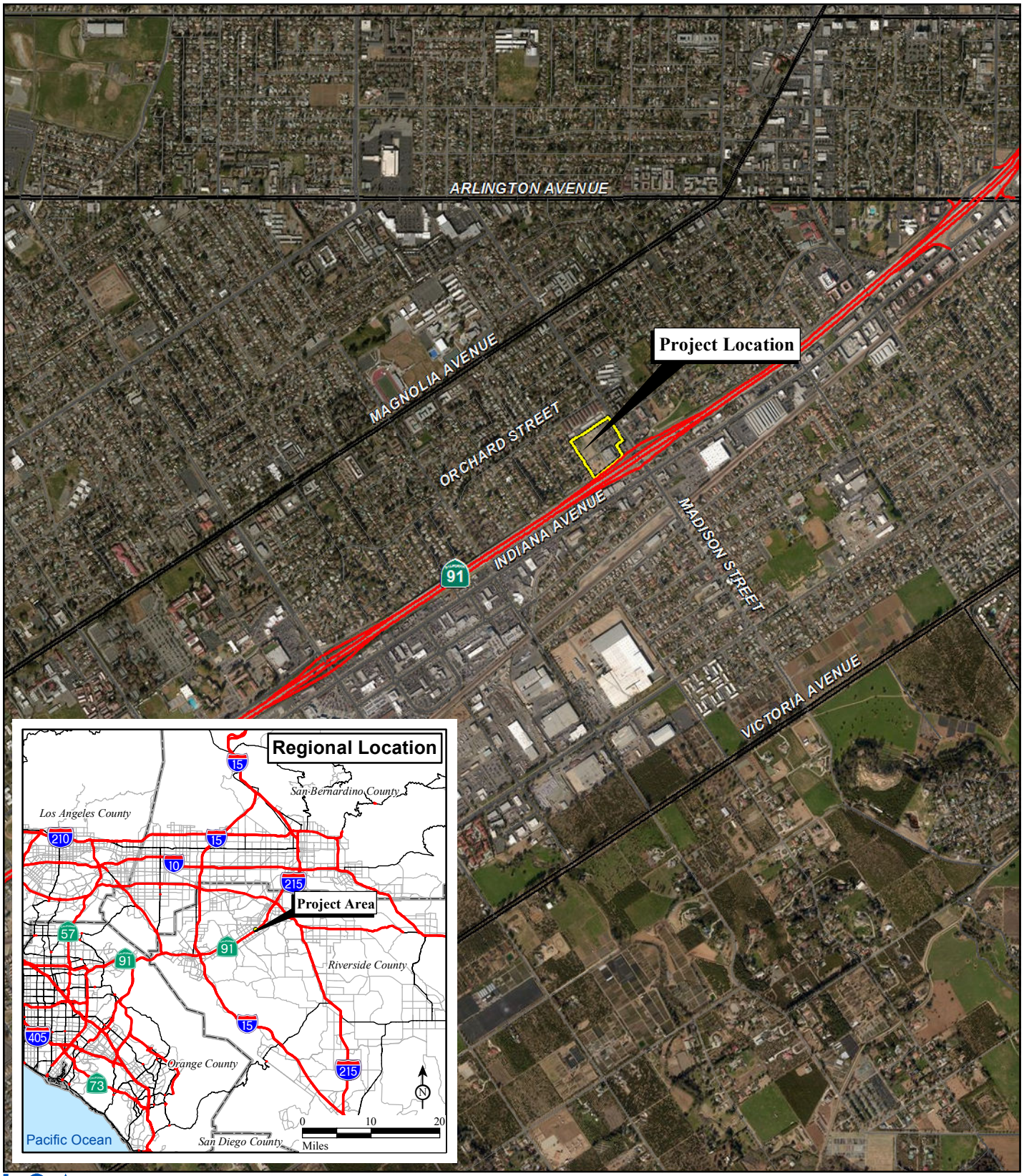

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FIGURE 1

N

0 1000 2000

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SOURCE: Bing Aerial, 2015; County of Riverside, 2015.

Madison Plaza

Regional and Project Location

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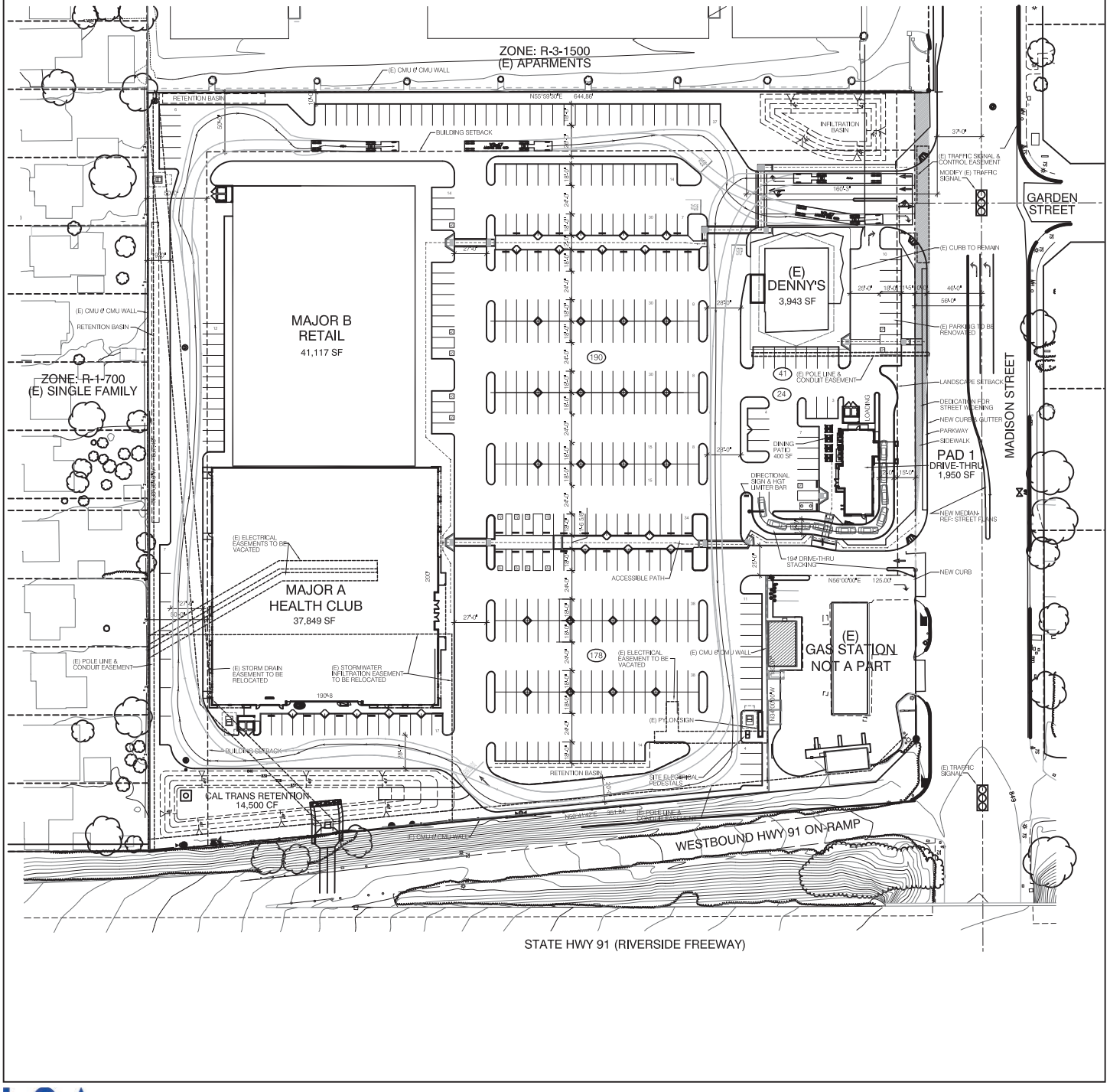

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FIGURE 2

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Madison Plaza

Conceptual Site Plan

SOURCE: GK Pierce Architects, December 7, 2012

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Methodology Related to Noise Impact Assessment

Evaluation of noise and vibration impacts associated with the proposed project includes the following:

- Determine the short-term construction noise and vibration impacts on off-site noise-sensitive uses
- Determine the long-term traffic noise impacts on on-site and off-site sensitive areas
- Determine the long-term traffic vibration impacts on off-site sensitive uses
- Determine the long-term stationary source noise and vibration impacts on off-site noise-sensitive uses
- Determine the required mitigation measures to reduce noise and vibration impacts

Characteristics of Sound

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units (e.g., inches or pounds), decibels (dB) are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 1 dB, 20 dB is 100 times more intense than 1 dB, and 30 dB is 1,000 times more intense than 1 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 1 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 A-weighted decibels (dBA) (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dBA for each doubling of distance in a hard site environment. Line source noise (noise in a relatively flat environment with absorptive vegetation) decreases 4.5 dBA for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average level (L_{dn}) based on dBA. CNEL is the time varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The City uses the CNEL noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise level of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure (typically more than 8 hours, as defined by the Occupational Safety and Health Administration [OSHA]) to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire body system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the

heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dB, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dB, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160 to 165 dB will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their noise sources. Table C shows noise and land use compatibility criteria from the City General Plan 2025 Noise Element, *Noise/Land Use Noise Compatibility Criteria* (adopted in November 2007).

