



Environmental Noise Assessment

106 Bonny Knoll Auto Repair and Car Wash

City of Roseville, California

June 22, 2021

Project #210506

Prepared for:

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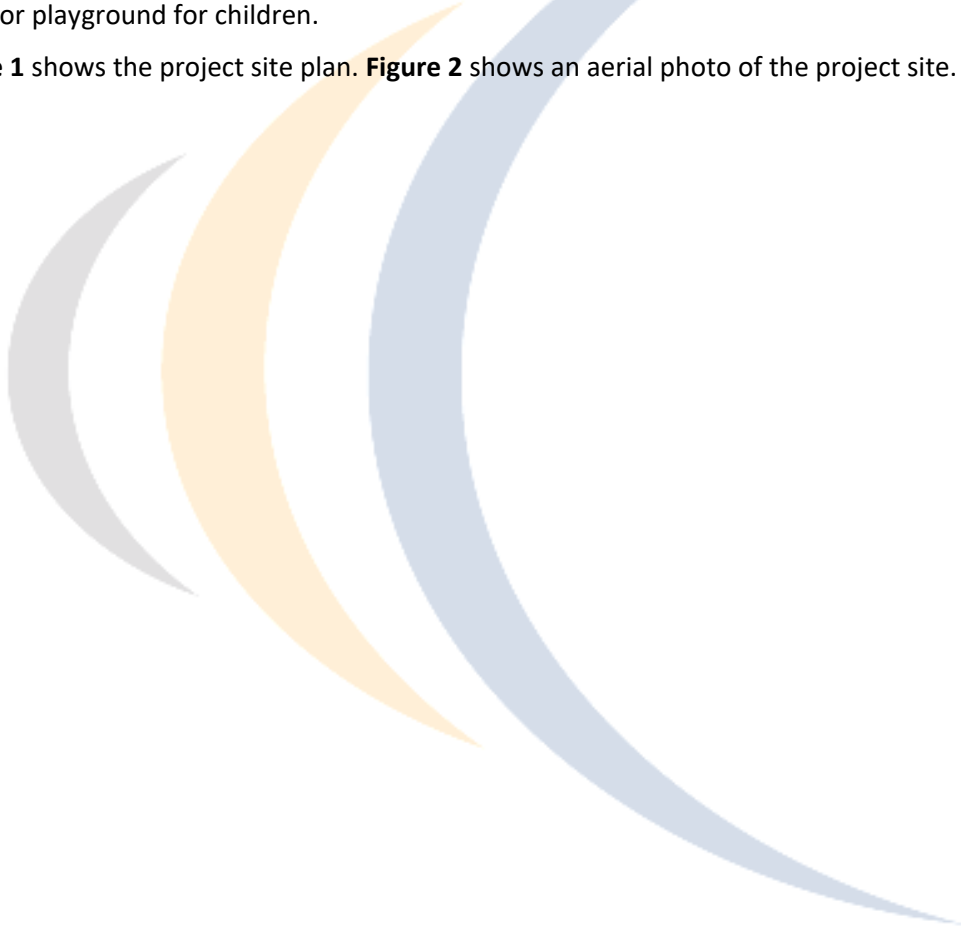


