Noise Study for

Mercy Medical Center

City of Redding, California

March 20, 2019

jcb Project # 2018-150

Prepared for:

omni · means
A GHD company

Omni-Means
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Prepared by:

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Jim Brennan
President
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CEQA Checklist - Noise				
	Potentially Significant Impact	**Less Than Significant with Mitigation**	**Less Than Significant Impact**	**No Impact**
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

INTRODUCTION

This report describes the existing noise environment in the area of the proposed Mercy Medical Center project in the City of Redding, California and the potential of the proposed project to generate noise levels exceeding the applicable City of Redding exterior noise level standards at noise-sensitive receptors in the project area.

PROJECT DESCRIPTION

Dignity Health Mercy Medical Center Redding (Dignity) proposes the development of the North State Pavilion (project) an approximate 10.55-acre project in the City of Redding. The site is located west of Interstate 5, southwest of the intersection Cypress Avenue and Hartnell Avenue, in close proximity to the Sacramento River to the west.

Dignity proposes the construction of three buildings totaling approximately 129,600 square feet. Whereas, estimated building heights have yet to be determined, the number of building stories and approximate square footage are:

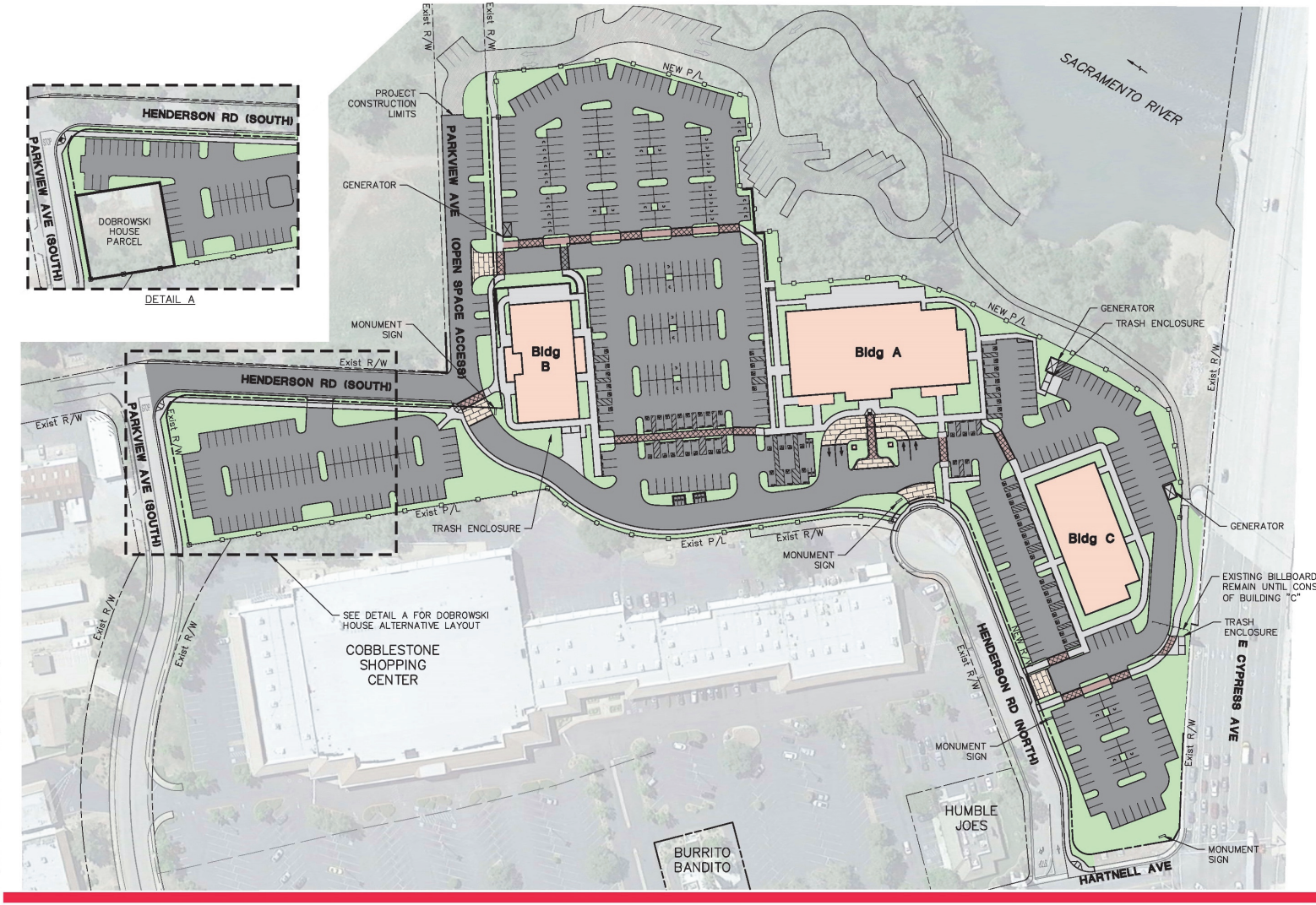
- Building "A" – 4 stories – 80,000 Sq. Ft.
- Building "B" – 3 stories – 27,800 Sq. Ft.
- Building "C" – 3 stories – 21,800 Sq. Ft.

Other project features include but are not limited to landscaping, hardscape features, emergency generator enclosures, solid waste bin enclosures, decorative fencing, monument signs, a pole sign, building signage, and parking lot, driveway and walkway lighting. The project is currently proposed to develop in two phases. Phase 1 will include Building "A" which is 74,000 square feet in size. Phase I is projected to be completed in 2019. It is estimated that up to 180 persons will be employed once the project is completed. Potential uses and services to be located within all the buildings may include, but are not limited to the following:

- Administrative Offices
- Auditorium / Conference Rooms / Class
- Cafeteria
- Diagnostic Imaging
- Electrical / Mechanical Rooms
- Employee Lounge / Locker Rooms
- Family Medicine / Pediatrics
- Gift Shop
- Janitorial Rooms
- Laboratories
- Orthopedics
- Palliative Care
- Pharmacy
- Physical Therapy
- Physician Offices
- Radiology
- Reception/Waiting Areas
- Rehabilitation
- Urgent Care Center
- Visitor Lounges
- Women's Health & Wellness

Cafeteria services, physical therapy and pharmacy services may more than likely be leased to outside service providers.

Figure 1 shows the project site plan. Figure 2 shows an aerial photo of the project site.



LEGEND

CITY PROJECTS (HENDERSON OPEN SPACE)

DECORATIVE FENCE

NOTE:

1. DOBROWSKI HOUSE PARCEL PER 08-16-16 PURCHSE AND SALE AGREEMENT BETWEEN THE CITY OF REDDING AND DIGNITY HEALTH.

REGISTERED PROFESSIONAL ENGINEER RUSSELL A. BRENNAN 73162 CIVIL STATE OF CALIFORNIA — NOT FOR CONSTRUCTION

60 0 60 (IN FEET) 1 inch = 60 ft.

April 17, 2017

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NORTH STATE PAVILION

OVERALL SITE PLAN-AERIAL UNDERLAY

Redding, Califinia

Dignity Health

SHEET 3 OF 27

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330 Hartnell Ave, Suite B
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(530) 242-1700
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Mercy Medical Center North State Pavilion
Figure 1: Site Plan

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Mercy Medical Center North State Pavilion

Figure 2: Noise Monitoring Site

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ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

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

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

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. Appendix A provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

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

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

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

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

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

EXISTING AND FUTURE NOISE AND VIBRATION ENVIRONMENTS

EXISTING NOISE RECEPTORS

Some land uses are considered more sensitive to noise than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise.

Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. In the vicinity of the project site, sensitive land uses include existing single-family residential uses near the southwest corner of the project site, near the intersection of Parkview Avenue and Henderson Road.

EXISTING GENERAL AMBIENT NOISE LEVELS

The existing noise environment in the project area is defined primarily by the local roadway network including East Cypress Avenue located adjacent to the north edge of the project site.

To quantify the existing ambient noise environment in the project vicinity, j.c. brennan & associates Inc. conducted noise level measurements at three locations around the project site.

Noise measurement locations are shown on Figure 2. A summary of the noise level measurement survey results are provided in Table 2. Appendix B contains the complete results of the noise monitoring.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

A Larson Davis Laboratories (LDL) Model 824 precision integrating sound level meter was used for the ambient noise level measurement survey. The meter was calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Site	Date	Time	Measured Noise Levels		
			L_{eq}	L_{50}	L_{max}
Short Term Noise Level Measurements					
1	12/19/2016	12:11 p.m.	66	64	83
		3:33 p.m.	66	64	79
2	12/19/2016	12:34 p.m.	65	63	81
		3:54 p.m.	66	65	80
3	12/19/2016	1:05 p.m.	49	47	65
		4:17 p.m.	49	47	67

Source: j.c. brennan & associates, Inc., 2016.

AVIATION NOISE LEVELS

The Benton Airport is located approximately 1.75-miles west of the project site. The Airport is located in the City of Redding.

It should be noted that during visits to the project site, no aircraft overflights were observed, nor was aircraft activity found to be a significant source of noise at the project site.

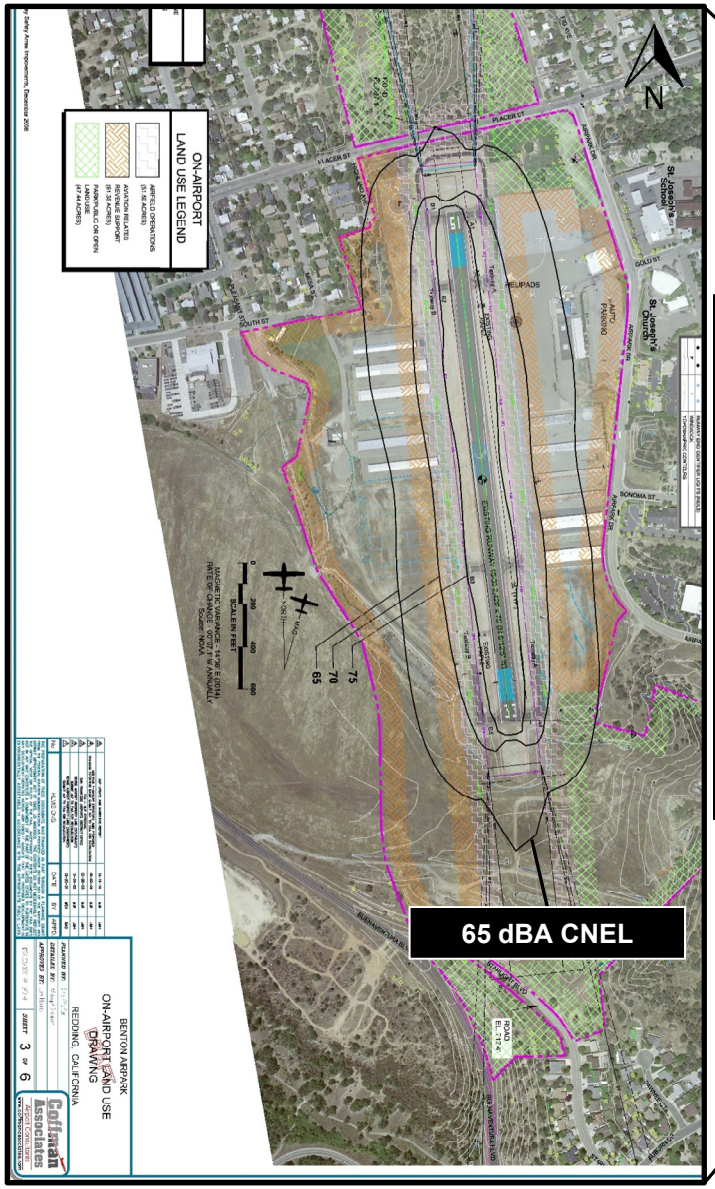
Figure 3 shows the most recent noise contours developed for the airport.