Vibration

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration include construction activities (e.g., blasting, pile driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (FTA 2006). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. For most projects, it is assumed that the roadway surface would be smooth enough that ground-borne vibration from street traffic would not exceed the impact criteria; however, both construction of the project and the delivery truck operations could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. It is not uncommon for construction processes (e.g., blasting and pile driving) to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2006). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV).

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of level that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1%, 10%, 50%, and 90% of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dB to sound levels occurring in the evening from 7:00 PM to 10:00 PM. and after the addition of 10 dB to sound levels occurring in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dB to sound levels occurring in the night between 10:00 PM and 7:00 AM.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

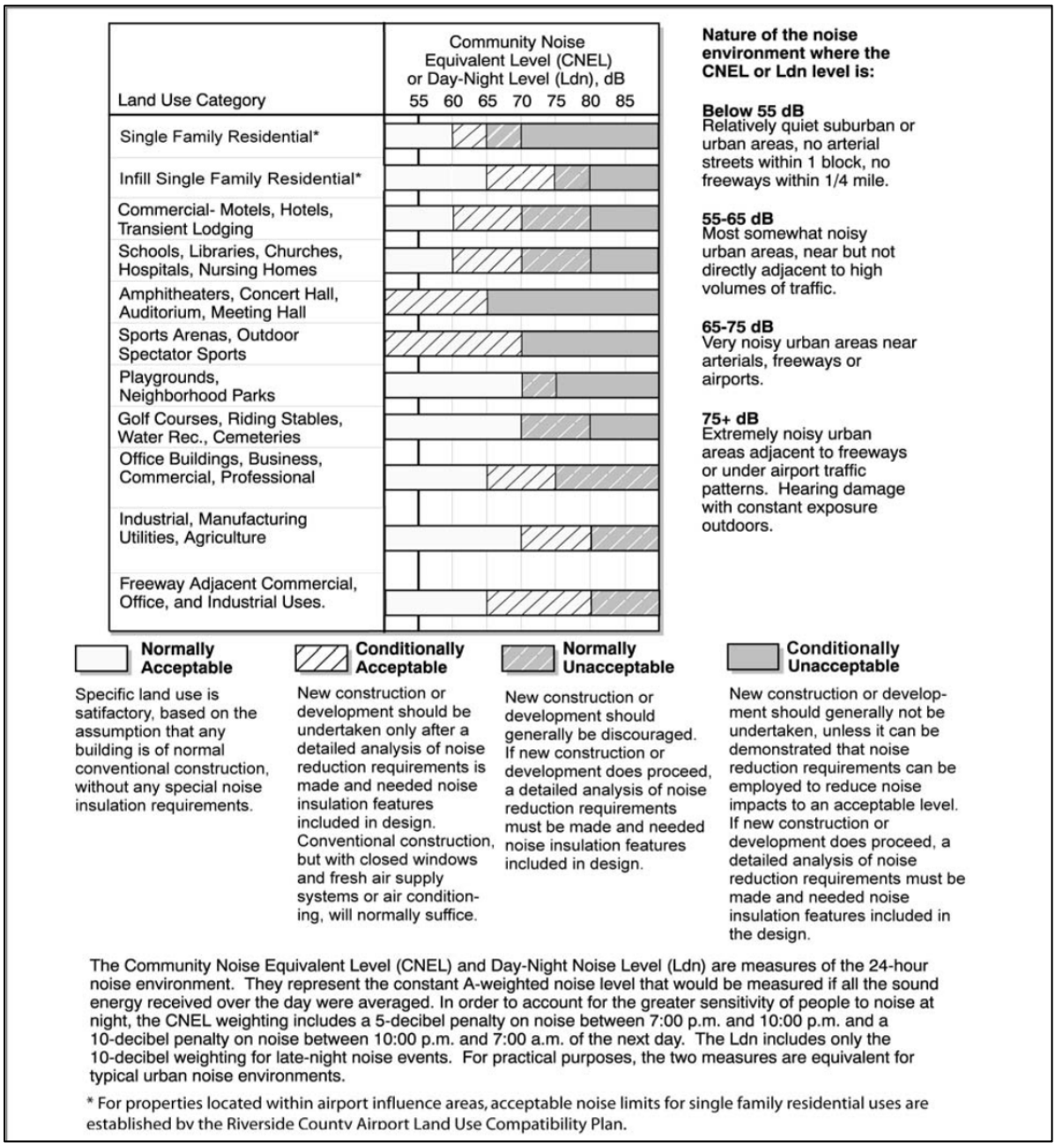
Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environment	Subjective Evaluation
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle a few feet away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	
Near Freeway Auto Traffic	70	Moderately Loud	Reference Level
Average Office	60	Quiet	½ as loud
Suburban Street	55	Quiet	
Light Traffic; Soft Radio Music in Apartment	50	Quiet	1/4 as loud
Large Transformer	45	Quiet	
Average Residence Without Stereo Playing	40	Faint	⅛ as loud
Soft Whisper	30	Faint	
Rustling Leaves	20	Very Faint	
Human Breathing	10	Very Faint	Threshold of Hearing
	0	Very Faint	

Source: Compiled by LSA Associates, Inc. (2015).

Table C: Noise/Land Use Noise Compatibility Criteria



Source: Figure N-10, Riverside General Plan 2025 Noise Element, *Noise/Land Use Noise Compatibility Criteria* (City of Riverside 2007).

The RMS is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

Where L_v is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or $1x10^{-6}$ inches per second used in the United States. Table D illustrates human response to various vibration levels, as described in the *Transit Noise and Vibration Impact Assessment* (FTA 2006).

Table D: Human Response to Different Levels of Ground-Borne Noise and Vibration

Vibration Velocity Level	Noise Level		Human Response
	Low-Frequency[1]	Mid-Frequency[2]	
65 VdB	25 dBA	40 dBA	Approximate threshold of perception for many humans. Low-frequency sound usually inaudible; mid-frequency sound excessive for quiet sleeping areas.
75 VdB	35 dBA	50 dBA	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level unacceptable. Low-frequency noise acceptable for sleeping areas; mid-frequency noise annoying in most quiet occupied areas.
85 VdB	45 dBA	60 dBA	Vibration acceptable only if there are an infrequent number of events per day. Low-frequency noise unacceptable for sleeping areas; mid-frequency noise unacceptable even for infrequent events with institutional land uses (e.g., schools and churches).

Source: *Transit Noise and Vibration Impact Assessment* (FTA 2006).
[1] Approximate noise level when vibration spectrum peak is near 30 Hz.
[2] Approximate noise level when vibration spectrum peak is near 60 Hz.
dBA = A-weighted decibels
FTA = Federal Transit Administration
Hz = Hertz
VdB = vibration velocity decibels

Factors that influence ground-borne vibration and noise include the following:

- **Vibration Source:** Vehicle suspension, wheel types and condition, railroad track/roadway surface, railroad track support system, speed, transit structure, and depth of vibration source
- **Vibration Path:** Soil type, rock layers, soil layering, depth to water table, and frost depth
- **Vibration Receiver:** Foundation type, building construction, and acoustical absorption

Among the factors listed above, there are significant differences in the vibration characteristics when the source is underground compared to when the source is at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of ground-borne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock.

Experience with ground-borne vibration indicates (1) vibration propagation is more efficient in stiff, clay soils than in loose, sandy soils; and (2) shallow rock seems to concentrate the vibration energy

close to the surface and can result in ground-borne vibration problems at large distances from a railroad track. Factors including layering of the soil and the depth to the water table can have significant effects on the propagation of ground-borne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils.

EXISTING CONDITIONS

Land Uses in the Project Vicinity

Sensitive receptors surrounding the project site consist of residential uses to the north and west. Single-family homes are located approximately 50 ft to the west of the project boundary. Multifamily apartments are located to the north approximately 53 ft from the project's northern boundary. The areas adjacent to the project site include the following uses:

- Two-story multi-family apartments (north);
- Commercial uses across Madison Street (east);
- Single-family residences (west); and
- Riverside Freeway and westbound on-ramp (south).

The project site has a 6 ft high concrete masonry unit (CMU) wall along its western boundary and a 5 ft high perimeter wall along its northern boundary.

Overview of the Existing Noise Environment

The primary existing noise sources in the project area are transportation facilities. Traffic on SR-91, Madison Street, and other local streets is the dominant source of ambient noise. Based on the existing traffic noise modeling results (see Table K later in this report), the single-family residences to the west of the project site range from 100 ft to 720 ft from the centerline of SR-91 and are exposed to traffic noise levels between 73 dBA CNEL and 86 dBA CNEL without considering the barrier effect along the freeway. With the noise barrier effect included, these residences are exposed to traffic noise from the SR-91 estimated to be in the range of 60 to 75 dBA CNEL. Apartment units to the north of the project site range from 180 ft to 660 ft from the centerline of Madison Street, and are exposed to traffic noise from Madison Street ranging from 55 dBA CNEL to 63 dBA CNEL. These CNEL values are representative of existing ambient noise levels at these existing noise-sensitive uses because there are no other major noise sources in the project vicinity that would affect existing ambient noise levels.