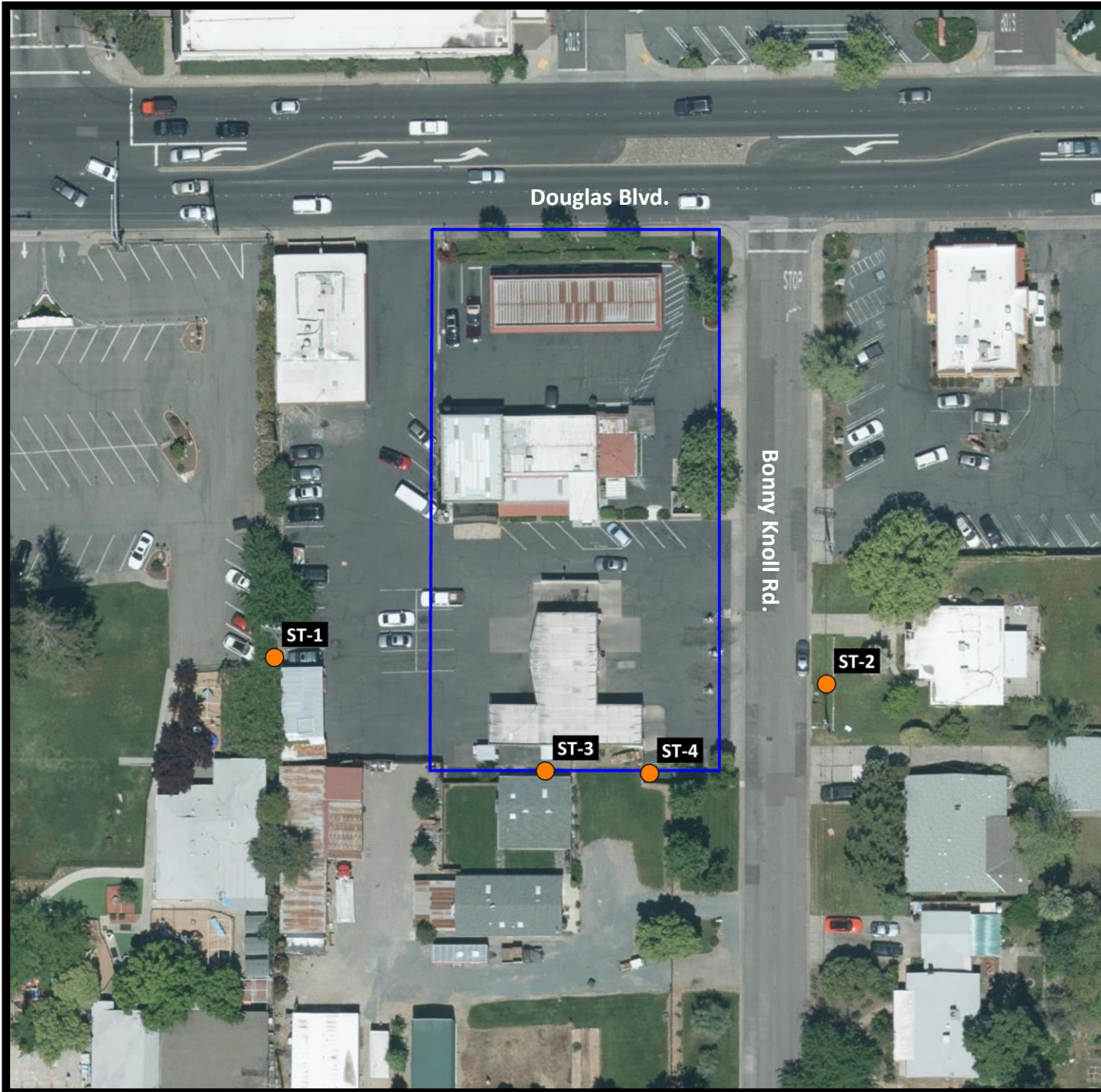
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INTRODUCTION

The proposed project includes the conversion of two existing unused car wash bays into auto repair bays and the addition of a third auto repair bay. One existing bay contains an car wash which will continue to operate without changes to operations. The project is located at the existing Auto Service of Roseville (ASR) repair facility located at the southwestern corner of the intersection of Douglas Boulevard and Bonny Knoll Road in the City of Roseville, California. This analysis will evaluate the potential of the proposed project to generate noise levels exceeding the applicable the City of Roseville exterior noise level standards at existing noise-sensitive receptors or to substantially increase existing noise levels. Adjacent land uses include residences to the east and south of the project site and commercial uses to the north and west of the project site. A church lies directly west of the project site and includes an outdoor playground for children.

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





Bonny Knoll Auto Repair

Roseville, California

Figure 2

Noise Measurement Sites

Legend

- Project Site
- Noise Measurement - Short Term



Projection: Mercator / WGS84 / meters
 Rev. Date: 06/24/2021



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 AMBIENT NOISE LEVELS

The existing ambient noise environment in the project vicinity is primarily defined by traffic on the local roadways adjacent to the project site, including Douglas Boulevard and Bonny Knoll Road.

To quantify the existing ambient noise environment on the project site, Saxelby Acoustics conducted a noise measurement survey. The noise measurement location is shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meter was 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 831 precision integrating sound level meter was used for the ambient noise level measurement survey. The meter was calibrated before and after use with a 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 Sound Level, dB			Notes
			L_{eq}	L_{50}	L_{max}	
ST-1	5/28/2021	2:57 p.m.	65	52	95	Primary noise source is traffic on Douglas Blvd. Secondary noise source is existing repair facility noise.
ST-2		3:30 p.m.	55	53	66	Primary noise source is traffic on Douglas Blvd. and Bonny Knoll Lane.1 Secondary noise source is existing repair facility noise.
ST-3		3:45 p.m.	65	52	78	Primary noise source is car wash blowers. Traffic from car wash is secondary noise source.
ST-4		3:51 p.m.	62	53	76	Primary noise source is car wash blowers. Traffic on Douglas Blvd is secondary noise source.