EXISTING AND FUTURE TRAFFIC NOISE ENVIRONMENT

Off-Site Traffic Noise Impact Assessment Methodology

To assess noise impacts due to project-related traffic increases on the local roadway network, traffic noise levels are predicted at sensitive receptors for existing and future, project and no-project conditions.

Existing and future noise levels due to traffic are calculated using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108). The model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.



Benton Airpark Noise Contours

Project Location Relative to Benton Airpark

Mercy Medical Center North State Pavilion
Figure 3: Benton Airpark Noise Contours

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The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict traffic noise levels in terms of L_{dn}, it is necessary to adjust the input volume to account for the day/night distribution of traffic.

Inputs to the FHWA model included ADT daily traffic volumes and peak hour turning movement volumes which were provided by the project traffic engineer (Omni-Means, December 2016), truck usage and vehicle speeds on the local area roadways were estimated from field observations. The predicted increases in traffic noise levels on the local roadway network for existing and future (2035) conditions which would result from the project are provided in terms of L_{dn}.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. A conservative adjustment of -5 dB is assumed where noise barriers are located adjacent to sensitive receptors. In some locations sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the Project area roadway segments analyzed in this report. In some cases, a standard distance of 100 feet is used where no obvious sensitive receptors are located along a specific roadway segment (i.e. commercial areas).

Predicted Exterior Traffic Noise Levels

Operation of the proposed project would result in an increase in ADT volumes on the local roadway network and consequently, an increase in noise levels from traffic sources along affected segments.

To examine the affect of project-generated traffic increases, traffic noise levels associated with the proposed project were calculated for roadway segments in the project study area using the FHWA model. Traffic noise levels were modeled under existing and future (2040) conditions with and without the proposed project.

Table 3 summarizes the modeled traffic noise levels at the nearest sensitive receptors along each roadway segment in the Project area. Appendix C provides the complete inputs and results of the FHWA traffic modeling.

TABLE 3: PREDICTED TRAFFIC NOISE LEVEL AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES

Roadway	Segment	Predicted Exterior Noise Level (dBA L_{dn}) @ Closest Sensitive Receptors – 1st Floor Outdoor Activity Areas					
		Existing No Project	Existing + Project	Change	Future No Project	Future + Project	Change
Bechelli Ln.	North of E. Cypress	53	53	0	54	54	0
Bechelli Ln.	E. Cypress to Hartnell	64	64	0	64	64	0
Bechelli Ln.	South of Hartnell	66	66	0	66	66	0
E. Cypress Ave.	West of Hartnell	66	66	0	66	67	+1
E. Cypress Ave.	Hartnell to Bechelli	63	63	0	64	64	0
E. Cypress Ave.	Bechelli to Hilltop	66	66	0	66	66	0
E. Cypress Ave.	East of Hilltop	65	65	0	65	65	0
Hartnell Ave.	E. Cypress to Henderson	61	62	+1	62	63	+1
Hartnell Ave.	Henderson to Parkview	61	62	+1	62	63	+1
Hartnell Ave.	Parkview to Shotwick	58	58	0	59	59	0
Hartnell Ave.	Shotwick to Bechelli	58	58	0	59	59	0
Hartnell Ave.	Bechelli to Northwoods	63	63	0	64	64	0
Hartnell Ave.	Northwoods to Churn Creek	58	58	0	59	59	0
Hartnell Ave.	East of Churn Creek	68	68	0	69	69	0
Henderson Rd.	North of Parkview	38	52	+14	41	52	+11
Henderson Rd.	South of Parkview	48	48	0	49	49	0

Source: j.c. brennan & associates, Inc., FHWA RD-77-108 Traffic Noise Prediction Model, Caltrans, and Omni-Means. 2018

EVALUATION OF FUTURE TRANSPORTATION NOISE SOURCES ON THE PROJECT SITE

On-Site Traffic Noise Prediction Methodology

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

Based upon the Table 3 data, Cumulative + Project traffic noise levels for E. Cypress Avenue, west of Hartnell Avenue are predicted to be 67 dBA L_{dn}. This noise level is based upon a distance of 100 feet, based upon the input data shown in Appendix B. Based upon the proposed setback distances to each of the three project buildings, traffic noise levels have been calculated and are shown in Table 4.

TABLE 4: TRAFFIC NOISE LEVELS ON PROJECT SITE

Location	Distance	Predicted Traffic Noise Level, L_{dn}
Building A Exterior	350’	59 dBA
Building B Exterior	815’	54 dBA
Building C Exterior	125’	65 dBA

EVALUATION OF PROJECT-GENERATED NON-TRANSPORTATION NOISE SOURCES

The primary non-transportation noise sources associated with the proposed project are on-site parking lot circulation and heating ventilation and air-conditioning (HVAC) equipment.

On-Site Parking Lot Circulation and Delivery Vehicle Noise Impact Assessment

Parking lot noise levels generally are a result of vehicles arriving or departing, car doors slamming and people talking. Noise level data for parking lot activities indicate that a typical sound exposure level (SEL) of 71 dBA at a distance of 50 feet characterizes a typical vehicle arrival and departure.

The traffic analysis indicates that the weekday peak hour trip movements for the project would be 311 AM peak hour and 330 PM peak hour trips.

Based upon 330 PM peak hour trips, the greatest noise exposure for parking lot activities can be calculated as follows:

L_{eq} = 71 + 10 * log (330) - 35.6, dBA

71 is the mean sound exposure levels (SEL) for an automobile arrival and departure, and 10 * log(330) is 10 times the logarithm of the number of vehicle trips per hour, and 35.6 is 10 times the logarithm of the number seconds in an hour.

The formula indicates that the predicted peak hour L_{eq} at a distance of 50 feet is 61 dBA L_{eq}.

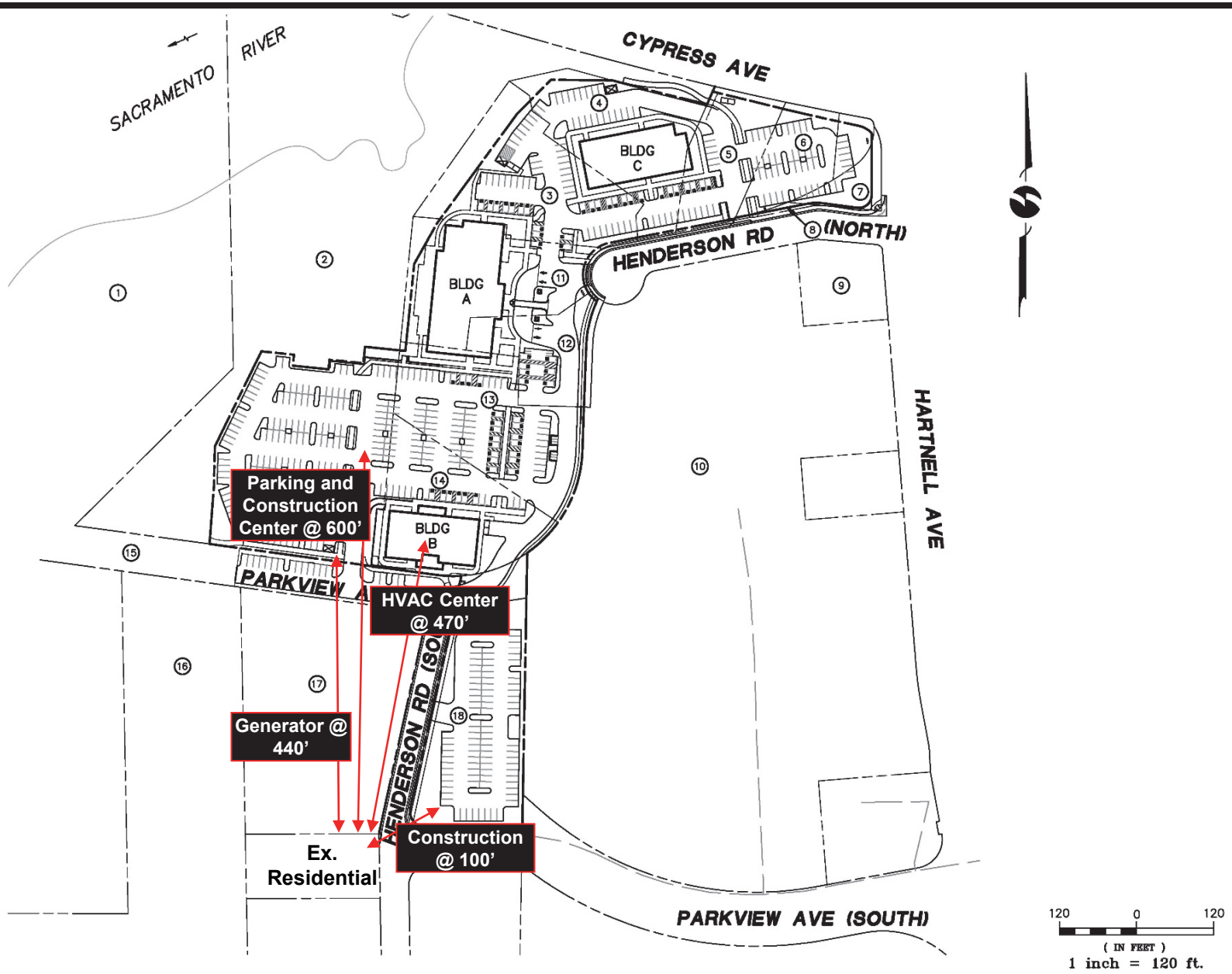
Based upon the project site plan, the center of the Building B parking lot would be located approximately 600 feet from the nearest residential property line to the south. At this distance, parking lot noise levels would average 39 dBA L_{eq}, assuming that all parking lot activity were centered around this 600-foot distance. While some parking lot activity would occur closer than 600 feet from the nearest residential uses (parking lot on Parcel 18), much of the parking lot activity would occur further than 600 feet away (parking lots for Buildings A and C). Therefore, the 600-foot distance is a conservative assumption. See Figure 4 for measured distances used in calculation of project-generated noise at the nearest residential receptors.

Delivery vehicles will primarily be associated with large vans, which are similar to UPS delivery vehicles. The deliveries will occur at each of the buildings, and can be expected to be between 3 and 4 deliveries during a peak hour, and will occur during the daytime hours. A typical SEL associated with a delivery truck is 78 dBA at a distance of 50-feet. Using the formula shown above, the typical peak hour Leq is calculated to be 48 dBA, at a distance of 50-feet. The Leq for deliveries at the nearest residences is expected to be less than 30 dBA.

Mechanical Equipment Noise

Based upon similar projects, it is assumed that the proposed project buildings will include rooftop mechanical equipment consisting of packaged HVAC units. Typical rooftop equipment would likely include one to two 75-ton packaged rooftop units.

Based upon these assumptions, the units would likely have a sound power rating of 102 dBA each, for a total of 105 dBA for two units operating simultaneously. Based upon the project site plan, the mechanical units for Building B would be located approximately 470 feet from the nearest residential property line to the south (as measured from the center of the Building B rooftop). Based upon this distance and screening due to the proposed mechanical screen wall, HVAC noise levels are predicted to be 44 dBA L_{eq}. This analysis assumes that all equipment will be shielded by rooftop building parapets or mechanical screen walls.



Mercy Medical Center North State Pavilion
Figure 4: Distances Used in Analysis

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Backup Generator Noise

The project includes the potential for three backup generators at the locations shown on Figure 1. The generators for Buildings A and C would be located over 1,000 feet from the nearest sensitive receptors and would be shielded by intervening buildings. Therefore, the Buildings A and C generators are not analyzed further in this analysis. However, the generator for Building B would be located approximately 440 feet from the existing residential uses located near the intersection of Parkview Avenue and Henderson Road.