Thresholds of Significance

A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and goals of the community in which it is located. The applicable noise standards governing the project site are the noise criteria listed in the City's Municipal Code and in the Noise Element of the General Plan.

Based on the standards and thresholds identified earlier, the effects of the proposed project have been categorized as either "less than significant impact" or a "potentially significant impact." Mitigation measures are recommended for potentially significant impacts. If a potentially significant impact cannot be reduced to a less than significant level through the application of mitigation, it is categorized as a significant unavoidable impact.

City of Riverside Noise Element. The City in its General Plan Noise Element has established noise/ land use noise compatibility criteria. Single-family and multi-family residences are normally acceptable in exterior noise environments up to 60 dBA CNEL and conditionally acceptable in exterior noise environments of up to 65 dBA CNEL. Infill residential uses are normally acceptable in exterior noise environments up to 65 dBA CNEL and conditionally acceptable in exterior noise environments of up to 75 dBA CNEL. Interior noise levels within residential structures are acceptable up to 45 dBA CNEL. Commercial uses are normally acceptable in exterior noise environments of up to 65 dBA CNEL. Industrial uses are normally acceptable up to 70 dBA CNEL. For the purposes of this noise and vibration impact analysis, multifamily (apartments or condominiums) uses with outdoor active use areas (e.g., patios or balconies) exposed to noise levels exceeding 65 dBA CNEL would need to be mitigated.

City of Riverside Municipal Code Noise Ordinance. The City has incorporated the following measures in its Municipal Code to control loud, unnecessary, and unusual nuisance noises:

- **Exterior Sound Level Limits.** Unless a variance has been granted it shall be unlawful for any person to cause or allow the creation of any noise which exceeds the following:
    - The exterior noise standard of the applicable land use category (see Table E), up to 5 dB (up to 60 dBA during the day and up to 50 dBA during the night), for a cumulative period of more than 30 minutes in an hour; or
    - The exterior noise standard of the applicable land use category, plus 5 dB (60 dBA during the day and 50 dBA during the night), for a cumulative period of more than 15 minutes in any hour; or
    - The exterior noise standard of the applicable land use category, plus 10 dB (65 dBA during the day and 55 dBA during the night), for a cumulative period of more than 5 minutes in any hour; or
    - The exterior noise standard of the applicable land use category, plus 15 dB (70 dBA during the day and 65 dBA during the night), for a cumulative period of more than 1 minute in any hour; or
    - The exterior noise standard of the applicable land use category, plus 20 dB (75 dBA during the day and 70 dBA during the night) or the maximum measured ambient noise level, for any period of time.
- **Interior Sound Level Limits.** No person shall operate or cause to be operated, any source of sound indoors that causes the noise level, when measured inside another dwelling unit, school or hospital, to exceed:

- The interior noise standard for the applicable noise category (see Table E), up to 5 dB (up to 50 dBA during the day and up to 40 dBA during the night), for a cumulative period of more than 5 minutes in any hour; or
- The interior noise standard for the applicable land use category, plus 5 dB (55 dBA during the day and 45 dBA during the night), for a cumulative period of more than 1 minute in any hour; or
- The interior noise standard for the applicable land use category, plus 10 dB (60 dBA during the day and 50 dBA during the night) or the maximum measured ambient noise level, for any period of time.

Table E: City of Riverside Sound Level Limits (dBA)

Land Use Category	Time Period	Exterior Noise Standard	Interior Noise Standard
Residential	Night (10:00 PM to 7:00 AM) Day (7:00 AM to 10:00 PM)	45 55	35 45
School	7:00 AM to 10:00 PM (while school is in session)	N/A[1]	45
Hospital	Anytime	N/A	45
Office/Commercial	Anytime	65	N/A
Industrial	Anytime	70	N/A
Community Support	Anytime	60	N/A
Public Recreation Facility	Anytime	65	N/A
Nonurban	Anytime	70	N/A

Source: Municipal Code (City of Riverside 2005).
[1] N/A = Not Applicable. The City of Riverside has not established a sound level limit for this land use.
dBA = A-weighted decibels

Based on Table E and Sections 7.25.010 and 7.30.015 of the City Municipal Code, the maximum peak exterior noise level for residential uses is 75 dBA L_{max} (55 dB + 20 dB) during daytime hours and 65 dBA L_{max} (45 dB + 20 dB) during nighttime hours, or the maximum measured ambient noise level for any period of time. Similarly, the maximum peak interior nuisance noise level for residential uses is 55 dBA L_{max} (45 dB + 10 dB) during daytime hours and 45 dBA L_{max} (35 dB + 10 dB) during nighttime hours, or the maximum measured ambient noise level for any period of time.

Construction activities are restricted within the City to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday, and 8:00 a.m. to 5:00 p.m. on Saturdays, and are prohibited on Sundays and federal holidays.

Vibration. Based on the FTA *Transit Noise and Vibration Impact Assessment* (2006) and depending on the building category of the nearest buildings adjacent to the project site, the potential construction vibration damage criteria vary.

The FTA in its *Transit Noise and Vibration Impact Assessment* (2006) included ground-borne vibration and noise impact criteria guidance, as shown in Table F.

Table F: Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 µin/sec)		Ground-Borne Noise Impact Levels (dB re 20 µPa)	
	Frequent[1] Events	Infrequent[2] Events	Frequent[1] Events	Infrequent[2] Events
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	B[4]	B[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Source: *Transit Noise and Vibration Impact Assessment* (FTA 2006).

1 "Frequent Events" is defined as more than 70 events per day.

2 "Infrequent Events" is defined as fewer than 70 events per day.

3 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research requires detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

4 Vibration-sensitive equipment is used in buildings where sufficient noise attenuation is provided; additionally, such equipment is not sensitive to either airborne or ground-borne noise.

µin/sec = microinches per second
µPa = micropascals
dB = decibels
dBA = A-weighted decibels
FTA = Federal Transit Administration
HVAC = heating, ventilation, and air conditioning
VdB = vibration velocity decibels

The criteria presented in Table F account for variation in project types, as well as the frequency of events, which differ widely among transit projects. Although the criteria are provided for community response to ground-borne vibration from rail rapid transit systems, they also provide useful guidelines for human response to exposure to vibration in general and are used in this analysis for vibration impact assessment. Table G lists the vibration damage criteria for various structural categories. These are identified by the FTA as criteria that should be used during the environmental impact assessment phase or environmental review process in general to identify problem locations that must be addressed during final design (FTA 2006).

Tables F (criteria in terms of VdB) and G (criteria in terms of inches per second [in/sec] and VdB) are used to evaluate the effects of vibration on human response and structural damage. For example, for a building that is constructed with reinforced concrete with no plaster, the FTA guidelines show that a vibration level of up to 102 VdB (0.5 in/sec) (FTA 2006) is considered safe and would not result in any construction vibration damage. For a nonengineered timber and masonry building, the construction vibration damage criterion is 94 VdB (0.2 in/sec).

Table G: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate Lv[1]
Reinforced concrete, steel, or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Nonengineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

Source: *Transit Noise and Vibration Impact Assessment* (FTA 2006).
[1] RMS VdB re 1 µin/sec.
µin/sec = microinches per second
in/sec = inches per second
Lv = 20 log10 (V/Vref) is the vibration velocity in decibels
PPV = peak particle velocity
RMS = root mean square
VdB = vibration velocity decibels

IMPACTS AND MITIGATION MEASURES

Short-Term Construction-Related Impacts

Short-term noise impacts would be associated with grading and erecting of buildings on site during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today, but would no longer occur once construction of the project is completed. Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 87 dBA L_{max}), the effect on longer term (hourly or daily) ambient noise levels would be small. Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during grading and building erection on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment, and consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site, and therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists typical construction noise levels (L_{max}) included in the Federal Highway Administration (FHWA) *Highway Construction Noise Handbook* (2006) that are based on a distance of 50 ft between the equipment and a noise receptor. Typical noise levels range up to 86 dBA L_{max} at 50 ft during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery, such as backfillers, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 or 4 minutes at lower power settings.