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 Roseville General Plan

The City of Roseville General Plan Noise Element Table 1X-3 (**Table 3**) establishes an acceptable exterior noise level of 50 dBA L_{eq} for daytime (7:00 a.m. to 10:00 p.m.) for stationary noise sources.

TABLE 3: CITY OF ROSEVILLE NOISE ELEMENT TABLE 1X-3

TABLE IX-3		
PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES OR PROJECTS AFFECTED BY NON-TRANSPORTATION NOISE SOURCES (As Measured at the Property Line of Noise-Sensitive Uses)		
Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly L_{eq}, dB	50	45
Maximum level, dB	70	65
<p>¹ For municipal power plants consisting primarily of broadband, steady state noise sources, the hourly (L_{eq}) noise standard may be increased up to 10 dB(A), but not exceed 55 dB(A) Hourly L_{eq} dB.</p> <p>Each of the noise levels specified above should be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Such noises are generally considered by residents to be particularly annoying and are a primary source of noise complaints. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).</p> <p>No standards have been included for interior noise levels. Standard construction practices should, with exterior noise levels identified, result in acceptable interior noise levels.</p>		

SOURCE: CITY OF ROSEVILLE GENERAL PLAN NOISE ELEMENT 2035.

Based upon review of the City of Roseville General Plan Noise Element standards, hourly noise level limits of 50 dBA L_{eq} during the daytime (7:00 a.m. to 10:00 p.m.) and 45 dBA L_{eq} during the nighttime (10:00 p.m. to 7 a.m.) will be applied to the proposed project.

EVALUATION OF PROJECT-GENERATED NOISE AT RESIDENTIAL RECEPTORS

The proposed project includes the conversion of two existing unused car wash bays into auto repair bays, the addition of a third auto repair bay, and the continued operation of the existing car wash. Therefore, this analysis assumes continuous operation of those three repair bays.

Based upon previous measurements of a similar automotive repair facility, it is expected that three auto maintenance bays would generate noise levels of 51 dBA L_{eq} at 60 feet. Operations include the use of hand tools, lift noise, vehicle engine noise, talking by repair technicians, use of a vacuum cleaner, and use of compressed air.

Saxelby Acoustics used the SoundPLAN noise prediction model. Inputs to the model included sound power levels for three proposed auto repair bays, existing and proposed buildings, terrain type, and locations of sensitive receptors. The model does not include the existing permitted uses which will continue to operate. The noise from those existing facilities is represented by the ambient noise measurements collected for the project. These predictions are made in accordance with International Organization for Standardization (ISO) standard 9613-2:1996 (Acoustics – Attenuation of sound during propagation outdoors). ISO 9613 is the most commonly used method for calculating exterior noise propagation.