At this time the exact generator specifications are not known. However, based upon similar projects, j.c. brennan & associates, Inc. estimates that the generator would be sized in the range of approximately 125 kW and would be housed in a sound attenuating enclosure. Based upon these assumptions, a typical noise level would be 75 dBA at distance of 7 meters (23 feet) during operation at rated power. Based upon the 440-foot distance, noise levels would be approximately 49 dBA L_{eq} at the nearest residential receptors.

Emergency Vehicle Siren Noise Levels

The project is considered an ambulatory medical facility, where there will be occasions where ambulances will bring patients/pick up patients from the facility. Although this is not a regular occurrence, it is expected to occur. Generally when the ambulances arrive the sirens are turned off once the arrive on site, when departing, the sirens are activated on the street system. Sirens generally produce noise levels of approximately 90 dBA Lmax at a distance of 100-feet. Emergency sirens for fire engines or ambulances are considered a part of any urban noise environment. Based upon the short period of time that sirens occur (no more than 30 to 60 seconds out of the hour), and the fact that they are used only in emergency situations, this is not considered to be a significant noise sourc.

Summary of Site-Generated Noise Levels

Table 5 provides a summary of the individual project-related noise levels at the nearest residential receptors. Table 5 also shows the estimated total project noise exposure assuming operation of all noise sources.

TABLE 5: SITE-GENERATED (NON-TRANSPORTATION) NOISE LEVELS

Noise Source	Distance	Predicted Peak Hour Noise Level, L_{eq}
Parking Lots / Including Deliveries	600’	39 dBA
Mechanical Equipment	470’	44 dBA
Building B Backup Generator	440’	49 dBA, or less depending on final generator selection
	Total:	**51 dBA, or less**

Source: j.c. brennan & associates, Inc., 2016.

Based upon the Table 5 data, the total noise exposure from on-site sources is predicted to be 51 dBA $L_{eq,}$ or less, at the nearest sensitive receptors.

Construction Noise Environment

During the construction of the proposed project, including roads, water and sewer lines, and related infrastructure, noise from construction activities would temporarily add to the noise environment in the project vicinity. As shown in Table 6, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet.

TABLE 6: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Maximum Level, dBA at 50 feet
Auger Drill Rig	84
Backhoe	78
Compactor	83
Compressor (air)	78
Concrete Saw	90
Dozer	82
Dump Truck	76
Excavator	81
Generator	81
Jackhammer	89
Pneumatic Tools	85

Source: *Roadway Construction Noise Model User's Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

Activities involved in project construction would typically generate maximum noise levels ranging from 85 to 90 dB at a distance of 50 feet. Residential receptors located south of the project site are located approximately 100 feet from the project site construction area at the Parcel 13 Henderson Road (south) parking lot. Assuming worst-case that construction activity was to occur at this distance, maximum construction noise levels would be 79-84 dBA L_{max}. However, the majority of construction activity on the project site would occur at distances much greater than 100 feet. Construction activity occurring in the center of the project site, around Building B, would be located approximately 600 feet from the nearest residential receptors. At this distance construction noise levels would be approximately 63-68 dBA L_{max}.

Construction Vibration Environment

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. Table 7 shows the typical vibration levels produced by construction equipment.

TABLE 7: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210	0.074	0.026

Source: *Transit Noise and Vibration Impact Assessment Guidelines.* Federal Transit Administration. May 2006.

REGULATORY CONTEXT

FEDERAL

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

STATE

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

LOCAL

City of Redding General Plan

The City of Redding General Plan Noise Element establishes goals, policies and criteria for determining land use compatibility with major noise sources within the community. The following provides the applicable goals, policies and criteria for evaluating the feasibility and potential noise impacts associated with the proposed project.

Goal N1 - Protect residents from the harmful and annoying effects of exposure to excessive noise.

Policy N1C *Require an acoustical analysis for new development in locations where exterior and/or interior noise levels will likely exceed the City's noise standards to determine appropriate mitigation measures.*

Policy N1D *Encourage the use of site planning and building materials/design as primary methods of noise attenuation.*

Policy N1F *Discourage use of noise barriers and walls constructed exclusively for noise attenuation purposes, where possible. In instances where noise barriers cannot be avoided, require the use of site planning and building material/design features in conjunction with barriers to mitigate visual impacts and reduce the size of barriers.*

GOAL N2 – Protect Residents from Exposure to Excessive Transportation-Related Noise

Policy N2B *Prevent development of new projects which contain noise-sensitive land uses in areas exposed to existing or projected levels of noise from transportation sources which exceed the levels specified in Table 5-4* (Table 8 of this report)*, unless the project design includes effective mitigation measures to reduce exterior noise and noise levels in interior spaces to the levels specified in that table.*

Policy N2D *Consider the significance of noise-level increases associated with roadway improvement projects needed to accommodate buildout of the General Plan. Since it may be impractical to reduce increased traffic noise to levels in Table 5-4* (Table 8 of this report)*, the following criteria may be used as a test of significance for roadway-improvement projects:*

- *Where existing traffic noise levels are less than 60 dB L_{dn} in the outdoor-activity areas of noise-sensitive uses, roadway improvement projects which increase noise levels to 60 dB L_{dn} will not be considered significant.*
- *Where existing traffic noise levels range between 60 and 65 dB L_{dn} in the outdoor activity areas of noise-sensitive uses, a +3 dB L_{dn} increase in noise levels due to a roadway-improvement project will be considered significant.*
- *Where existing traffic noise levels are greater than 65 dB L_{dn} in the outdoor activity areas of noise-sensitive uses, a +1.5 dB L_{dn} increase in noise levels due to a roadway- improvement project will be considered significant.*

Policy N2E *Require acoustical analysis for noise-sensitive land uses proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table 5-4* (Table 8 of this report) *or the performance*

standards of Table 5-5 (Table 9 of this report) *to determine mitigation for inclusion in the project design. Single-family dwellings on existing lots are excluded from this review.*

TABLE 8: (TABLE 5-4 OF THE CITY OF REDDING GENERAL PLAN NOISE ELEMENT) MAXIMUM ALLOWABLE NOISE EXPOSURE TRANSPORTATION NOISE SOURCES

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient Lodging	60[3]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

[1] The exterior noise level standard shall be applied to the outdoor activity area of the receiving land use. Outdoor activity areas are normally located near or adjacent to the main structure and often occupied by porches, patios, balconies, etc.
[2] As determined for a typical worst-case hour during periods of use.
[3] Where it is not possible to reduce noise in outdoor activity areas to 60 dB L L_{dn}/CNEL or less, using a practical application of the best-available noise reduction measures, higher noise levels may be allowed provided that practical exterior noise-level reduction measures have been implemented and that interior noise levels are in compliance with this table.

Non-Transportation Noise Sources

<u>Goal N3</u> – *Protect the Economic Base of the City of Redding by preventing incompatible land uses from encroaching upon existing or planned noise producing uses. Prevent the introduction of new fixed noise sources in noise-sensitive areas.*

<u>Policy N3B</u> - *Mitigate noise created by new proposed non-transportation sources consistent with the noise-level standards of Table 5-5* (Table 9 of this report) *as measured immediately within the property line of lands designated for noise-sensitive land uses. Noise level standards for non-noise-sensitive uses will generally be 10 dB higher before mitigation is required.*

<u>Policy N3C</u> - *Require acoustical analysis of new nonresidential land uses and the expansion of existing nonresidential land uses if likely to produce noise levels*

exceeding the performance standards of Table 5-5 within the property line of existing or planned noise sensitive uses.

<u>Policy N3H</u> – Require the installation of noise-buffering or reduction mechanisms, where appropriate, for major fixed noise sources throughout the City prior to the approval, amendment, and/or issuance of conditional use permits for these facilities.

TABLE 9: (TABLE 5-5 OF THE REDDING GENERAL PLAN NOISE ELEMENT) EXTERIOR HOURLY NOISE LEVEL STANDARDS FOR STATIONARY NOISE SOURCES CITY OF REDDING GENERAL PLAN

Noise Level Descriptor	Maximum Acceptable Noise Level	
	Daytime (7 am - 10 pm)	Nighttime (10 pm - 7 am)
Hourly L_{eq}, dBA	55	45

Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises (e.g., humming sounds, outdoor speaker systems). These noise level standards do not apply for residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The City can impose noise-level standards which are more restrictive than those specified above based upon determination of existing low ambient noise levels.

Industrial, light industrial, commercial, and public-service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the City. Fixed noise sources which are typically of concern include, but are not limited to, the following:

HVAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities, including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

Source: City of Redding General Plan Noise Element, Table 5-5.

City of Redding Municipal Code

Section 18.40.100, Noise Standards, of the City's Zoning Ordinance (Noise Ordinance) specifies additional noise regulations pertaining to the allowable interior and exterior noise levels based upon the time of day; refer to Table 5.5-3 (City of Redding Noise Ordinance Standards). The City's Noise Ordinance was established in order to control unnecessary, excessive and annoying noise, protect the public health, safety and welfare, and to declare that creating, maintaining or causing noise in excess of the limits prescribed (refer to Table 5.5-3), is a public nuisance and is punishable as such. The ordinance is provided below:

18.40.100 Noise standards.

A. Purpose. The purpose of this chapter is to:

1. Control unnecessary, excessive and annoying noise;
2. Protect the public health, safety and welfare;
3. Declare that creating, maintaining or causing noise in excess of the limits prescribed by this chapter is a public nuisance and shall be punishable as such.

B. General Noise Regulations. Notwithstanding any other provision of this chapter and in addition thereto, it is unlawful for any person to willfully or negligently make or continue or cause to be made or continued, any loud, unnecessary or unusual noise which disturbs the peace and quiet of any neighborhood or which causes any discomfort or annoyance to any reasonable person of normal sensitiveness residing in the area. Noncommercial public speaking and public assembly activities conducted on any public space or public right-of-way shall be exempt from the operation of this section.

C. Factors of Determination. The factors which will be considered in determining whether a violation of the provisions of this chapter exists shall include, but not be limited to, the following:

1. The sound level of the alleged objectionable noise;
2. The sound level of the ambient noise;
3. The nature and zoning of the area within which the noise emanates;
4. The time of day or night the noise occurs;
5. Whether the noise is continuous, recurrent or intermittent.

D. Noise Measurement. Noise shall be measured utilizing the hourly energy-equivalent noise level (L_{eq}).

E. Noise Limits. The provisions of this section address noise intrusions over and above the noise normally associated with a given location (intrusions over the ambient level). The ambient

noise varies throughout the community, depending upon proximity to streets and the type of area land uses.

The maximum sound levels shall be determined as follows:

1. Exterior Noise Limits.

a. The noise standards for the various categories of land use as set forth in Schedule 18.40.100-A, unless otherwise specifically indicated, shall apply to all such property within a designated zone. No person shall operate or cause to be operated, any source of sound at any location within the incorporated city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person which causes the noise level when measured on any other property, either incorporated or unincorporated, to exceed the noise standard for that land use specified in Schedule 18.40.100-A.

b. If the measured ambient level is above that permissible, the allowable noise exposure standard shall be increased to reflect the actual ambient noise level.

Schedule 18.40.100-A describes the noise standard for emanations from any source as measured on adjacent properties:

Schedule 18.40.100-A: Exterior Noise Standards

Receiving Land Use Category	Time Period	Noise Level (Hourly L_{eq}/dB)
Residential	10 p.m.—7 a.m.	45
	7 a.m.—10 p.m.	55
Office/commercial	10 p.m.—7 a.m.	55
	7 a.m.—10 p.m.	65
Industrial	10 p.m.—7 a.m.	N/A[1]
	7 a.m.—10 p.m.	N/A[1]

Industrial noise shall be measured at the property line of any nonindustrial district.