Table H: RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Impact Device?	Acoustical Usage Factor	Spec. 721.560 L_{max} at 50 ft (dBA, slow)	Actual Measured L_{max} at 50 ft (dBA, slow)	No. of Actual Data Samples (Count)
All other Equipment > 5 HP	No	50	85	N/A	0
Auger Drill Rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar Bender	No	20	80	N/A	0
Blasting	Yes	N/A	94	N/A	0
Boring Jack Power Unit	No	50	80	83	1
Chain Saw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Batch Plant	No	15	83	N/A	0
Concrete Mixer Truck	No	40	85	79	40
Concrete Pump Truck	No	20	82	81	30
Concrete Saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill Rig Truck	No	20	84	79	22
Drum Mixer	No	50	80	80	1
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flat Bed Truck	No	40	84	74	4
Front End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (< 25 kVA, VMS Signs)	No	50	70	73	74
Gradall	No	40	85	83	70
Grader	No	40	85	N/A	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal Boring Hydraulic Jack	No	25	80	82	6
Hydra Break Ram	Yes	10	90	N/A	0
Impact Derive	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man Lift	No	20	85	75	23
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	212
Pavement Scarifier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Refrigerator Unit	No	100	82	73	3
Rivet Buster/Chipping Gun	Yes	20	85	79	19
Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand Blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Sheers (on backhoe)	No	40	85	96	5
Slurry Plant	No	100	78	78	1
Slurry Trench Machine	No	50	82	80	75
Soil Mix Drill Rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum Excavator (Vac-Truck)	No	40	85	85	149
Vacuum Street Sweeper	No	10	80	82	19

Table H: RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Impact Device?	Acoustical Usage Factor	Spec. 721.560 L_{max} at 50 ft (dBA, slow)	Actual Measured L_{max} at 50 ft (dBA, slow)	No. of Actual Data Samples (Count)
Ventilation Fan	No	100	85	79	13
Vibrating Hopper	No	50	85	87	1
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder/Torch	No	40	73	74	5

Source: *Highway Construction Noise Handbook* (FHWA 2006).
dBA = A-weighted decibels
FHWA = Federal Highway Administration
ft = foot/feet
HP = horsepower
kVA = kilovolt-ampere
L_{max} = maximum instantaneous noise level
N/A = Not Applicable
RCNM = Roadway Construction Noise Model
VMS = variable-message sign

Construction Noise. Construction of the proposed project is expected to require the use of earthmoving equipment such as bulldozers, haul trucks, front-end loaders, and water and pickup trucks at the project site. Based on the information in Table H, the maximum noise level generated by each scraper on the proposed project site is assumed to be 84 dBA Lmax at 50 ft from the scraper. Each bulldozer would generate 82 dBA Lmax at 50 ft from the bulldozer. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, the worst-case combined noise level during this phase of construction would be 86 dBA L_{max} at a distance of 50 ft from the active construction area. Land uses adjacent to the project site include residential, streets, and highways. Construction on the project site would potentially expose noise-sensitive uses in the project vicinity to intermittent noise levels exceeding 80 dBA L_{max} during project construction. The multi-family apartments to the north of the project site are approximately 53 ft from the project boundary and are shielded by an existing 5 ft high perimeter wall and the single-family homes to the west are approximately 50 ft from the project boundary and are shielded by an existing 6 ft high perimeter wall. These residences would be potentially exposed to intermittent maximum construction noise reaching 80 dBA. However, the proposed project would be exempt from Title 7, Noise Control, of the Municipal Code provided that noise sources associated with construction, repair, remodeling, or grading take place between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and between 8:00 a.m. and 5:00 p.m. on Saturdays. Construction would be prohibited on Sundays and federal holidays.

To the east of the project site, the commercial uses are more than 200 ft from the project construction area and are not considered noise sensitive. Noise from on-site construction would not only be reduced by the distance attenuation but would also be masked by traffic noise on Madison Street, so no sensitive receivers on the east side of Madison Street would be exposed to substantial noise from on-site construction activity. As a worst-case scenario, even if construction noise occurs continuously and lasts for hours, the resulting noise level on the east side of Madison Street would be below 65 dBA L_{max}, a level that is lower than or compatible with traffic noise from Madison Street. No significant noise impacts would occur from project construction noise.

Construction Vibration. Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernable, but without the effects associated with the shaking of a building there is less adverse reaction. Construction on the project site would result in the exposure of persons to excessive ground-borne vibration or ground-borne noise levels. Ground-borne vibration during construction activity is temporary and would cease to occur after project construction is completed.

The proposed project would require the use of excavators, scrapers, and graders, as well as a bulldozer and other construction equipment. As shown in Table I, a large bulldozer would generate approximately 0.089 PPV (in/sec) when measured at 25 ft, while a loaded truck would generate 0.076 PPV (in/sec) at 25 ft. Table H also shows that caisson drilling and a jackhammer would generate approximately 0.035 to 0.089 PPV (in/sec) when measured at 25 ft.

Table I: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	**L_V (VdB)**
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks	**0.076**	**86**
Jackhammer	**0.035**	**79**
Small Bulldozer	0.003	58

Sources: *Transit Noise and Vibration Impact Assessment* (FTA 2006).
Note: Equipment and associated source vibration levels that are expected to be used on the project site are shown in **bold**.
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inches per second
L_V = velocity in decibels
PPV = peak particle velocity
VdB = velocity decibels

Vibration propagation is more efficient in stiff, clay soils than in loose, sandy soils. Shallow rock concentrates the vibration energy close to the surface and can result in ground-borne vibration problems at some distance from the source. Factors such as layering of the soil and depth to the water table can have significant effects on the propagation of ground-borne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils.

Regarding the potential for building damage, Table I shows that vibration levels from construction equipment and activities, including bulldozers, drilling, trucks, and jackhammers, would be less than 0.1 in/sec at 25 ft from the project site and lower than the PPV of 0.2 in/sec vibration damage criteria at the nearest residential structures that are more than 50 ft away for nonengineered timber and masonry buildings (FTA 2006). For new residential buildings, the vibration damage potential threshold recommended by Caltrans is 1 in/sec from transient sources, such as pile driving and blasting. Caltrans also states that it takes at least 0.9 in/sec of PPV for the human response to be strongly perceptible, or 0.25 in/sec to be distinctly perceptible (Caltrans 1992). The nearest residences are approximately 50 ft to the west and 53 ft to the north, and no commercial/industrial buildings are

within 50 ft of the project construction area. None of the predicted vibration levels (all below 0.1 in/sec) for sensitive uses in the vicinity of the project site would reach either of these two threshold levels. Thus, no significant vibration impacts are anticipated, and no mitigation is required.

The closest buildings/structures in the project vicinity are the residential structures located approximately 50 ft from the project construction area. Table I shows that none of the construction activities anticipated on the project site would result in a vibration level that would reach 2 in/sec PPV. Therefore, no building damage would occur as a result of the project construction.

Vibration levels from standard construction equipment are shown below for various pieces of construction equipment that are expected to be used on the project site:

- Large dozers, front end loaders, grader, backhoe (87 VdB at 25 ft)
- Loaded trucks (86 VdB at 25 ft)
- Jackhammers, forklift (79 VdB at 25 ft)

Based on the following formula for vibration transmission,

$$\text{LvdB (D)} = \text{LvdB (25 ft)} - 30 \text{ Log (D/25)}$$

a vibration level at 50 ft is 9 VdB lower than the vibration level at 25 ft. Vibration at 100 ft from the source is 18 VdB lower than the vibration level at 25 ft.

Table J lists the projected vibration level from various construction equipment expected to be used on the project site to the sensitive uses in the project vicinity. For typical construction activity, the equipment with the highest vibration generation potential is the large bulldozers, which would generate 87 VdB at 25 ft. With the vibration attenuation through distance divergence, the vibration from project construction would be reduced to 78 VdB or lower at the nearest residential buildings adjacent to the project site. Vibration levels from project construction would therefore be reduced to 78 VdB (0.033 in/sec PPV) or lower at the nearest residential buildings to the west and north. This range of vibration levels from construction equipment or activity would be below the FTA 94 VdB (0.2 in/sec PPV) threshold and would not exceed the 80 VdB threshold for residences due to infrequent events. No significant construction vibration impacts would occur; therefore, no mitigation measures are required.

Long-Term Vehicular Traffic Noise Impacts

The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. Traffic volumes provided in the Traffic Impact Study (LSA 2016), in terms of peak hour turn volumes at affected roadway intersections in the project vicinity, were used to assess the existing and future traffic noise impacts. These peak hour turn volumes were converted to 24-hour daily volumes with a factor of 10 and then entered into the FHWA highway traffic noise prediction model. A typical vehicle mix for Southern California was used. Table K provides the traffic noise levels along the roadways adjacent to the project site under the existing (2016) conditions. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and

the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and model printouts are provided in Appendix A.

Table J: Summary of Construction Equipment and Activity Vibration

Equipment/Activity	Vibration Level (VdB)			
	At 25 ft	Distance Attenuation	Intervening Buildings/ Sound Walls[1]	Maximum Vibration Level
Residences adjacent to the site, 50 ft				
Large dozers, front end loaders, grader, backhoe	87	9	0	78
Loaded trucks	86	9	0	77
Jackhammers, forklift	79	9	0	70

Source: Compiled by LSA Associates, Inc. (2016).
Note: The FTA recommended threshold is 0.2 in/sec or approximately 94 VdB at the receiving property structure or building.
[1] Intervening buildings/sound walls put weight on the transmission path and provide a damping effect on vibration.
[2] Large bulldozers represent the construction equipment with the highest vibration potential that would be used on site. Other equipment would result in lower vibration levels compared to that of large bulldozers.
ft = feet
in/sec = inches per second
FTA = Federal Transit Administration
VdB = vibration velocity decibels

Table K: Existing Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 dBA CNEL (Feet)	Centerline to 65 dBA CNEL (Feet)	Centerline to 60 dBA CNEL (Feet)	CNEL (dBA) 50 Feet from Centerline of Outermost Lane
Madison Street north of Magnolia Avenue	10,600	< 50	107	227	67.6
Madison Street between Magnolia Avenue and Orchard Street	13,900	63	128	271	68.8
Madison Street between Orchard Street and Garden Street	14,800	65	133	283	69.1
Madison Street between Garden Street and Indiana Avenue	16,500	70	143	304	69.5
Madison Street between Indiana Avenue and Evans Street	11,800	57	115	243	68.1
Madison Street east of Evans Street	10,400	< 50	106	224	67.5
Magnolia Avenue west of Madison Street	17,600	72	149	317	69.8
Magnolia Avenue east of Madison Street	17,600	72	149	317	69.8
Orchard Street west of Madison Street	1,900	< 50	< 50	< 50	57.7
Orchard Street east of Madison Street	600	< 50	< 50	< 50	52.7
Garden Street east of Madison Street	3,500	< 50	< 50	59	60.4
Indiana Avenue west of Madison Street	12,900	< 50	101	216	67.7
Indiana Avenue east of Madison Street	14,200	< 50	108	230	68.2
Evans Street west of Madison Street	1,400	< 50	< 50	< 50	56.4
Evans Street east of Madison Street	1,400	< 50	< 50	< 50	56.4
SR-91 at Madison Street	175,500	1,120	2,411	5,194	87.3

Source: Compiled by LSA Associates, Inc. (July 2016).
Note: Traffic noise within 50 feet of the roadway centerline should be evaluated with site-specific information.