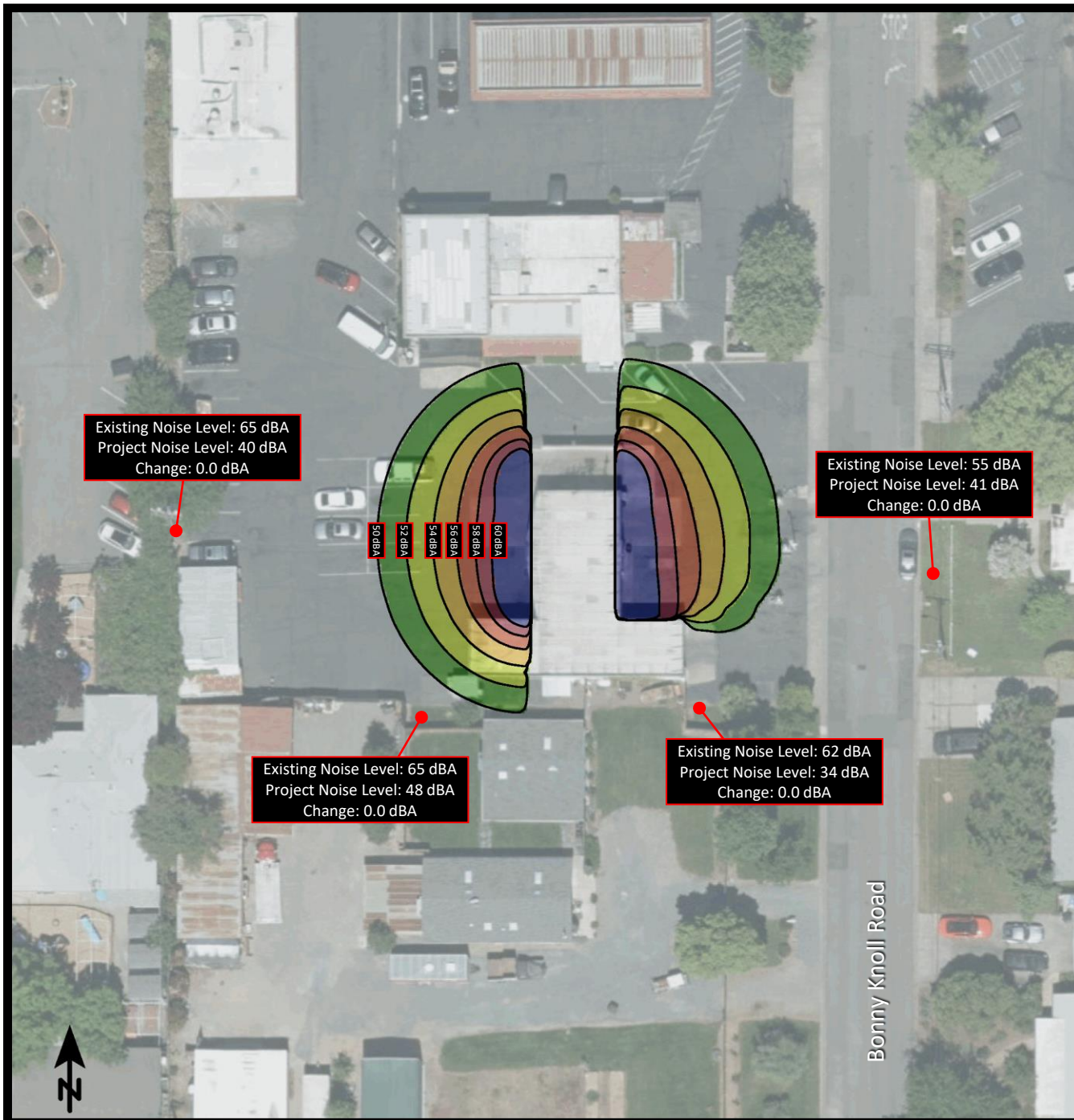
Figure 3 shows the predicted project noise level contours in terms of the average (L_{eq}) noise descriptor. **Figure 4** shows the predicted project noise level contours in terms of the maximum (L_{max}) noise descriptor.

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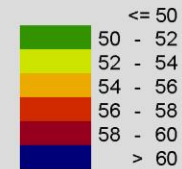
Figure 3

Project Noise Contours (dBA L_{eq})



Signs and symbols

Levels in dB(A)