F. Prohibited Acts. The following acts are hereby prohibited:

1. Loading and Unloading. Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials or similar objects between the hours of ten p.m. and seven a.m. in such a manner as to cause a noise disturbance across a residential real property line;

2. Construction or Demolition.

a. Operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work in or within five hundred feet of a residential district such that the sound creates a noise disturbance across a property line during the following times:

i. May 15 through September 15: Between the weekday hours of seven p.m. and six a.m. and weekends and holidays between eight p.m. and nine a.m.

ii. September 16 through May 14: Between the weekday hours of seven p.m. and seven a.m. and weekends and holidays between eight p.m. and nine a.m.

3. Domestic Power Tools and Equipment. Operation or permitting the operation, of any mechanically powered saw, lawn or garden tool or similar outdoor tool between ten p.m. and seven a.m. on weekdays (or nine p.m. and eight a.m. on weekends and legal holidays) so as to create a noise disturbance across a residential or commercial real property line.

G. Emergency Exemptions. The provisions of this chapter shall not apply to:

1. The emission of sound for the purpose of alerting persons to the existence of an emergency;

2. The emission of sound in the performance of emergency work.

H. Miscellaneous Exemptions.

1. Warning Devices. Warning devices necessary for the protection of the public safety, such as police, fire and ambulance sirens, shall be exempted from the provisions of this chapter.

2. Outdoor Activities. The provisions of this chapter shall not apply to occasional outdoor gatherings, public dances, shows, and sporting and entertainment events provided that such events are conducted pursuant to a permit or license issued by the city relative to the staging of such events.

3. Churches and Other Similar Organizations. Any churches or other similar organization which use unamplified bells, chimes or other similar devices are exempt from the provisions of this chapter so long as the church or other similar organizations play such between the time period of seven a.m. and ten p.m. and the playing period does not exceed thirty minutes in any one hour.

4. Municipal Solid Waste Collection. Collection of solid waste, vegetative waste and recyclable materials by the city of Redding shall be exempt from the provisions of this chapter.

5. Public Works Construction Projects. Street, utility and similar construction projects undertaken by or under contract to the city of Redding, county of Shasta or state of California or a public utility regulated by the California Public Utilities Commission.

6. Public Utility Facilities. Facilities including, but not limited to, sixty-cycle electric power transformers and related equipment, sewer lift stations, municipal wells and pumping stations.

I. Federal and State Preempted Activities. Any other activity shall be exempt from the provisions of this chapter to the extent regulation thereof has been preempted by state or federal laws.

(Ord. 2343 § 2 (part), 2005)

18.40.110 Performance standards—Citywide.

The following performance standards shall apply to all use classifications in all zoning districts:

A. Noise. No use shall create noise levels which exceed the standards of **Section 18.40.100** of this chapter.

1. Director May Require Acoustic Study. For new uses that, in the opinion of the director, may not meet the standards of the noise element, the director may require that an acoustical analysis be prepared. The analysis shall, at a minimum, conform to the following standards:

   a. Analysis shall be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

   b. Noise levels shall be documented with sufficient sampling periods and locations to adequately describe local noise conditions and noise sources.

   c. Existing and projected noise levels shall be estimated in terms of L_{eq} and L_{dn} or CNEL. Levels shall be compared to the existing ambient noise levels.

   d. Mitigation shall be recommended, giving preference to site planning and design rather than noise barriers, where feasible.

   e. Noise exposure after the prescribed mitigation measures have been implemented shall be estimated.

2. Noise Attenuation Measures. The approving authority may require the incorporation into a project of any noise-attenuation measures deemed necessary to ensure that noise standards are not exceeded, including, but not

limited to, noise walls exceeding maximum height limits and minimum setbacks of the zoning district.

B. Vibration. No use, activity or process shall produce vibrations that are perceptible without instruments at one or more property lines of a site.

Criteria for Acceptable Vibration

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

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

The City of Redding does not have specific policies pertaining to vibration levels. However, perceptible vibrations at the property line of a site are prohibited by Section 18.40.110.B of the City's Zoning Ordinance.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 10, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 10 indicates that the threshold for architectural damage to structures is 0.20 in/sec p.p.v. and continuous vibrations of 0.10 in/sec p.p.v., or greater, would likely cause annoyance to sensitive receptors.

TABLE 10: Effects of Vibration on People and Buildings

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

Source: *Transportation Related Earthborne Vibrations.* Caltrans. TAV-02-01-R9601. February 20, 2002.

PROJECT IMPACTS AND MITIGATION MEASURES

IMPACT 1: WOULD THE PROJECT RESULT IN EXPOSURE OF PERSONS TO OR GENERATION OF NOISE LEVELS IN EXCESS OF STANDARDS ESTABLISHED IN THE LOCAL GENERAL PLAN OR NOISE ORDINANCE, OR APPLICABLE STANDARDS OF OTHER AGENCIES?

As shown in Table 3, traffic from the proposed project is not predicted to cause exterior noise levels to exceed the City's 60 dBA L_{dn} exterior noise level standard at any existing residential areas where no-project noise levels are less than 60 dBA L_{dn}.

As shown in Table 4, traffic from E. Cypress Avenue is predicted to range between 53-65 dBA L_{dn} at the proposed project buildings. Based upon a typical 25 dB exterior-to-interior noise level reduction achieve by modern building construction, interior noise levels of 28-40 dBA L_{dn} would be expected. It is not clear whether the City would apply the hospital/nursing home standards shown in Table 8 to this project. However, traffic noise exposure would comply with the City of Redding 45 dBA L_{dn} interior noise level standard for hospital uses without additional noise control measures.

As shown in Table 5, operation of the project is predicted to generate exterior noise levels of 51 dBA L_{eq}, or less, at the nearest sensitive receptors. These noise levels would comply with the City of Redding 55 dBA L_{eq} daytime exterior noise level standard. This conclusion assumes that the backup generator for Building B would generate a noise level of 75 dBA L_{eq}, or less, at a distance of 7 meters (23 feet). Additionally, the generator shall be exercised (tested) during daytime hours only. Nighttime operation of the Building B generator could exceed the City's nighttime noise level standard of 45 dBA L_{eq}. However, nighttime operation would likely only occur under a widespread power loss scenario. Under these circumstances, noise from operation of emergency power generators are typically exempt from noise regulations. Mechanical equipment is assumed to be roof-mounted and shielded by parapets or mechanical screening. The equipment was predicted to produce noise levels of approximately 44 dBA L_{eq}.

Mitigation Measure for Impact 1:

MM 1A: Prior to issuance of a building permit, the project applicant shall provide to the satisfaction of the City of Redding Development Services Department, either an acoustical analysis that demonstrates that operational noise levels from the use of emergency generators do not exceed 75 dBA L_{eq}, or manufacturer's data that demonstrates that the emergency generators do not exceed 75 dBA L_{eq}, as measured at a distance of 7 meters (23 feet) feet from the generator.

MM 1B: Generators shall be exercised during daytime hours only.

MM 1C: Mechanical equipment shall be roof-mounted and screened by parapets or mechanical screening.

This would be a ***less than significant*** with the outlined mitigation measure.

IMPACT 2: WOULD THE PROJECT RESULT IN EXPOSURE OF PERSONS TO OR GENERATION OF EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural.

The Table 7 data indicate that construction vibration levels anticipated for the project are less than the 0.2 in/sec p.p.v. threshold of damage to buildings and less than the 0.1 in/sec threshold of annoyance criteria at distances of 50 feet. Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are located approximately 100 feet, or further, from the project site construction areas. At these distances construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

Because construction vibrations are not predicted to cause damage to existing buildings or cause annoyance to sensitive receptors, implementation of the proposed project would not expose persons to or generate excessive ground borne vibration or ground borne noise levels.

This would be a ***less than significant*** impact.

IMPACT 3: WOULD THE PROJECT RESULT IN A SUBSTANTIAL PERMANENT INCREASE IN AMBIENT NOISE LEVELS IN THE PROJECT VICINITY ABOVE LEVELS EXISTING WITHOUT THE PROJECT?

CEQA does not define a threshold of "significant increase" regarding noise exposure; Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

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

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project-noise conditions. Table 11 is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are

based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn}.

TABLE 11: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

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

Source: Federal Interagency Committee on Noise (FICON)

Based on the Table 11 data, an increase in the traffic noise level of 3.0 dBA or more would be significant where the pre-project noise levels are within 60-65 dBA L_{dn}. Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dBA or more may be significant where the pre-project traffic noise level exceeds 65 dBA L_{dn}. The rationale for the Table 11 criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

It should be noted that this methodology was adopted by the City in General Plan Noise Policy N2-D which applies specifically to transportation projects with one exception. Based upon Policy N2-D, the City does not consider an increase up to 60 dBA L_{dn} to be significant where existing noise levels are less than 60 dBA L_{dn}. For example, based upon this policy, an increase in ambient noise levels from 50 dBA L_{dn} to 59 dBA L_{dn} would be less than significant. Therefore, j.c. brennan & associates, Inc. recommends that the City's test of significance as outlined in Policy N2-D should be applied to noise level increases due to project-related traffic noise. For on-site or "non-transportation" noise sources (parking lots, mechanical noise, child play areas, etc.), j.c. brennan & associates, Inc. recommends that a permanent increase exceeding 5 dBA over existing average ambient noise levels should be applied as the test of significance.

Traffic Noise Increases

As shown in Table 3, increased traffic due to the project would cause increased traffic noise of up to 14.0 dBA L_{dn} on Henderson Avenue, north of Parkview. However, the resulting noise level is 52.0 dBA L_{dn} at the nearest sensitive receptor. This exterior noise exposure complies with the City's 60 dBA L_{dn} exterior noise level standard for residential uses.

At all of the locations shown in Table 3, the proposed project would not independently cause increased noise levels above 60 dBA L_{dn} where existing noise levels are less than 60 dBA L_{dn}. Additionally, the project would not cause increases of 3.0 dBA where existing noise levels are in the range of 60-65 dBA, or 1.5 dBA increases where existing noise levels exceed 65 dBA L_{dn}.

Non-Transportation Noise Increases

The proposed project is predicted to generate non-transportation noise of 51 dBA L_{eq} at the nearest residential receptors. Ambient noise measurements indicate that existing noise levels are approximately 49 dBA $L_{eq.}$ Therefore, the proposed project is not predicted to generate noise levels exceeding existing ambient noise by more than 2 dBA L_{eq} at the nearest sensitive receptors located south of the project site.

This would be a ***less than significant*** impact.

IMPACT 4: WOULD THE PROJECT RESULT IN ASUBSTANTIAL TEMPORARY OR PERIODIC INCREASE IN AMBIENT NOISE LEVELS IN THE PROJECT VICINITY ABOVE LEVELS EXISTING WITHOUT THE PROJECT?

Typical construction activities are predicted to generate maximum noise levels in the range of 63-68 dBA L_{max} depending on the exact location of construction activity and the type of equipment being used. Existing maximum noise levels at the nearest sensitive receptors was found to be in the range of 65-67 dBA L_{max}. Therefore, typical maximum construction noise levels would be within the range of existing maximum ambient noise levels. The Federal Highway Administrations Roadway Construction Noise Model indicates that maximum noise levels from the typical construction equipment will occur between 20% and 40% of an hour. Therefore, the predicted hourly Leq is expected to be approximately 66 dBA at the nearest residences during construction activities. Based upon background noise levels conducted at the nearest residences, the existing typical background noise levels are 49 dBA Leq. Therefore, the predicted noise levels due to construction activities could be up to 17 dBA Leq higher than the measured existing noise levels.

The City's Zoning Ordinance Section 18.40.100.F.2 states the following regarding construction activities:

F. Prohibited Acts. The following acts are hereby prohibited:

2. Construction or Demolition.

a. Operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work in or within five hundred feet of a residential district such that the sound creates a noise disturbance across a property line during the following times:

i. May 15 through September 15: Between the weekday hours of seven p.m. and six a.m. and weekends and holidays between eight p.m. and nine a.m.

ii. September 16 through May 14: Between the weekday hours of seven p.m. and seven a.m. and weekends and holidays between eight p.m. and nine a.m.