Table K: Existing Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 dBA CNEL (Feet)	Centerline to 65 dBA CNEL (Feet)	Centerline to 60 dBA CNEL (Feet)	CNEL (dBA) 50 Feet from Centerline of Outermost Lane

ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
SR91 = State Route 91

Table K shows that, under existing conditions, traffic noise levels along roadway segments in the project vicinity are moderate to high along Madison Street, Indiana Avenue, and Magnolia Avenue, with the 65 dBA CNEL extending to 149 ft from the roadway centerline. Traffic noise levels along Orchard Street and Evans Street are low, with both the 70 and 65 dBA CNEL contours confined to within the roadway right-of-way.

Traffic on the Riverside Freeway has 172,000 average daily traffic (ADT) volumes in 2014. Assuming a 1 percent annual growth, the traffic will grow to 175,500 ADT under the existing condition. It is also assumed that the proposed project would not measurably add to the traffic volumes on SR-91. Therefore, this ADT would continue to be 175,500 in 2017.

Tables L and M provide the traffic noise levels for the without and with project conditions along the roadways adjacent to the project site under the Existing and Opening Year (2017) traffic conditions. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and model printouts are provided in Appendix A.

Based on the traffic study, the proposed project is expected to generate a daily traffic volume of 6,227 vehicle trips. These traffic volumes are expected to travel on roadways in the project vicinity. As a rule of thumb, traffic volumes would need to double the baseline volume to increase the traffic noise by 3 dBA. Because project-related traffic volumes would contribute a small percentage to the existing and projected daily traffic volumes on area roadways, as can be seen in Table L, which used the FHWA highway traffic noise prediction model (FHWA RD-77-108) to evaluate highway traffic-related noise conditions, the project-related traffic noise level increase along all area roadways would be less than 1 dBA over the corresponding without project levels. This range of traffic noise level increases is small and would not be discernible to the human ear in an outdoor environment. Similarly, for traffic on area roadways, project-related daily trips would be less than 10 percent of the opening year (2017) traffic volumes, and would increase the traffic noise by 0.9 dBA at most. None of the street segments would result in 3 dBA or higher project-related traffic noise level increases. No project-related traffic noise impacts on off-site land uses would occur, and no mitigation measures would be required.

For on-site proposed land uses, the 65 dBA CNEL from Madison Street would extend to 158 ft from the roadway centerline. The proposed on-site restaurants do not have any outdoor eating areas proposed that would be exposed to traffic noise levels exceeding 65 dBA CNEL, the City's acceptable noise level for such uses. In addition, no outdoor noise-sensitive uses would be associated with the proposed commercial and retail uses on the western portion of the project site. Traffic noise from SR-91 would not result in any significant noise impacts on the proposed on-site land uses. Therefore, no mitigation measures would be required.

The project would contribute towards an increase in the ambient traffic noise levels in the project vicinity, and in particular at the adjacent sensitive receptors. The adjacent sensitive receptors include the multi-family apartments to the north and the single family homes to the west. Based on the existing plus project traffic noise modeling results shown in Table , the single family residences to the west of the project site would be exposed to noise levels ranging from 73 dBA CNEL and 86 dBA CNEL without considering the barrier effect along the freeway. With the noise barrier effect included, these residences would be exposed to traffic noise from the SR-91 estimated to be in the range of 60 to 75 dBA CNEL, which exceeds the City's 65 dBA CNEL exterior standard for residential uses at more than half of these existing single family residences. However, the project's contribution to these noise levels is negligible, and is considered to be less than significant and no mitigation is required. Based on the existing plus project traffic noise modeling results shown in Table L, the apartment units to the north of the project site would be exposed to traffic noise from Madison Street ranging from 56 dBA CNEL to 64 dBA CNEL, which is below the City's 65 dBA CNEL exterior standard for residential uses. The project's contribution to these noise levels is up to 0.6 dBA, and is considered to be less than significant and no mitigation is required.

Based on the opening year plus project traffic noise modeling results shown in Table M, the single family residences to the west of the project site would be exposed to noise levels ranging from 73 dBA CNEL and 86 dBA CNEL without considering the barrier effect along the freeway. With the noise barrier effect included, these residences would be exposed to traffic noise from the SR-91 estimated to be in the range of 60 to 75 dBA CNEL, which exceeds the City's 65 dBA CNEL exterior standard for residential uses at more than half of these existing single family residences. However, the project's contribution to these noise levels is negligible, and is considered to be less than significant and no mitigation is required. Based on the opening year plus project traffic noise modeling results shown in Table M, the apartment units to the north of the project site would be exposed to traffic noise from Madison Street ranging from 56 dBA CNEL to 64 dBA CNEL, which is below the City's 65 dBA CNEL exterior standard for residential uses. The project's contribution to these noise levels is up to 0.6 dBA, and is considered to be less than significant and no mitigation is required.

The above roadway noise CNEL analysis conducted for existing plus project and opening year plus project conditions represents the project's effect on ambient noise levels at the adjacent noise-sensitive uses because there are no other major noise sources in the project vicinity that would affect existing ambient noise levels. In addition, the project's intermittent and peak noise levels are addressed in the following On-Site Operational Stationary Source Noise Impacts analysis. Increases to the ambient noise levels attributable to intermittent and peak stationary noise sources would be negligible, as they represent a short term noise metric in contrast to a 24-hour noise metric such as CNEL.

On-Site Operational Stationary Source Noise Impacts

Potential long-term noise impacts would be associated with on-site stationary sources. These activities are potential point sources of noise that could affect off-site, noise-sensitive receptors (e.g., residences to the north and west). On-site, noise-producing activities include rooftop heating, ventilation, and air-conditioning units (HVAC), loading/unloading activity, outdoor speakers at the drive-thru intercom, and parking lot activities that include slow-moving vehicles, doors slamming, vehicle engines starting, and people conversing in the parking lots.

Table L: Existing Traffic Noise Levels Without and With Project

Roadway Segment	Existing Without Project (Baseline)					Existing With Project						
	ADT	Centerline to 70 dBA CNEL (feet)	Centerline to 65 dBA CNEL (feet)	Centerline to 60 dBA CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	ADT	Change in ADT	Centerline to 70 dBA CNEL (feet)	Centerline to 65 dBA CNEL (feet)	Centerline to 60 dBA CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	Increase over Baseline CNEL (dBA) 50 feet from Centerline of Outermost Lane
Madison Street north of Magnolia Avenue	10,600	< 50	107	227	67.6	11,000	400	< 50	110	232	67.8	0.2
Madison Street between Magnolia Avenue and Orchard Street	13,900	63	128	271	68.8	14,900	1,000	66	133	284	69.1	0.3
Madison Street between Orchard Street and Garden Street	14,800	65	133	283	69.1	16,000	1,200	68	140	298	69.4	0.3
Madison Street between Garden Street and Indiana Avenue	16,500	70	143	304	69.5	18,900	2,400	75	156	332	70.1	0.6
Madison Street between Indiana Avenue and Evans Street	11,800	57	115	243	68.1	12,500	700	59	119	253	68.3	0.2
Madison Street east of Evans Street	10,400	< 50	106	224	67.5	10,600	200	< 50	107	227	67.6	0.1
Magnolia Avenue west of Madison Street	17,600	72	149	317	69.8	17,800	200	73	150	319	69.9	0.1
Magnolia Avenue east of Madison Street	17,600	72	149	318	69.8	17,800	200	73	150	319	69.9	0.1
Orchard Street west of Madison Street	1,900	< 50	< 50	< 50	57.7	2,100	200	< 50	< 50	< 50	58.2	0.5
Orchard Street east of Madison Street	600	< 50	< 50	< 50	52.7	600	0	< 50	< 50	< 50	52.7	0.0
Garden Street east of Madison Street	3,500	< 50	< 50	59	60.4	3,500	0	< 50	< 50	59	60.4	0.0
Indiana Avenue west of Madison Street	12,900	< 50	101	216	67.7	13,100	200	< 50	102	218	67.8	0.1
Indiana Avenue east of Madison Street	14,200	< 50	108	230	68.2	14,400	200	< 50	109	232	68.2	0.0
Evans Street west of Madison Street	1,400	< 50	< 50	< 50	56.4	1,600	200	< 50	< 50	< 50	57.0	0.6
Evans Street east of Madison Street	1,400	< 50	< 50	< 50	56.4	1,700	300	< 50	< 50	< 50	57.3	0.9
SR-91 at Madison Street	175,500	1,120	2,411	5,194	87.3	175,500	0	1,120	2,411	5,194	87.3	0.0