1 : 700

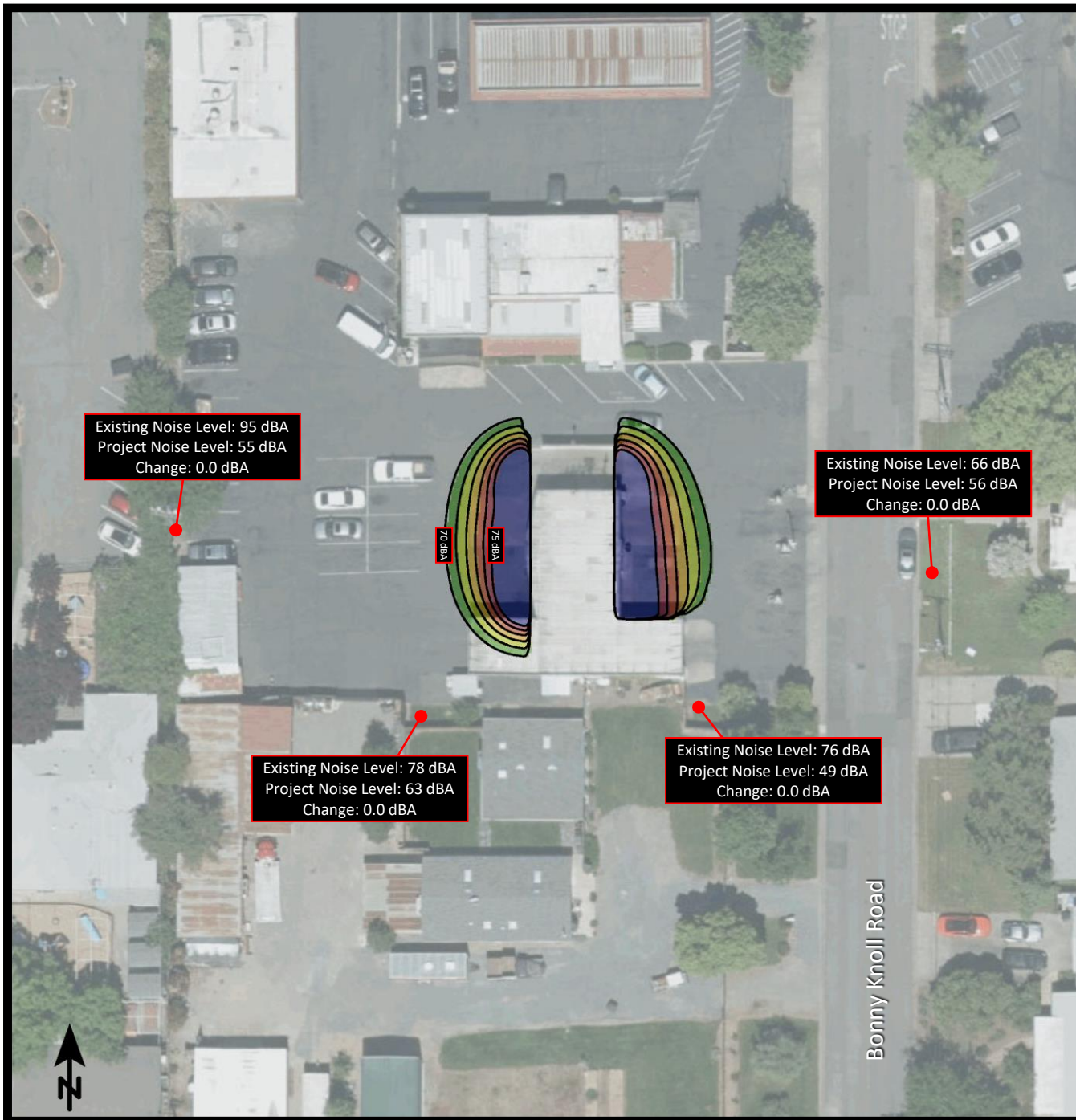


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Figure 4

Project Noise Contours (dBA L_{max})



Existing Noise Level: 95 dBA
Project Noise Level: 55 dBA
Change: 0.0 dBA

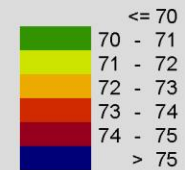
Existing Noise Level: 66 dBA
Project Noise Level: 56 dBA
Change: 0.0 dBA

Existing Noise Level: 78 dBA
Project Noise Level: 63 dBA
Change: 0.0 dBA

Existing Noise Level: 76 dBA
Project Noise Level: 49 dBA
Change: 0.0 dBA

Signs and symbols

Levels in dB(A)



1 : 700



CONCLUSIONS

The noise analysis indicates that project noise levels at the existing single-family residential uses would be less than 50 dBA L_{eq} and 70 dBA L_{max} . Specifically, project-related noise levels at the nearest receptors are predicted to range between 34-48 dBA L_{eq} and 49-63 dBA L_{max} . These noise levels would not cause an increase above the existing ambient noise environment at the nearby sensitive receptors. Nighttime (10:00 p.m. to 7:00 a.m.) operation is not expected to occur. Therefore, no additional noise control measures are recommended.

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.
ASTC	Apparent Sound Transmission Class. Similar to STC but includes sound from flanking paths and correct for room reverberation. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
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 +5 dBA and nighttime hours weighted by +10 dBA.
DNL	See definition of Ldn.
IIC	Impact Insulation Class. An integer-number rating of how well a building floor attenuates impact sounds, such as footsteps. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	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 L50 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.
NIC	Noise Isolation Class. A rating of the noise reduction between two spaces. Similar to STC but includes sound from flanking paths and no correction for room reverberation.
NNIC	Normalized Noise Isolation Class. Similar to NIC but includes a correction for room reverberation.
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.
RT60	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is a rating, in decibels, of a discrete event, such as an aircraft flyover or train pass by, that compresses the total sound energy into a one-second event.
SPC	Speech Privacy Class. SPC is a method of rating speech privacy in buildings. It is designed to measure the degree of speech privacy provided by a closed room, indicating the degree to which conversations occurring within are kept private from listeners outside the room.
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. The STC rating is typically used to rate the sound transmission of a specific building element when tested in laboratory conditions where flanking paths around the assembly don't exist. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
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: Ambient Noise Measurement Results