All construction activities will be subject to the requirements of the City of Redding with respect to limits on construction noise. The predicted construction noise levels at the nearest residences would exceed the exterior noise level standards contained in the Noise Ordinance. In addition, although maximum noise levels due to construction activities would be consistent with those which were measured at the nearest residences, the hourly Leq noise levels would be considerably higher than existing background noise levels. This would be a ***significant*** impact.

While this impact is predicted to be significant, the following is a list of mitigation measures which would further reduce project construction noise at sensitive receptors. This would remain a ***significant and unavoidable*** with the following mitigation measures.

Mitigation Measure for Impact 4:

MM 4A: Construction activities shall comply with the requirements of the City of Redding Noise Ordinance with respect to hours of operation.

MM 4B: Locate fixed construction equipment such as compressors and generators as far as possible from sensitive receptors. Shroud or shield all impact tools, and muffle or shield all intake and exhaust ports on power construction equipment.

MM 4C: Require that heavy trucks used for soil or materials hauling do not use local residential streets, to the extent feasible during project construction.

IMPACT 5: FOR A PROJECT LOCATED WITHIN AN AIRPORT LAND USE PLAN OR, WHERE SUCH A PLAN HAS NOT BEEN ADOPTED, WITHIN TWO MILES OF A PUBLIC AIRPORT OR PUBLIC USE AIRPORT, WOULD THE PROJECT EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?

Based upon Figure 3, the proposed project is located approximately 8,500 feet, or more, outside of the 65 dBA CNEL noise contour for the Benton Airpark. Considering this distance, it is estimated that aircraft noise levels would be 45 dBA L_{dn}, or less. Therefore, the project site will not be exposed to exterior aviation noise levels exceeding the City's 60 dBA L_{dn} exterior or 45 dBA L_{dn} interior noise level standards for hospital uses.

This would be a ***less than significant*** impact.

IMPACT 6: FOR A PROJECT WITHIN THE VICINITY OF A PRIVATE AIRSTRIP, WOULD THE PROJECT EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?

There are no private airstrips in the project vicinity. Therefore, this impact is not applicable to

the proposed project.

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_{(n)}$	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L_{50} is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the AMaximum@ level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is s rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 1.1
Date: 12/19/2016
Time: 12:11 PM
SLM: Larson Davis Model 824-1

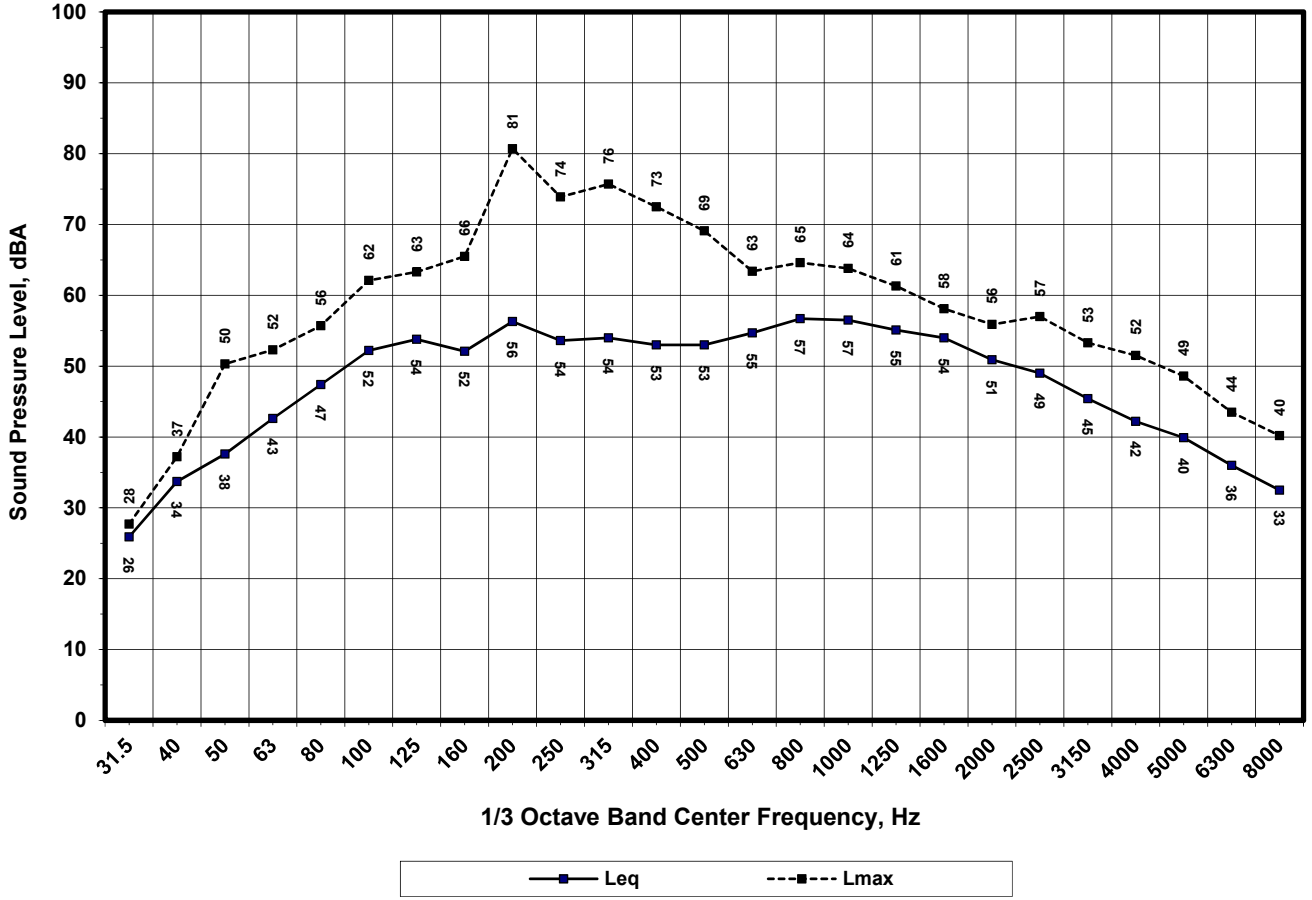
Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

Measurement Results, dBA

Duration:	0:15
L_{eq}:	65.8 dBA
L_{max}:	83.2 dBA
L_{min}:	57.4 dBA
L_{50}:	64
L_{90}:	60

Notes

Cypress Ave. & Hartnell Ave. are primary noise sources. Construction work at adjacent project site contributes at times



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Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 1.2
Date: 12/19/2016
Time: 3:33 PM
SLM: Larson Davis Model 824-1

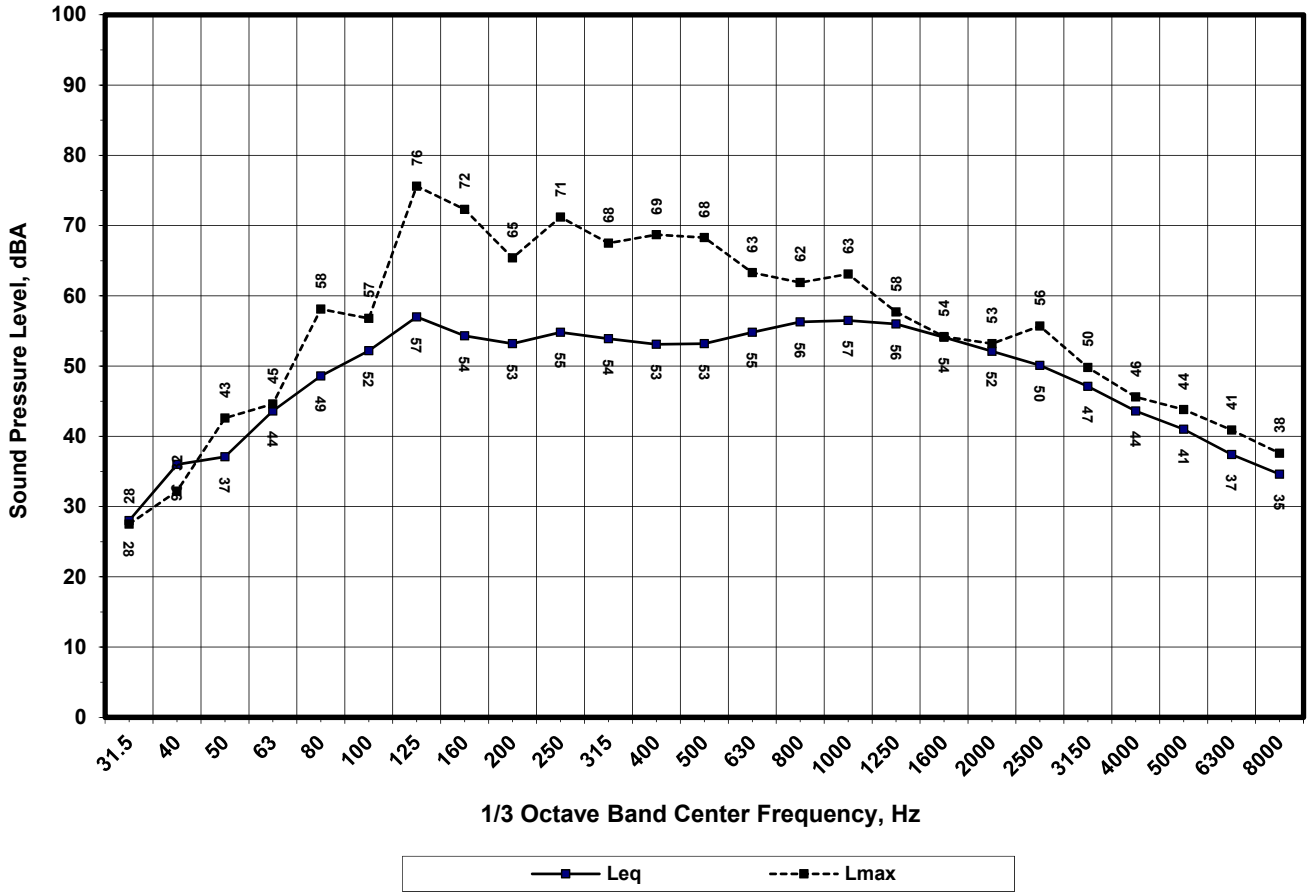
Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

Measurement Results, dBA

Duration:	0:15
L_{eq}:	66.3 dBA
L_{max}:	78.7 dBA
L_{min}:	58.9 dBA
L_{50}:	64
L_{90}:	61

Notes

Cypress Ave. & Hartnell Ave. are primary noise sources. Construction work at adjacent project site contributes at times



Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 2.1
Date: 12/19/2016
Time: 12:34 PM
SLM: Larson Davis Model 824-1

Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

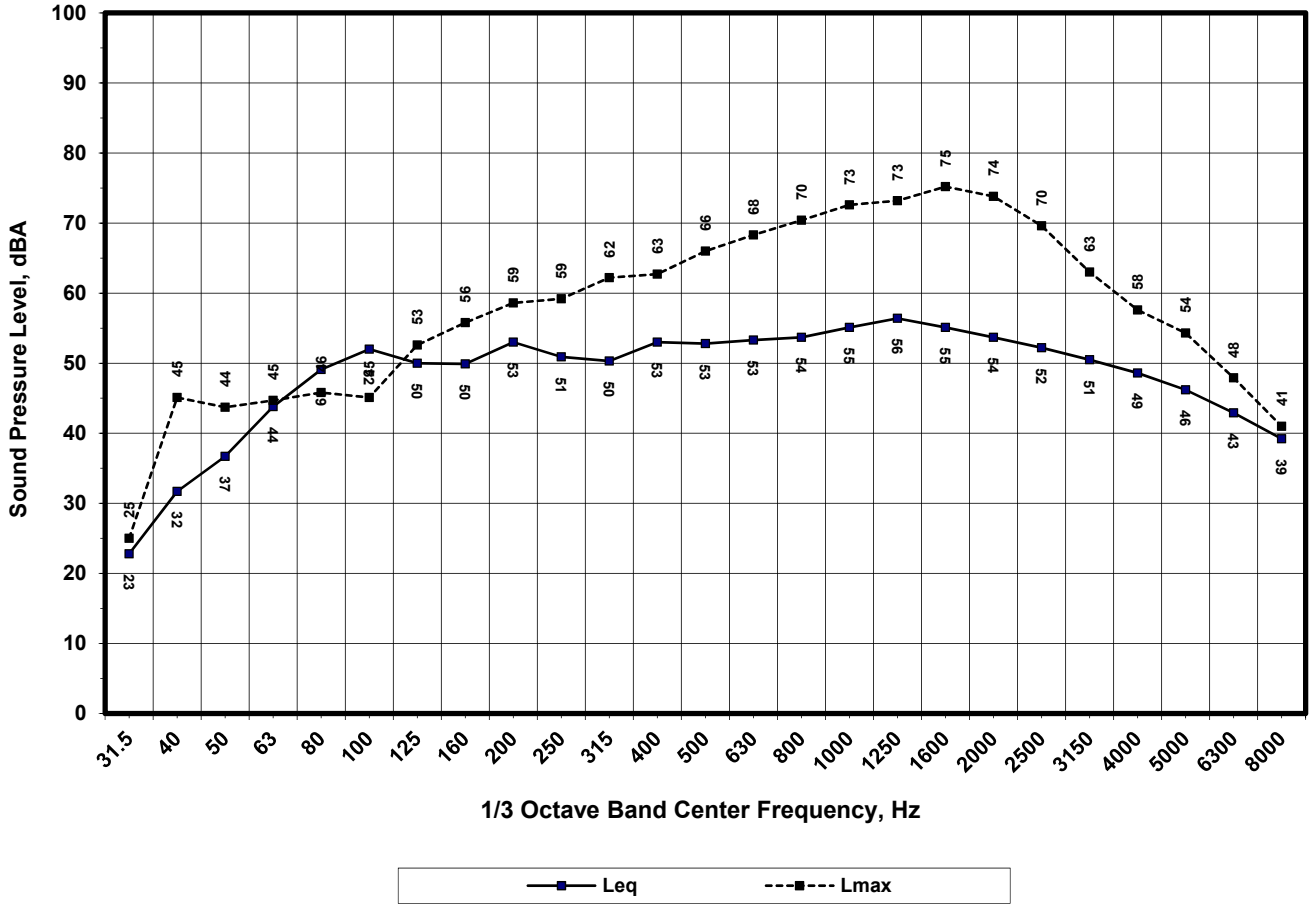
Measurement Results, dBA

Duration: 0:15
L_{eq}: 65.2 dBA
L_{max}: 81.0 dBA
L_{min}: 57.3 dBA
L_{50}: 63
L_{90}: 60

Notes

Primary noise source is traffic with construction noise contributing.


Noise Measurement Site



Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 2.2
Date: 12/19/2016
Time: 3:54 PM
SLM: Larson Davis Model 824-1

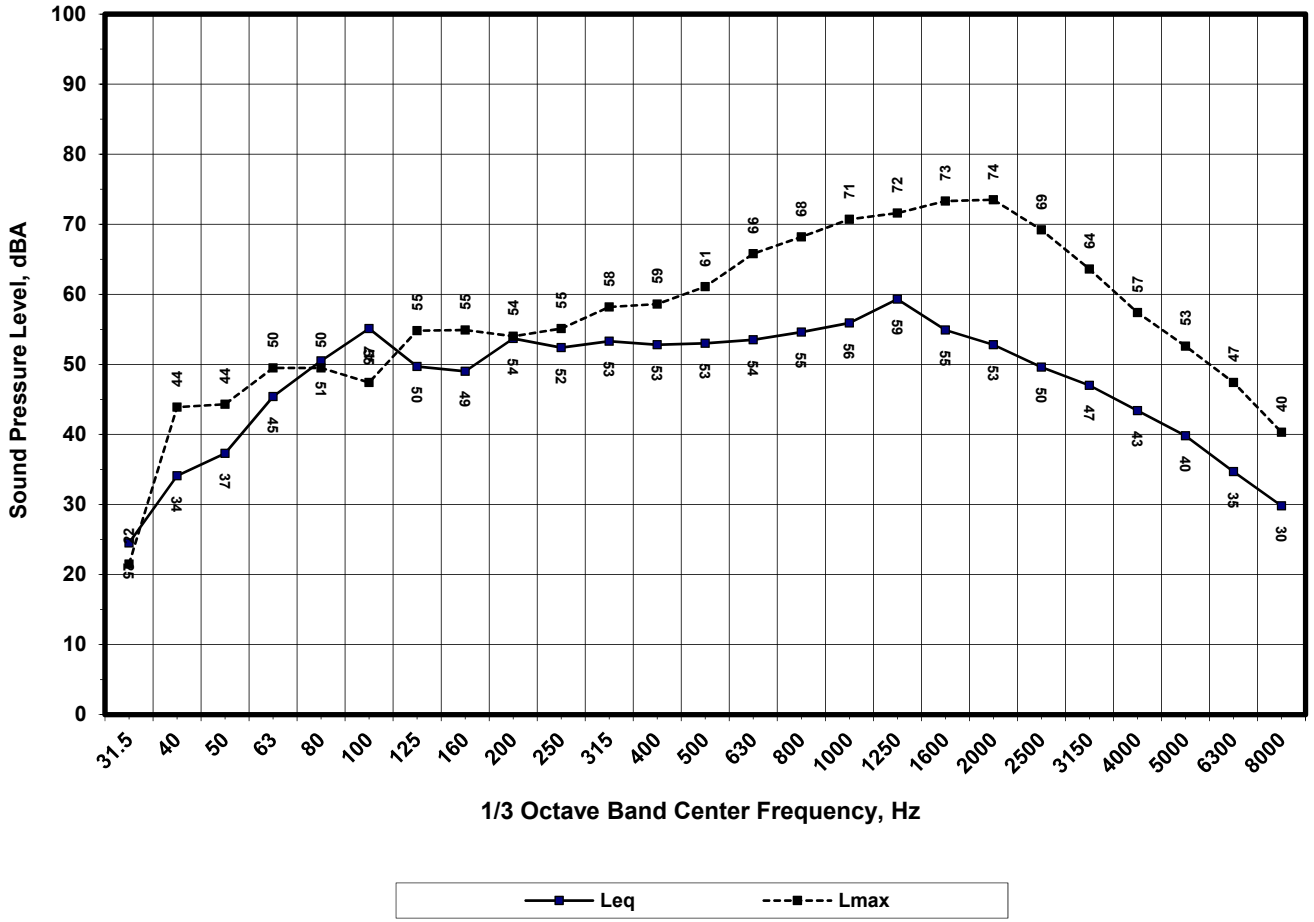
Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

Measurement Results, dBA

Duration:	0:15
L_{eq}:	65.9 dBA
L_{max}:	79.7 dBA
L_{min}:	56.9 dBA
L_{50}:	65
L_{90}:	60

Notes
Primary noise source is traffic with construction noise contributing.


Noise Measurement Site



Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 3.1
Date: 12/19/2016
Time: 1:05 PM
SLM: Larson Davis Model 824-1

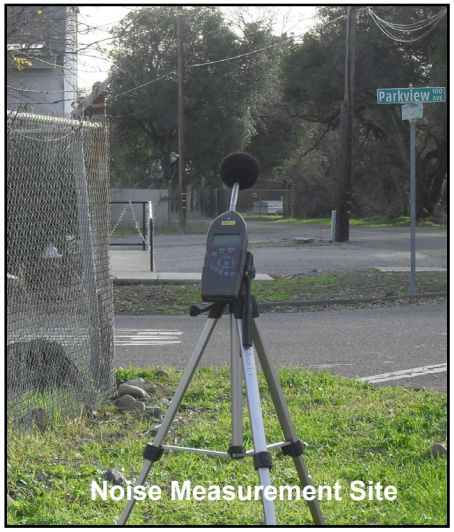
Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

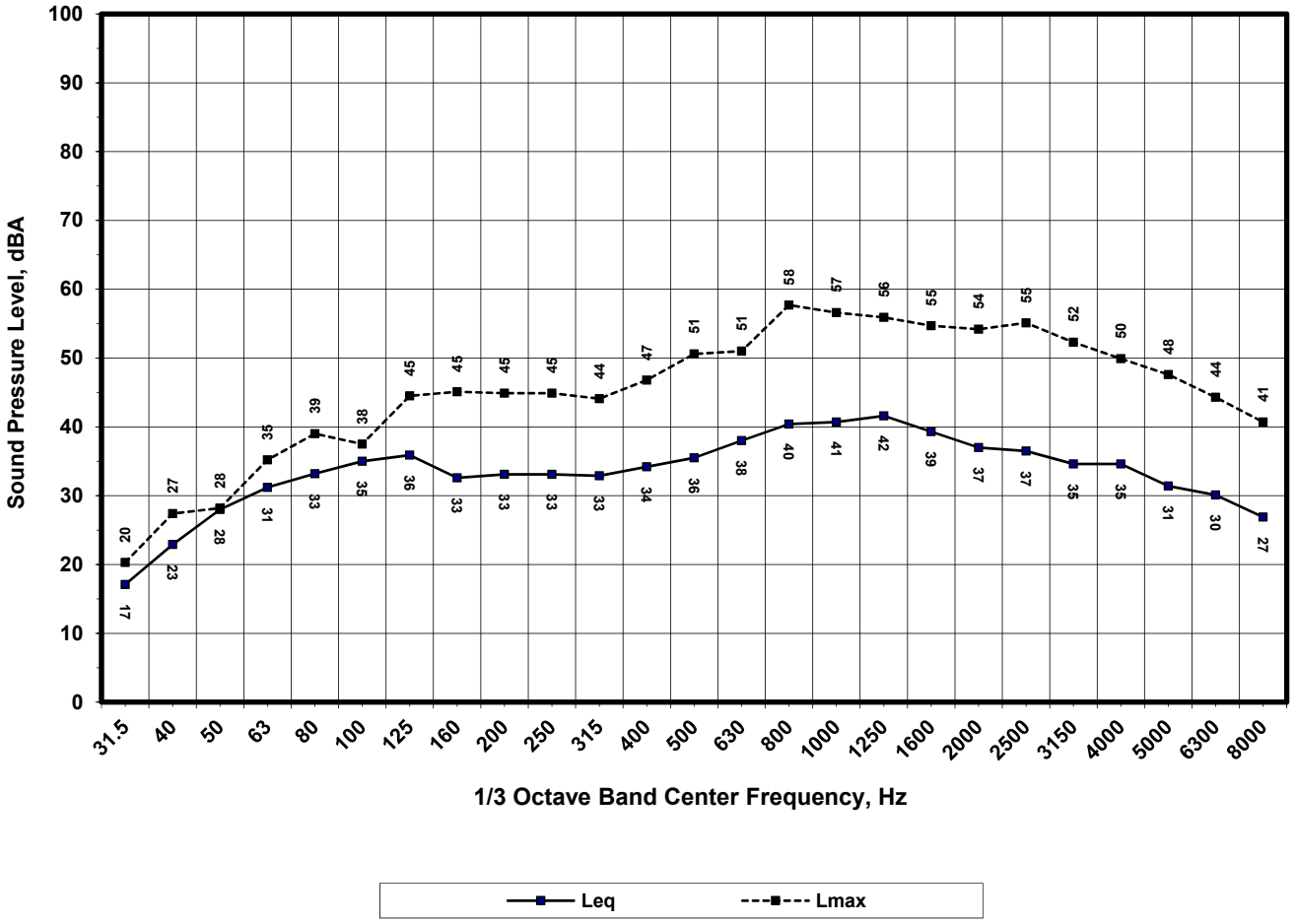
Measurement Results, dBA

Duration: 0:15
L_{eq}: 49.7 dBA
L_{max}: 64.8 dBA
L_{min}: 43.6 dBA
L_{50}: 47
L_{90}: 45

Notes

Primary noise source is traffic with construction noise contributing.