Source: LSA Associates, Inc. (July 2016).
Note: Traffic noise within 50 feet of the roadway centerline should be evaluated with site-specific information.
ADT = average daily traffic CNEL = Community Noise Equivalent Level dBA = A-weighted decibels

Table M: Opening Year (2017) Traffic Noise Levels Without and With Project

Roadway Segment	Opening Year (2017) Without Project (Baseline)					Opening Year (2017) With Project						
	ADT	Centerline to 70 dBA CNEL (feet)	Centerline to 65 dBA CNEL (feet)	Centerline to 60 dBA CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	ADT	Change in ADT	Centerline to 70 dBA CNEL (feet)	Centerline to 65 dBA CNEL (feet)	Centerline to 60 dBA CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	Increase over Baseline CNEL (dBA) 50 feet from Centerline of Outermost Lane
Madison Street north of Magnolia Avenue	10,800	< 50	109	230	67.7	11,200	400	56	111	235	67.9	0.2
Madison Street between Magnolia Avenue and Orchard Street	14,200	64	129	275	68.9	15,200	1,000	66	135	288	69.2	0.3
Madison Street between Orchard Street and Garden Street	15,100	66	135	286	69.2	16,300	1,200	69	141	301	69.5	0.3
Madison Street between Garden Street and Indiana Avenue	16,900	71	145	309	69.6	19,300	2,400	76	158	337	70.2	0.6
Madison Street between Indiana Avenue and Evans Street	12,100	58	117	247	68.2	12,800	700	60	121	257	68.4	0.2
Madison Street east of Evans Street	10,600	< 50	107	227	67.6	10,800	200	< 50	109	230	67.7	0.1
Magnolia Avenue west of Madison Street	18,000	73	151	322	69.9	18,200	200	74	152	324	70.0	0.1
Magnolia Avenue east of Madison Street	18,000	73	151	322	69.9	18,200	200	74	152	324	70.0	0.1
Orchard Street west of Madison Street	1,900	< 50	< 50	< 50	57.7	2,100	200	< 50	< 50	< 50	58.2	0.5
Orchard Street east of Madison Street	610	< 50	< 50	< 50	52.8	610	0	< 50	< 50	< 50	52.8	0.0
Garden Street east of Madison Street	3,500	< 50	< 50	59	60.4	3,500	0	< 50	< 50	59	60.4	0.0
Indiana Avenue west of Madison Street	13,200	< 50	103	219	67.8	13,400	200	< 50	104	221	67.9	0.1
Indiana Avenue east of Madison Street	14,600	53	110	234	68.3	14,800	200	54	111	236	68.3	0.0
Evans Street west of Madison Street	1,500	< 50	< 50	< 50	56.4	1,600	200	< 50	< 50	< 50	57.0	0.6
Evans Street east of Madison Street	1,500	< 50	< 50	< 50	56.7	1,700	200	< 50	< 50	< 50	57.3	0.6
SR-91 at Madison Street	177,300	1,128	2,428	5,229	87.4	177,300	0	1,128	2,428	5,229	87.4	0.0

Source: LSA Associates, Inc. (April 2016).
Note: Traffic noise within 50 feet of the roadway centerline should be evaluated with site-specific information.
ADT = average daily traffic CNEL = Community Noise Equivalent Level dBA = A-weighted decibels

As noise spreads from a source, it loses energy; thus, the farther the noise receiver is from the noise source, the lower the perceived noise level by the receiver. Geometric spreading causes the sound level to attenuate, or be reduced, resulting in a 6 dBA reduction in the noise level for each doubling of distance from a single-point source of noise (e.g., a car door slam) to the noise-sensitive receptor of concern.

On-site HVAC Mechanical Equipment Noise. The proposed buildings are expected to have rooftop HVAC equipment for central air system. The representative HVAC equipment would generate approximately 65 dBA L_{max} at 3 ft. The shortest distance between these residences to the west and where the HVAC units would be located is approximately 100 ft (30 dBA noise reduction compared to the noise level measured at 3 ft), and would be reduced to 35 dBA L_{max} by distance attenuation alone. Under the most stringent assumption that the maximum noise level would last over the entire period when the HVAC is being used, then the noise level from this stationary source would be 35 dBA L_{eq}. This range of noise levels would be lower than the ambient noise levels dominated by traffic noise from the SR-91 and would not exceed the City's 35 dBA exterior noise level threshold from stationary sources under the nighttime conditions (10:00 p.m. to 7:00 a.m.). Similarly, the shortest distance between existing multifamily residences to the north and the nearest on-site buildings with rooftop HVAC units is approximately 500 ft, which would provide 44 dBA of noise attenuation and reduce the HVAC noise to 21 dBA. No significant noise impacts at residences adjacent to the project site would occur and no mitigation would be required.

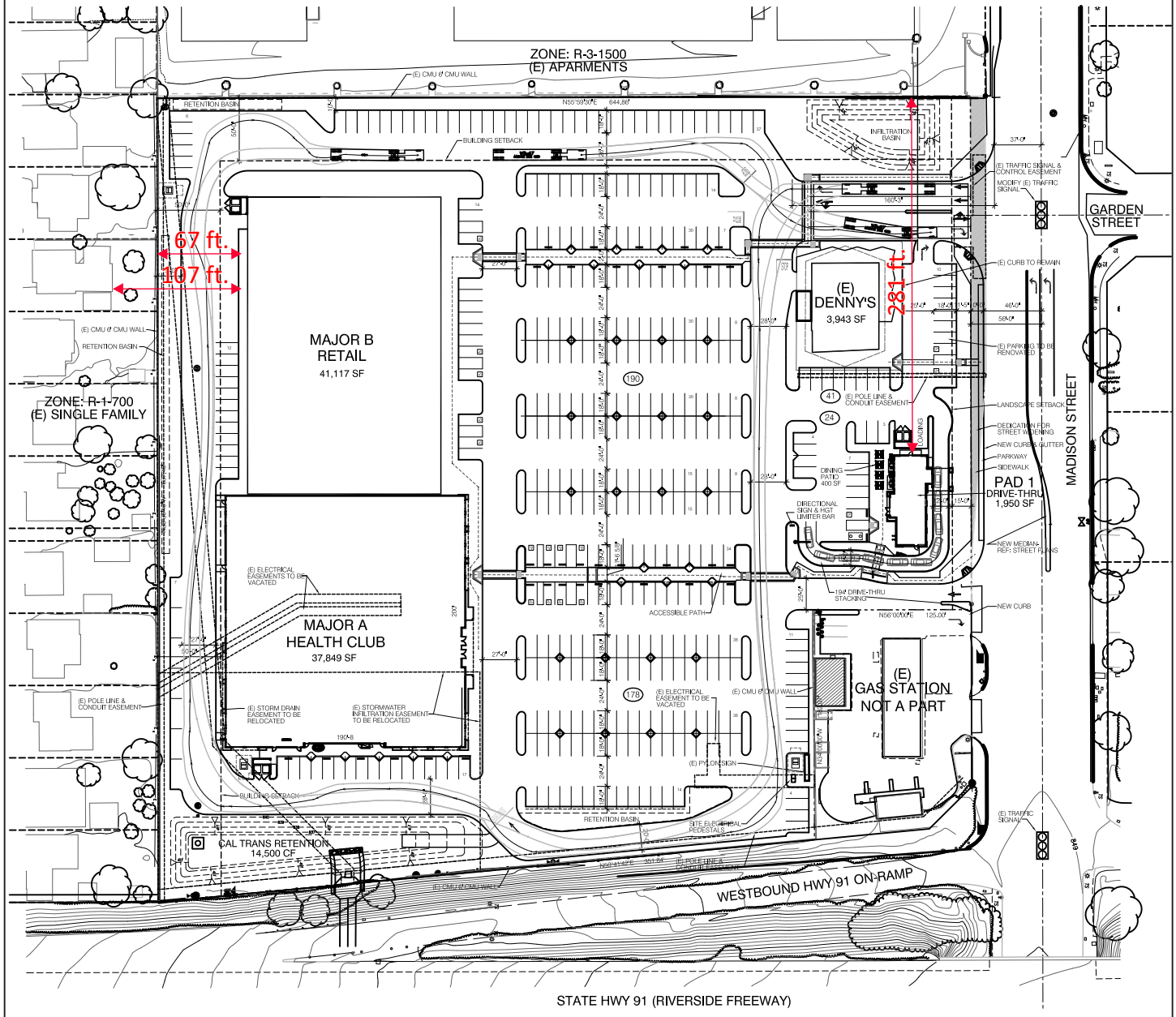
On-site Drive-thru Intercom Noise. Noise associated with menu board ordering was measured at close range at an existing McDonald's Restaurant on Rosecrans Avenue in the City of Norwalk (November 24, 2003). The sound level meter was positioned at a distance of approximately 15 feet from the speaker. When measured in front of the drive-through vehicle with the highest exposure to the speaker, sound from the speaker fluctuated between 55 and 65 dBA L_{max}. At a distance of 50 feet from the sound level meter, the menu board ordering noise would be reduced by 10 dBA to 45 to 55 dBA L_{max}. LSA conducted noise measurements at another existing McDonald's on Norwalk Boulevard in the City of Norwalk (January 14, 2004) at 50 feet from the existing menu board. Sound associated with menu board ordering ranged from 53.7 to 57.9 dBA and was audible or distinguishable only when there was no traffic on Norwalk Boulevard and Imperial Highway, i.e., when the background noise was low. Therefore, as a worst case scenario, the noise level range of 54 to 58 dBA is used in this analysis. At a distance of 500 feet, the drive-thru intercom noise would be reduced from 54 to 58 dBA to 34 to 38 dBA at the nearest existing multi-family residences to the north of the project site. The existing single-family residences more than 1,000 feet to the west would be partially shielded by the other on-site buildings, and noise associated with the drive-thru intercom would therefore be attenuated to a level that is not audible.