Appendix B1 : Short Term Noise Monitoring Results

Site: ST-1

Project: Bonny Knoll Auto Repair Facility

Meter: LDL 831-4

Location: Car Wash Blowers E Boundary

Calibrator: CAL200

Coordinates: 38.743260°, -121.275730°

Start: 2021-05-28 14:57:09

Stop: 2021-05-28 15:42:15

SLM: Model 831

Serial: 2893

Measurement Results, dBA

Duration: 0:44

L_{eq} : 65

L_{max} : 95

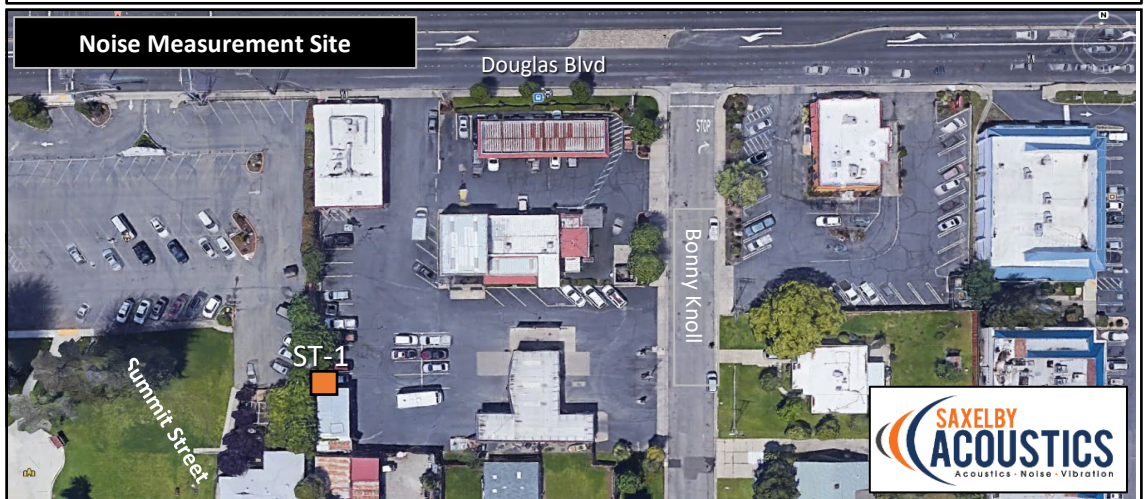
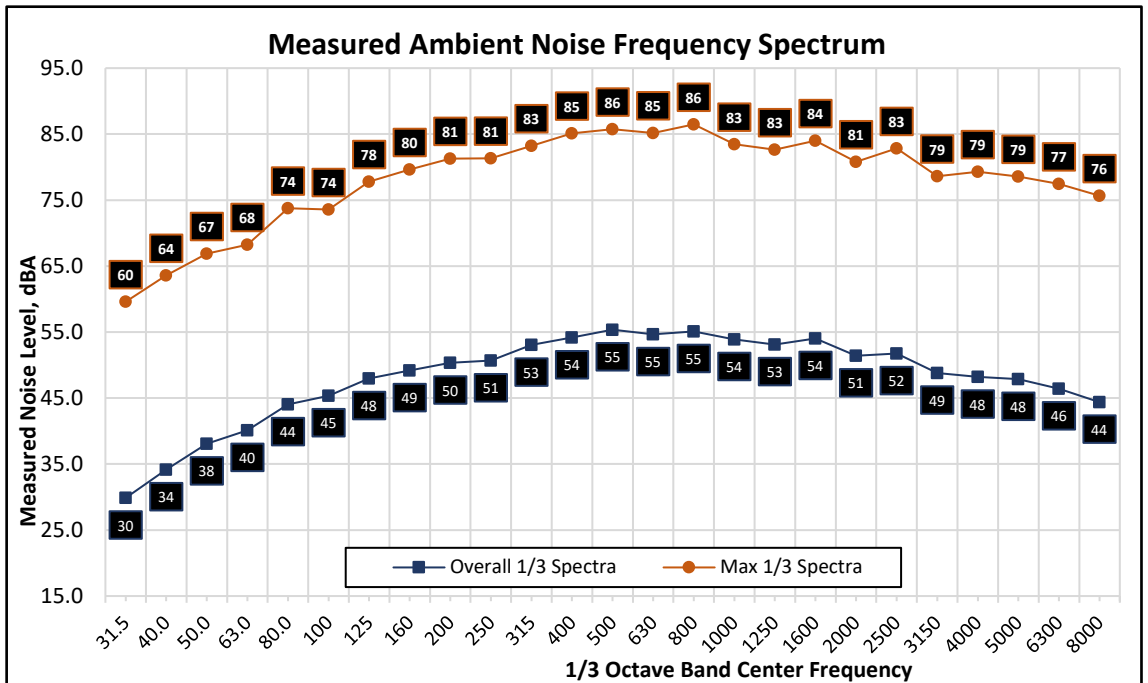
L_{min} : 44