Appendix B
Short-Term Noise Monitoring Summary

Project: Mercy Medical Center
Location: Site 3.2
Date: 12/19/2016
Time: 4:17 PM
SLM: Larson Davis Model 824-1

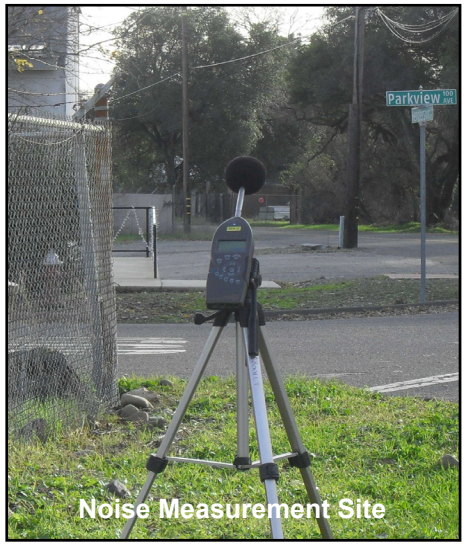
Calibrator: LDL CAL 200
Wind Speed: Calm
Weather: Partly cloudy, dry, ~ 52 F
Field Tech: NTP

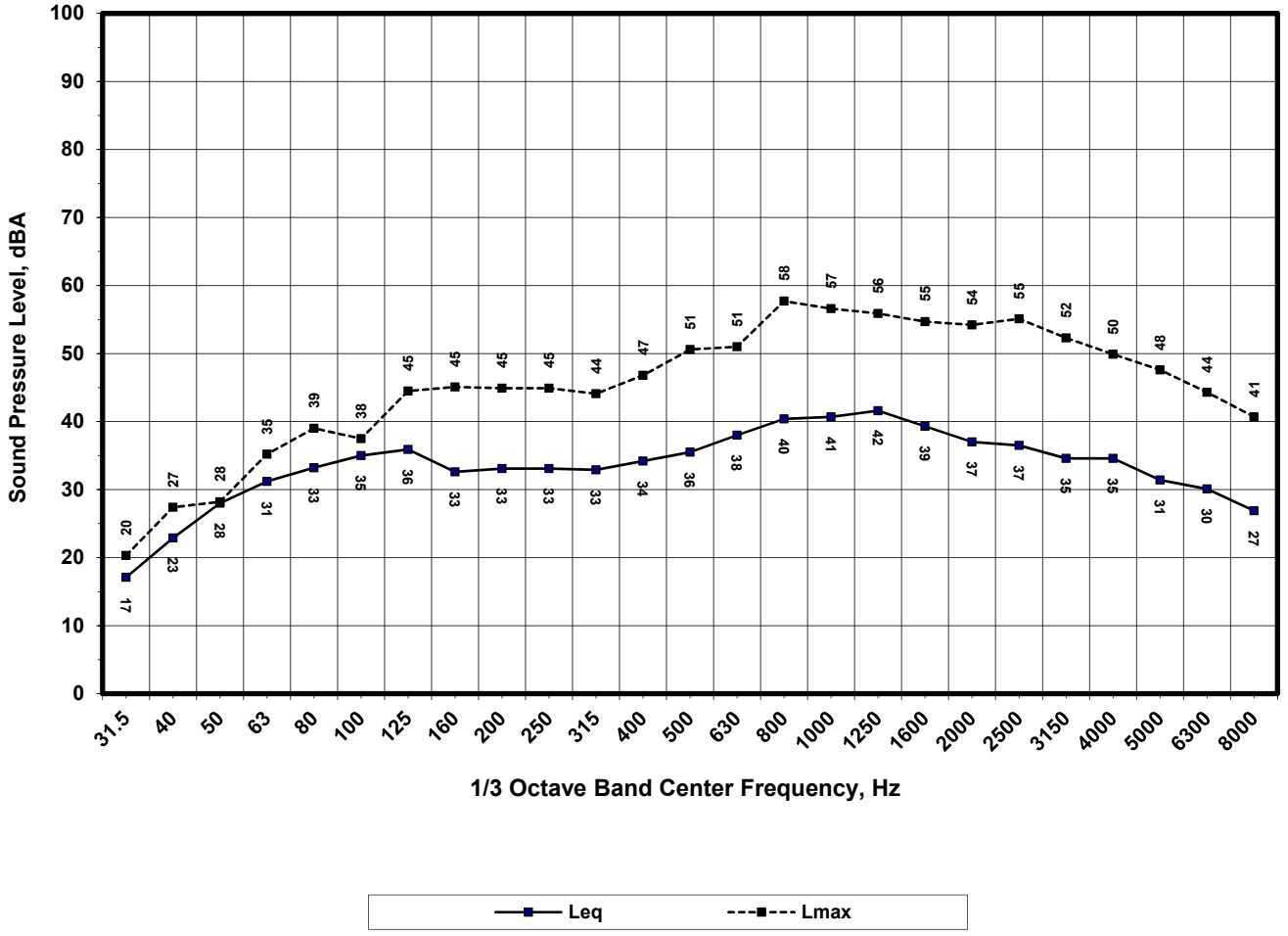
Measurement Results, dBA

Duration:	0:15
L_{eq}:	49.7 dBA
L_{max}:	64.8 dBA
L_{min}:	43.6 dBA
L_{50}:	47
L_{90}:	45

Notes

Primary noise source is traffic with construction noise contributing.





Appendix C

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

Data Input Sheet

Project #: 2018-150
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Bechelli Ln.	North of E. Cypress	4,900	83		17	1	0.5	25	100	
2	Bechelli Ln.	E. Cypress to Hartnell	9,050	83		17	1	0.5	35	50	
3	Bechelli Ln.	South of Hartnell	13,650	83		17	1	0.5	35	50	
4	E. Cypress Ave.	West of Hartnell	26,690	83		17	2	1	40	100	
5	E. Cypress Ave.	Hartnell to Bechelli	17,970	83		17	2	1	35	100	
6	E. Cypress Ave.	Bechelli to Hilltop	33,730	83		17	2	1	35	100	
7	E. Cypress Ave.	East of Hilltop	22,110	83		17	2	1	40	100	
8	Hartnell Ave.	E. Cypress to Henderson	13,720	83		17	1	0.5	35	100	
9	Hartnell Ave.	Henderson to Parkview	13,620	83		17	1	0.5	35	100	
10	Hartnell Ave.	Parkview to Shotwick	12,500	83		17	1	0.5	35	150	
11	Hartnell Ave.	Shotwick to Bechelli	12,090	83		17	1	0.5	35	150	
12	Hartnell Ave.	Bechelli to Northwoods	14,900	83		17	1	0.5	35	75	
13	Hartnell Ave.	Northwoods to Churn Creek	13,310	83		17	1	0.5	35	150	
14	Hartnell Ave.	East of Churn Creek	17,960	83		17	1	0.5	40	50	
15	Henderson Rd.	North of Parkview	110	83		17	0.5	0.25	25	75	
16	Henderson Rd.	South of Parkview	620	83		17	0.5	0.25	25	50	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2018-150
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Bechelli Ln.	North of E. Cypress	51.4	43.1	47.7	53
2	Bechelli Ln.	E. Cypress to Hartnell	62.8	52.6	54.7	64
3	Bechelli Ln.	South of Hartnell	64.6	54.3	56.5	66
4	E. Cypress Ave.	West of Hartnell	64.6	56.7	58.5	66
5	E. Cypress Ave.	Hartnell to Bechelli	61.2	54.0	56.2	63
6	E. Cypress Ave.	Bechelli to Hilltop	63.9	56.8	59.0	66
7	E. Cypress Ave.	East of Hilltop	63.8	55.8	57.7	65
8	Hartnell Ave.	E. Cypress to Henderson	60.1	49.9	52.0	61
9	Hartnell Ave.	Henderson to Parkview	60.1	49.8	52.0	61
10	Hartnell Ave.	Parkview to Shotwick	57.1	46.8	49.0	58
11	Hartnell Ave.	Shotwick to Bechelli	56.9	46.7	48.8	58
12	Hartnell Ave.	Bechelli to Northwoods	62.3	52.1	54.3	63
13	Hartnell Ave.	Northwoods to Churn Creek	57.3	47.1	49.3	58
14	Hartnell Ave.	East of Churn Creek	67.5	56.4	58.3	68
15	Henderson Rd.	North of Parkview	36.8	25.5	30.1	38
16	Henderson Rd.	South of Parkview	47.0	35.6	40.2	48

Appendix C

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

Project #: 2018-150
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Bechelli Ln.	North of E. Cypress	4	8	17	36	78
2	Bechelli Ln.	E. Cypress to Hartnell	9	19	41	89	192
3	Bechelli Ln.	South of Hartnell	12	25	55	117	253
4	E. Cypress Ave.	West of Hartnell	25	55	118	254	547
5	E. Cypress Ave.	Hartnell to Bechelli	16	34	73	158	341
6	E. Cypress Ave.	Bechelli to Hilltop	24	52	112	241	519
7	E. Cypress Ave.	East of Hilltop	22	48	104	224	482
8	Hartnell Ave.	E. Cypress to Henderson	12	25	55	118	254
9	Hartnell Ave.	Henderson to Parkview	12	25	54	117	253
10	Hartnell Ave.	Parkview to Shotwick	11	24	51	111	239
11	Hartnell Ave.	Shotwick to Bechelli	11	23	50	108	233
12	Hartnell Ave.	Bechelli to Northwoods	12	27	58	125	268
13	Hartnell Ave.	Northwoods to Churn Creek	12	25	54	115	249
14	Hartnell Ave.	East of Churn Creek	18	38	82	177	382
15	Henderson Rd.	North of Parkview	0	1	1	3	5
16	Henderson Rd.	South of Parkview	1	2	4	8	17

Appendix C

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

Data Input Sheet

Project #: 2018-150
Description: Existing + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Bechelli Ln.	North of E. Cypress	4,900	83		17	1	0.5	25	100	
2	Bechelli Ln.	E. Cypress to Hartnell	9,090	83		17	1	0.5	35	50	
3	Bechelli Ln.	South of Hartnell	13,910	83		17	1	0.5	35	50	
4	E. Cypress Ave.	West of Hartnell	27,610	83		17	2	1	40	100	
5	E. Cypress Ave.	Hartnell to Bechelli	19,500	83		17	2	1	35	100	
6	E. Cypress Ave.	Bechelli to Hilltop	33,940	83		17	2	1	35	100	
7	E. Cypress Ave.	East of Hilltop	22,280	83		17	2	1	40	100	
8	Hartnell Ave.	E. Cypress to Henderson	16,240	83		17	1	0.5	35	100	
9	Hartnell Ave.	Henderson to Parkview	15,700	83		17	1	0.5	35	100	
10	Hartnell Ave.	Parkview to Shotwick	13,320	83		17	1	0.5	35	150	
11	Hartnell Ave.	Shotwick to Bechelli	12,910	83		17	1	0.5	35	150	
12	Hartnell Ave.	Bechelli to Northwoods	15,410	83		17	1	0.5	35	75	
13	Hartnell Ave.	Northwoods to Churn Creek	13,820	83		17	1	0.5	35	150	
14	Hartnell Ave.	East of Churn Creek	18,300	83		17	1	0.5	40	50	
15	Henderson Rd.	North of Parkview	2,830	83		17	0.5	0.25	25	75	
16	Henderson Rd.	South of Parkview	620	83		17	0.5	0.25	25	50	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2018-150
Description: Existing + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Bechelli Ln.	North of E. Cypress	51.4	43.1	47.7	53
2	Bechelli Ln.	E. Cypress to Hartnell	62.8	52.6	54.8	64
3	Bechelli Ln.	South of Hartnell	64.7	54.4	56.6	66
4	E. Cypress Ave.	West of Hartnell	64.7	56.8	58.6	66
5	E. Cypress Ave.	Hartnell to Bechelli	61.6	54.4	56.6	63
6	E. Cypress Ave.	Bechelli to Hilltop	64.0	56.8	59.0	66
7	E. Cypress Ave.	East of Hilltop	63.8	55.9	57.7	65
8	Hartnell Ave.	E. Cypress to Henderson	60.8	50.6	52.8	62
9	Hartnell Ave.	Henderson to Parkview	60.7	50.4	52.6	62
10	Hartnell Ave.	Parkview to Shotwick	57.3	47.1	49.3	58
11	Hartnell Ave.	Shotwick to Bechelli	57.2	46.9	49.1	58
12	Hartnell Ave.	Bechelli to Northwoods	62.5	52.2	54.4	63
13	Hartnell Ave.	Northwoods to Churn Creek	57.5	47.2	49.4	58
14	Hartnell Ave.	East of Churn Creek	67.5	56.5	58.3	68
15	Henderson Rd.	North of Parkview	50.9	39.6	44.2	52
16	Henderson Rd.	South of Parkview	47.0	35.6	40.2	48