Truck Delivery and Loading/Unloading. Delivery trucks (including food trucks, Federal Express, United Parcel Service, and other trucks) and loading/unloading (including forklift) operations for the proposed commercial/restaurant uses would result in maximum noise readings similar to loading and unloading activities for other projects (Noise Impact Analysis for Poway Super Walmart, LSA, September 2001). Delivery trucks for the on-site commercial/restaurant uses would result in maximum noise similar to noise readings from loading/unloading activities for other commercial use projects, which would generate a noise level of 75 dBA L_{max} at 50 ft based on LSA's measurements

conducted in past years. The closest residential property line to the west is located approximately 67 ft from the loading dock at Major B Retail on the project site (see Figure 3). The closest residential building to the west is approximately 107 ft from this loading dock (see Figure 3). Delivery trucks would park at the loading dock to unload goods. The on-site commercial uses may have deliveries occurring once in the morning and once in the afternoon. The 67 ft distance would provide a noise reduction of 3 dBA compared to the noise level measured at 50 ft from the noise source. The 107 ft distance would provide approximately 7 dBA in noise attenuation compared to the noise level measured at 50 ft. In addition, the existing 6 ft high barrier would provide approximately 6 dBA in noise reduction. The loading/unloading noise associated with the on-site commercial uses would be reduced to 72 dBA L_{max} or lower at the property line or 63 dBA L_{max} at the nearest outdoor living areas (i.e., backyards measured 5 ft from the property line or perimeter wall) west of the project site. This range of loading/unloading noise would be lower than the City's 75 dBA L_{max} during daytime hours and 65 dBA L_{max} during nighttime hours.

The loading dock proposed for the 1,950 sf restaurant is located on the north side of the building, south of the existing Denny's building that will remain. Loading/unloading noise from the proposed restaurant would be blocked by the Denny's building itself from the nearest residences to the north, approximately 281 ft from this parking area (see Figure 3). The 281 ft distance would provide a noise reduction of 18 dBA compared to the noise level measured at 50 ft from the noise source, and the shielding provided by the proposed restaurant building would reduce the loading/unloading noise by at least 10 dBA. In addition, the existing 5 ft high wall would provide these residences at least 5 dBA in noise attenuation. Therefore, loading/unloading noise associated with the on-site restaurant uses would be reduced to 42 dBA L_{max} or lower at the nearest outdoor living areas (i.e., patios and/or balconies) north of the project site. This range of loading/unloading noise would be lower than the City's 75 dBA L_{max} during daytime hours and 65 dBA L_{max} during nighttime hours.

Although a typical truck unloading process takes an average of 15 to 20 minutes, the maximum loading/unloading noise level occurs in a much shorter period of time, in a few minutes over each truck delivery. In addition, truck idling for more than 5 minutes is not permitted under State regulations. For events lasting 5 minutes or shorter, the City's noise standards show that up to 65 dBA (L_8) is acceptable. Because this range of noise levels from the project site is below the City's exterior noise standards, noise associated with loading/unloading activities at on-site commercial/restaurant uses would not result in noise levels exceeding the noise standards at the nearest off-site outdoor living areas (i.e., backyards). In addition, the proposed landscaping along the western property line will further attenuate noise from trucks on the drive aisle. No mitigation is required.



LSA

FIGURE 3

X ft. Distance to Sensitive Recptors

0 61 122
FEET

Madison Plaza

Distance to Sensitive Receptors

SOURCE: GK Pierce Architects, December 7, 2012

I:\PRP1501\Reports\Environ\IS_MND\fig3_SensitiveReceptors.cdr (12/16/2016)

Based on the United States Environmental Protection Agency (EPA) *Protective Noise Levels* (EPA 1978), in warm-climate areas (e.g., Southern California), with windows or doors open, the exterior-to-interior noise attenuation would be 12 dBA. With windows closed, this noise attenuation increases to 24 dBA.

For off-site residential units that are located to the west of the project site near the proposed market uses, standard building construction (with windows closed) would provide sufficient exterior-to-interior noise attenuation (63 dBA - 24 dBA = 39 dBA) for noise from stationary sources to meet the City's 60 and 50 dBA L_{max} interior noise standards during daytime and nighttime hours, respectively. Since truck idling would not last more than 5 minutes and loading/unloading activity could last more than 5 minutes in any hour, the interior noise standard is adding 5 dBA to the applicable noise category (see Table E) for a cumulative period of more than 5 minutes in any hour, or up to 50 dBA (L_8) during the day and up to 40 dBA (L_8) during the night for residential uses. Therefore, loading/unloading activity noise would not exceed the most stringent nighttime interior noise standard for residential uses, with windows closed. With windows open (63 dBA - 12 dBA = 51 dBA), loading/unloading activity noise would potentially exceed the interior noise standards for residential uses. However, these residences have air conditioning unit, a form of mechanical ventilation, that would enable them to keep the windows closed for prolonged periods of time when necessary. All interior noise standards are based on the windows closed scenario for the determination of impact significance.

For off-site residential units to the north of the project site near the proposed restaurant uses, standard building construction (with windows rated Sound Transmission Class [STC] 24 to STC-28) would also provide sufficient exterior-to-interior noise attenuation (47 dBA - 24 dBA = 23 dBA) for noise from stationary sources to meet the City's 50 dBA L_{max} interior noise standard. Therefore, no window upgrades would be required to reduce the exterior stationary-source noise to meet the City's 50 dBA L_{max} interior noise standard.

Slow-Moving Project Trucks on the Perimeter Drive-Aisles. LSA's past noise measurement results show that vehicles, including trucks which generate higher pass-by noise than automobiles (Noise Impact Analysis for Poway Super Walmart, LSA 2001) at low speeds (15 to 35 miles per hour) would result in a maximum noise level of 68 dBA L_{max} at 50 ft. This noise level is used for this analysis. The closest residences to the north of the project site are approximately 60 ft from the driveway along the north side of the project site, and would be potentially exposed to vehicle pass-by noise intermittently reaching 66 dBA L_{max} without any shielding. The existing 5 ft high CMU wall would provide 6 dBA in noise reduction to ground-floor receivers at the apartment complex, thus reducing the intermittent maximum vehicle noise to 60 dBA L_{max}. Depending on the number of vehicles driving by on the northern driveway and the times they would occur (during daytime, evening, or nighttime hours), the effects to the 24-hour weighted average CNEL would vary. However, the CNEL is not expected to reach or exceed the City's 65 dBA CNEL exterior noise standard for residential uses due to the slow-moving vehicles on the northern driveway alone, because even if it occurs during the nighttime hours and last for more than an hour, it would contribute 58 dBA L_{eq} to that hour as a component of the 24 hour weighted average of CNEL, which is much lower than the 65 dBA CNEL noise standard. No significant operational noise impacts would occur, and no mitigation measure is required for residences to the north.

The existing residences to the west of the project site are more than 60 ft from the project's driveway along the western project boundary. The existing 6 ft high CMU wall along the western project boundary would provide shielding to the residences to the west of the project site. With the distance attenuation (2 dBA) and noise shielding from the existing wall (8 dBA), vehicle pass-by noise would be reduced to 58 dBA L_{max} or lower. Since vehicle pass-by lasts less than 5 seconds each time it occurs, the applicable noise standard is the maximum noise level threshold that should not be exceeded. Because the projected 58 dBA L_{max} is lower than the 75 dBA and 70 dBA L_{max} during the daytime and nighttime hours, respectively, for residential uses, the vehicle pass-by noise would not result in any significant noise impacts for residences to the west of the project site. In addition, vehicle noise on SR-91 would remain relatively high in this area and would mask the majority of the noise from the project site. Therefore, no mitigation measures are required for residences to the west.