L_{50} : 52

L_{90} : 48

Notes

Car wash blowers were primary noise source, traffic was secondary noise source. Vacuum was sort of a primary source since it was almost as loud as the blowers. Lmax caused by passing pickups and commercial activity at adjacent uses.



Appendix B2 : Short Term Noise Monitoring Results

Site: ST-2

Project: Bonny Knoll Auto Repair Facility

Meter: LDL 831-5

Location: Street Adjacent to Car Wash W Boundary

Calibrator: CAL200

Coordinates: 38.743380°, -121.276050°

Start: 2021-05-28 15:30:09

Stop: 2021-05-28 15:40:26

SLM: Model 831

Serial: 2658

Measurement Results, dBA

Duration: 0:10

L_{eq} : 55

L_{max} : 66

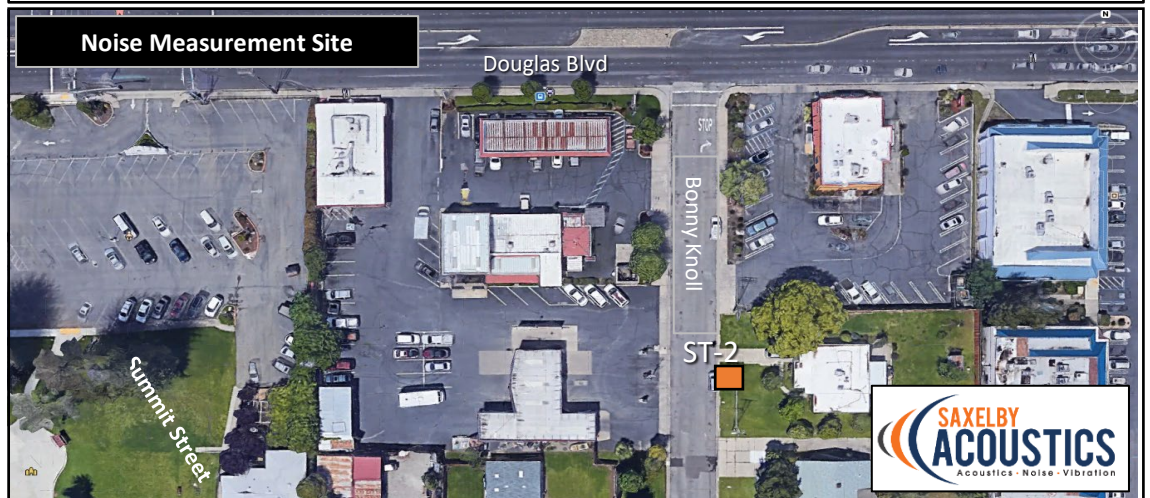
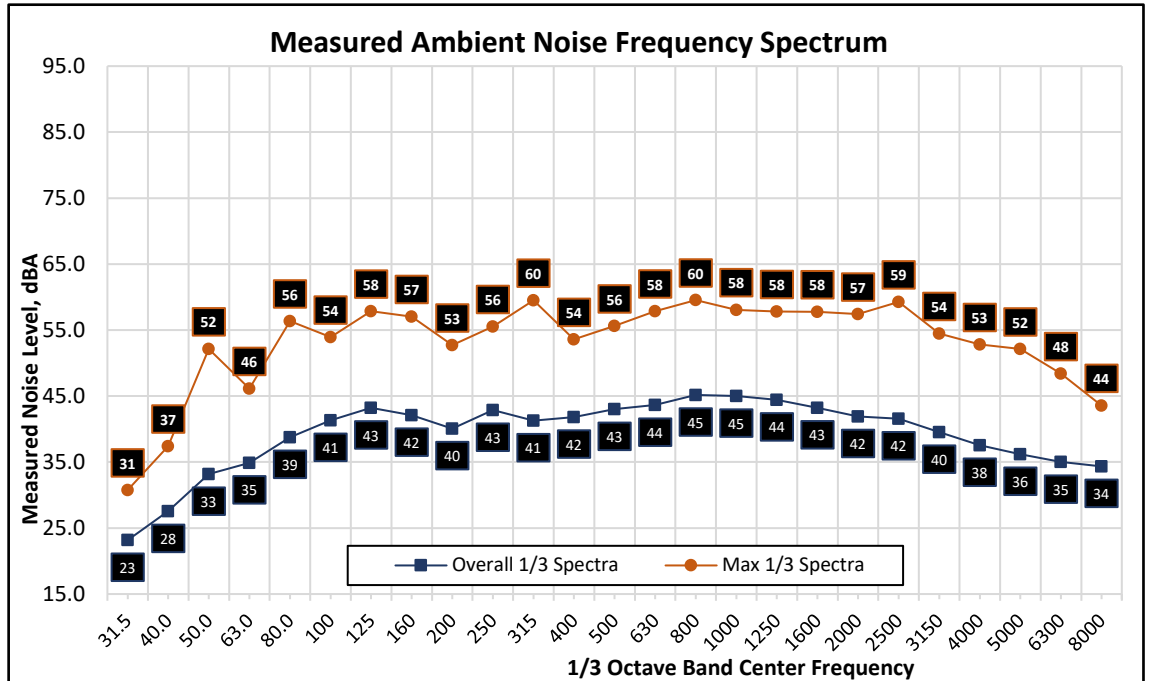
L_{min} : 47