Appendix C

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

Project #: 2018-150
Description: Existing + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Bechelli Ln.	North of E. Cypress	4	8	17	36	78
2	Bechelli Ln.	E. Cypress to Hartnell	9	19	42	90	193
3	Bechelli Ln.	South of Hartnell	12	26	55	119	256
4	E. Cypress Ave.	West of Hartnell	26	56	121	260	559
5	E. Cypress Ave.	Hartnell to Bechelli	17	36	78	167	360
6	E. Cypress Ave.	Bechelli to Hilltop	24	52	112	242	521
7	E. Cypress Ave.	East of Hilltop	23	48	104	225	485
8	Hartnell Ave.	E. Cypress to Henderson	13	28	61	132	284
9	Hartnell Ave.	Henderson to Parkview	13	28	60	129	278
10	Hartnell Ave.	Parkview to Shotwick	12	25	54	116	249
11	Hartnell Ave.	Shotwick to Bechelli	11	24	53	113	244
12	Hartnell Ave.	Bechelli to Northwoods	13	27	59	127	274
13	Hartnell Ave.	Northwoods to Churn Creek	12	26	55	118	255
14	Hartnell Ave.	East of Churn Creek	18	39	83	179	387
15	Henderson Rd.	North of Parkview	2	5	10	22	48
16	Henderson Rd.	South of Parkview	1	2	4	8	17

Appendix C

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

Data Input Sheet

Project #: 2018-150
Description: Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Bechelli Ln.	North of E. Cypress	5,050	83		17	1	0.5	25	100	
2	Bechelli Ln.	E. Cypress to Hartnell	9,700	83		17	1	0.5	35	50	
3	Bechelli Ln.	South of Hartnell	14,900	83		17	1	0.5	35	50	
4	E. Cypress Ave.	West of Hartnell	28,750	83		17	2	1	40	100	
5	E. Cypress Ave.	Hartnell to Bechelli	21,400	83		17	2	1	35	100	
6	E. Cypress Ave.	Bechelli to Hilltop	34,400	83		17	2	1	35	100	
7	E. Cypress Ave.	East of Hilltop	22,700	83		17	2	1	40	100	
8	Hartnell Ave.	E. Cypress to Henderson	18,250	83		17	1	0.5	35	100	
9	Hartnell Ave.	Henderson to Parkview	17,950	83		17	1	0.5	35	100	
10	Hartnell Ave.	Parkview to Shotwick	15,300	83		17	1	0.5	35	150	
11	Hartnell Ave.	Shotwick to Bechelli	14,800	83		17	1	0.5	35	150	
12	Hartnell Ave.	Bechelli to Northwoods	17,700	83		17	1	0.5	35	75	
13	Hartnell Ave.	Northwoods to Churn Creek	16,100	83		17	1	0.5	35	150	
14	Hartnell Ave.	East of Churn Creek	20,100	83		17	1	0.5	40	50	
15	Henderson Rd.	North of Parkview	200	83		17	0.5	0.25	25	75	
16	Henderson Rd.	South of Parkview	750	83		17	0.5	0.25	25	50	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2018-150
Description: Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Bechelli Ln.	North of E. Cypress	51.5	43.2	47.9	54
2	Bechelli Ln.	E. Cypress to Hartnell	63.1	52.9	55.0	64
3	Bechelli Ln.	South of Hartnell	65.0	54.7	56.9	66
4	E. Cypress Ave.	West of Hartnell	64.9	57.0	58.8	66
5	E. Cypress Ave.	Hartnell to Bechelli	62.0	54.8	57.0	64
6	E. Cypress Ave.	Bechelli to Hilltop	64.0	56.9	59.0	66
7	E. Cypress Ave.	East of Hilltop	63.9	56.0	57.8	65
8	Hartnell Ave.	E. Cypress to Henderson	61.3	51.1	53.3	62
9	Hartnell Ave.	Henderson to Parkview	61.3	51.0	53.2	62
10	Hartnell Ave.	Parkview to Shotwick	57.9	47.7	49.9	59
11	Hartnell Ave.	Shotwick to Bechelli	57.8	47.5	49.7	59
12	Hartnell Ave.	Bechelli to Northwoods	63.1	52.8	55.0	64
13	Hartnell Ave.	Northwoods to Churn Creek	58.2	47.9	50.1	59
14	Hartnell Ave.	East of Churn Creek	67.9	56.9	58.7	69
15	Henderson Rd.	North of Parkview	39.4	28.1	32.7	41
16	Henderson Rd.	South of Parkview	47.8	36.5	41.1	49

Appendix C

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

Project #: 2018-150
Description: Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Bechelli Ln.	North of E. Cypress	4	8	17	37	80
2	Bechelli Ln.	E. Cypress to Hartnell	9	20	43	94	201
3	Bechelli Ln.	South of Hartnell	12	27	58	125	268
4	E. Cypress Ave.	West of Hartnell	27	57	124	267	575
5	E. Cypress Ave.	Hartnell to Bechelli	18	38	83	178	383
6	E. Cypress Ave.	Bechelli to Hilltop	24	53	113	244	526
7	E. Cypress Ave.	East of Hilltop	23	49	106	228	491
8	Hartnell Ave.	E. Cypress to Henderson	14	31	66	143	307
9	Hartnell Ave.	Henderson to Parkview	14	30	65	141	304
10	Hartnell Ave.	Parkview to Shotwick	13	27	59	127	273
11	Hartnell Ave.	Shotwick to Bechelli	12	27	58	124	267
12	Hartnell Ave.	Bechelli to Northwoods	14	30	65	140	301
13	Hartnell Ave.	Northwoods to Churn Creek	13	28	61	131	282
14	Hartnell Ave.	East of Churn Creek	19	41	89	191	412
15	Henderson Rd.	North of Parkview	0	1	2	4	8
16	Henderson Rd.	South of Parkview	1	2	4	9	20

Appendix C

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

Data Input Sheet

Project #: 2018-150
Description: Cumulative + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Bechelli Ln.	North of E. Cypress	5,050	83		17	1	0.5	25	100	
2	Bechelli Ln.	E. Cypress to Hartnell	9,760	83		17	1	0.5	35	50	
3	Bechelli Ln.	South of Hartnell	15,160	83		17	1	0.5	35	50	
4	E. Cypress Ave.	West of Hartnell	29,670	83		17	2	1	40	100	
5	E. Cypress Ave.	Hartnell to Bechelli	22,930	83		17	2	1	35	100	
6	E. Cypress Ave.	Bechelli to Hilltop	34,610	83		17	2	1	35	100	
7	E. Cypress Ave.	East of Hilltop	22,870	83		17	2	1	40	100	
8	Hartnell Ave.	E. Cypress to Henderson	20,770	83		17	1	0.5	35	100	
9	Hartnell Ave.	Henderson to Parkview	20,010	83		17	1	0.5	35	100	
10	Hartnell Ave.	Parkview to Shotwick	16,100	83		17	1	0.5	35	150	
11	Hartnell Ave.	Shotwick to Bechelli	15,600	83		17	1	0.5	35	150	
12	Hartnell Ave.	Bechelli to Northwoods	18,200	83		17	1	0.5	35	75	
13	Hartnell Ave.	Northwoods to Churn Creek	16,600	83		17	1	0.5	35	150	
14	Hartnell Ave.	East of Churn Creek	20,430	83		17	1	0.5	40	50	
15	Henderson Rd.	North of Parkview	2,920	83		17	0.5	0.25	25	75	
16	Henderson Rd.	South of Parkview	750	83		17	0.5	0.25	25	50	
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Appendix C

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

Project #: 2018-150
Description: Cumulative + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Bechelli Ln.	North of E. Cypress	51.5	43.2	47.9	54
2	Bechelli Ln.	E. Cypress to Hartnell	63.1	52.9	55.1	64
3	Bechelli Ln.	South of Hartnell	65.0	54.8	57.0	66
4	E. Cypress Ave.	West of Hartnell	65.1	57.1	58.9	67
5	E. Cypress Ave.	Hartnell to Bechelli	62.3	55.1	57.3	64
6	E. Cypress Ave.	Bechelli to Hilltop	64.0	56.9	59.1	66
7	E. Cypress Ave.	East of Hilltop	63.9	56.0	57.8	65
8	Hartnell Ave.	E. Cypress to Henderson	61.9	51.7	53.8	63
9	Hartnell Ave.	Henderson to Parkview	61.7	51.5	53.7	63
10	Hartnell Ave.	Parkview to Shotwick	58.2	47.9	50.1	59
11	Hartnell Ave.	Shotwick to Bechelli	58.0	47.8	50.0	59
12	Hartnell Ave.	Bechelli to Northwoods	63.2	53.0	55.1	64
13	Hartnell Ave.	Northwoods to Churn Creek	58.3	48.0	50.2	59
14	Hartnell Ave.	East of Churn Creek	68.0	57.0	58.8	69
15	Henderson Rd.	North of Parkview	51.1	39.7	44.3	52
16	Henderson Rd.	South of Parkview	47.8	36.5	41.1	49

Appendix C

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

Project #: 2018-150
Description: Cumulative + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Bechelli Ln.	North of E. Cypress	4	8	17	37	80
2	Bechelli Ln.	E. Cypress to Hartnell	9	20	44	94	202
3	Bechelli Ln.	South of Hartnell	13	27	58	126	271
4	E. Cypress Ave.	West of Hartnell	27	59	126	272	587
5	E. Cypress Ave.	Hartnell to Bechelli	19	40	86	186	401
6	E. Cypress Ave.	Bechelli to Hilltop	25	53	114	245	528
7	E. Cypress Ave.	East of Hilltop	23	49	106	229	493
8	Hartnell Ave.	E. Cypress to Henderson	16	33	72	155	335
9	Hartnell Ave.	Henderson to Parkview	15	33	70	152	327
10	Hartnell Ave.	Parkview to Shotwick	13	28	61	131	282
11	Hartnell Ave.	Shotwick to Bechelli	13	28	60	128	277
12	Hartnell Ave.	Bechelli to Northwoods	14	31	66	142	307
13	Hartnell Ave.	Northwoods to Churn Creek	13	29	62	134	288
14	Hartnell Ave.	East of Churn Creek	19	42	90	193	416
15	Henderson Rd.	North of Parkview	2	5	10	23	49
16	Henderson Rd.	South of Parkview	1	2	4	9	20