Parking Lot Activity Noise. The representative parking lot activities (e.g., door slamming, engine starting, and slow-moving vehicles) would generate approximately 60 to 70 dBA L_{max} at 50 ft. The closest off-site residences to the north that are approximately 60 ft (2 dBA noise reduction compared to the noise level measured at 50 ft) away from the parking lot and shielded by the existing 5 ft high CMU wall (minimum 5 dBA noise reduction) would be exposed to noises from the project's nearest parking lot activities that would range from 53 to 63 dBA L_{max}. This range of intermittent noise levels would not result in significant noise impacts at residences to the north.

The existing residences to the west of the project site are approximately 100 ft (6 dBA noise reduction compared to the noise level measured at 50 ft) from the project's parking area and would be shielded by the existing 6 ft high CMU wall along the project's western boundary (minimum 6 dBA noise reduction). With the distance attenuation and noise shielding provided by the existing CMU wall, parking lot activity noise would be reduced to 58 dBA L_{max} or lower and would not result in any significant noise impacts. In addition, traffic noise from Madison Street would mask the majority of the noise from the project site. Therefore, no mitigation measures are required.

Long-Term Vehicular Traffic Vibration Impacts

Operations of the proposed project would not involve any vibration sources that would cause exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels. Vehicles with rubber tires on roadway segments surrounding the project site would not generate any significant ground-borne vibration that would exceed the 65 VdB perception threshold for such uses. No significant ground-borne vibration impacts would occur. No mitigation is required.

Mitigation Measures

Construction Impacts. The following measures would reduce short-term, construction-related noise impacts resulting from the proposed project:

- Construction activities are restricted within the City of Riverside to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, and 8:00 a.m. to 5:00 p.m. on Saturdays, and are prohibited on Sundays and federal holidays.

- During all project site excavation and grading on site, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.
- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

Traffic Noise Impacts. No mitigation measures are required.

On-Site Operational Noise Impacts. No mitigation measures are required.

On-Site Operational Vibration Impacts. No mitigation measures are required.

Level of Significance after Mitigation

Implementation of these mitigation measures for construction noise impacts would result in a less than significant impact for all potential noise and vibration impacts associated with the proposed project.

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APPENDIX A

FHWA HIGHWAY TRAFFIC NOISE PREDICTION MODEL PRINTOUTS

TABLE Existing-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street north of Magnolia Avenue
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10700 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.66

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	108.0	228.2	489.3

TABLE Existing-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Magnolia Avenue and Orchard Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14200 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.89

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
63.7	129.4	275.0	590.6

TABLE Existing-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Orchard Street and Garden Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 15100 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.16

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
66.0	134.7	286.4	615.2

TABLE Existing-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Garden Street and Indiana Avenue
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17200 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.73

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
71.3	146.5	312.2	670.9

TABLE Existing-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Indiana Avenue and Evans Street
NOTES: Madison Plaza - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12000 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.16

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
58.0	116.2	246.0	528.0

TABLE Existing-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street east of Evans Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10400 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.54

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	106.1	223.9	480.1

TABLE Existing-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue west of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17700 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.85

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
72.5	149.2	318.2	683.9

TABLE Existing-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue east of Madison Street
NOTES: Madison Plaza - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17700 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.85

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
72.5	149.2	318.2	683.9

TABLE Existing-09
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street west of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2000 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	88.0

TABLE Existing-10
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street east of Madison Street
NOTES: Madison Plaza - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 600 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 52.74

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	0.0

TABLE Existing-11
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Garden Street east of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.40

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	59.5	127.6

TABLE Existing-12
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue west of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 13000 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.78

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.0	217.0	466.1

TABLE Existing-13
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue east of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14300 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.19

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	108.5	231.1	496.6

TABLE Existing-14
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street west of Madison Street
NOTES: Madison Plaza - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1500 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	72.7

TABLE Existing-15
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street east of Madison Street
NOTES: Madison Plaza - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	72.7

TABLE Existing with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street north of Magnolia Avenue
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 11000 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.78

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	109.9	232.4	498.4

TABLE Existing with Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Magnolia Avenue and Orchard Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14900 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.10

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
65.5	133.5	283.9	609.8

TABLE Existing with Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Orchard Street and Garden Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 16000 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.41

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
68.3	139.8	297.6	639.4

TABLE Existing with Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Garden Street and Indiana Avenue
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18900 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.13

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	75.4	155.7	332.3	714.4

TABLE Existing with Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Indiana Avenue and Evans Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12500 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.34

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
59.3	119.3	252.8	542.5

TABLE Existing with Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street east of Evans Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10600 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.62

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	107.4	226.7	486.3

TABLE Existing with Project-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue west of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17800 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.87

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
72.7	149.8	319.4	686.4

TABLE Existing with Project-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue east of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17800 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.87

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
72.7	149.8	319.4	686.4

TABLE Existing with Project-09
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street west of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2100 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 58.18

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	90.9

TABLE Existing with Project-10
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street east of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 600 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 52.74

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	0.0

TABLE Existing with Project-11
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Garden Street east of Madison Street
NOTES: Madison Plaza - Existing with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3500 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.40

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	59.5	127.6

TABLE Existing with Project-12
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue west of Madison Street
NOTES: Madison Plaza - Existing with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 13100 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.81

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.5	218.1	468.5

TABLE Existing with Project-13
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue east of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14400 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.22

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	109.0	232.2	498.9

TABLE Existing with Project-14
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street west of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1600 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.00

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	75.9

TABLE Existing with Project-15
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street east of Madison Street
NOTES: Madison Plaza - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1700 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.26

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	79.0

TABLE 2017 Cumulative w/o Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street north of Magnolia Avenue
NOTES: Madison Plaza - 2017 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10900 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.74

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	109.3	231.0	495.4

TABLE 2017 Cumulative w/o Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Magnolia Avenue and Orchard Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14500 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.98

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
64.5	131.2	278.8	598.8

TABLE 2017 Cumulative w/o Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Orchard Street and Garden Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 15500 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.27

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
67.0	136.9	291.4	626.0

TABLE 2017 Cumulative w/o Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Garden Street and Indiana Avenue
NOTES: Madison Plaza - 2017 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17600 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.83

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	72.2	148.7	317.0	681.3

TABLE 2017 Cumulative w/o Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Indiana Avenue and Evans Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12300 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.27

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
58.8	118.0	250.1	536.7

TABLE 2017 Cumulative w/o Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street east of Evans Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10700 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.66

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	108.0	228.2	489.3

TABLE 2017 Cumulative w/o Project-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18000 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	73.2	150.9	321.8	691.6

TABLE 2017 Cumulative w/o Project-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18000 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	73.2	150.9	321.8	691.6

TABLE 2017 Cumulative w/o Project-09
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2000 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	88.0

TABLE 2017 Cumulative w/o Project-10
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 610 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 52.81

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	0.0	0.0	0.0	0.0

TABLE 2017 Cumulative w/o Project-11
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Garden Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.40

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	59.5	127.6

TABLE 2017 Cumulative w/o Project-12
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 13300 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.87

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	103.5	220.3	473.2

TABLE 2017 Cumulative w/o Project-13
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14700 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.31

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
53.7	110.4	235.3	505.7

TABLE 2017 Cumulative w/o Project-14
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	72.7

TABLE 2017 Cumulative w/o Project-15
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 56.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	72.7

TABLE 2017 Cumulative with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street north of Magnolia Avenue
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 11200 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.86

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
55.8	111.2	235.1	504.3

TABLE 2017 Cumulative with Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Magnolia Avenue and Orchard Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 15200 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.19

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
66.3	135.2	287.7	617.9

TABLE 2017 Cumulative with Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Orchard Street and Garden Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 16300 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.49

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
69.0	141.5	301.3	647.4

TABLE 2017 Cumulative with Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Garden Street and Indiana Avenue
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 19300 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.23

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
76.3	157.9	337.0	724.4

TABLE 2017 Cumulative with Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street between Indiana Avenue and Evans Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12800 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.44

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
60.1	121.1	256.8	551.2

TABLE 2017 Cumulative with Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Madison Street east of Evans Street
NOTES: Madison Plaza - 2017 Cumulative with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 10800 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.70

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	108.7	229.6	492.3

TABLE 2017 Cumulative with Project-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18200 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	73.7	152.0	324.1	696.7

TABLE 2017 Cumulative with Project-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Magnolia Avenue east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18200 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
73.7	152.0	324.1	696.7

TABLE 2017 Cumulative with Project-09
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 2100 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 58.18

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	90.9

TABLE 2017 Cumulative with Project-10
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Orchard Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 610 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 52.81

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	0.0

TABLE 2017 Cumulative with Project-11
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Garden Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3500 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.40

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	59.5	127.6

TABLE 2017 Cumulative with Project-12
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 13400 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.91

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	0.0	104.0	221.4	475.6

TABLE 2017 Cumulative with Project-13
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Indiana Avenue east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 14800 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 18 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.34

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	53.9	110.9	236.4	508.0

TABLE 2017 Cumulative with Project-14
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street west of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1600 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.00

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	75.9

TABLE 2017 Cumulative with Project-15
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 04/13/2016
ROADWAY SEGMENT: Evans Street east of Madison Street
NOTES: Madison Plaza - 2017 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 1700 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	73.60	13.60	10.22
M-TRUCKS	0.90	0.04	0.90
H-TRUCKS	0.35	0.04	0.35

ACTIVE HALF-WIDTH (FT): 6 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 57.26

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	79.0