L_{50} : 53

L_{90} : 49

Notes

Car wash blowers were primary noise source, and cars exiting from car wash were secondary noise source.



Appendix B3 : Short Term Noise Monitoring Results

Site: ST-3

Project: Bonny Knoll Auto Repair Facility

Meter: LDL 831-4

Location: Car Wash Entrance Southern Boundary

Calibrator: CAL200

Coordinates: 38.743380°, -121.275460°

Start: 2021-05-28 15:45:41

Stop: 2021-05-28 16:19:29

SLM: Model 831

Serial: 2893

Measurement Results, dBA

Duration: 0:33

L_{eq}: 65

L_{max}: 78

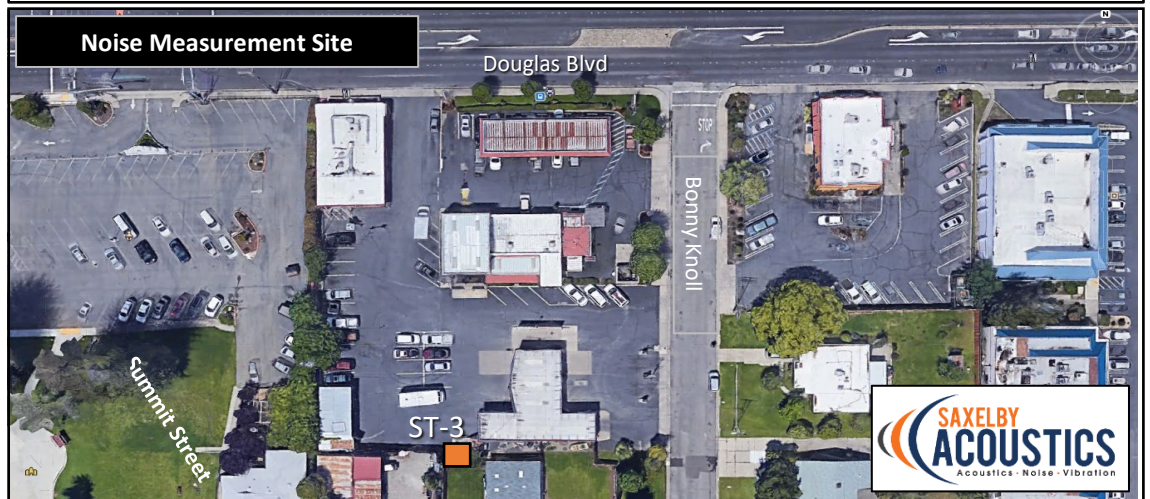
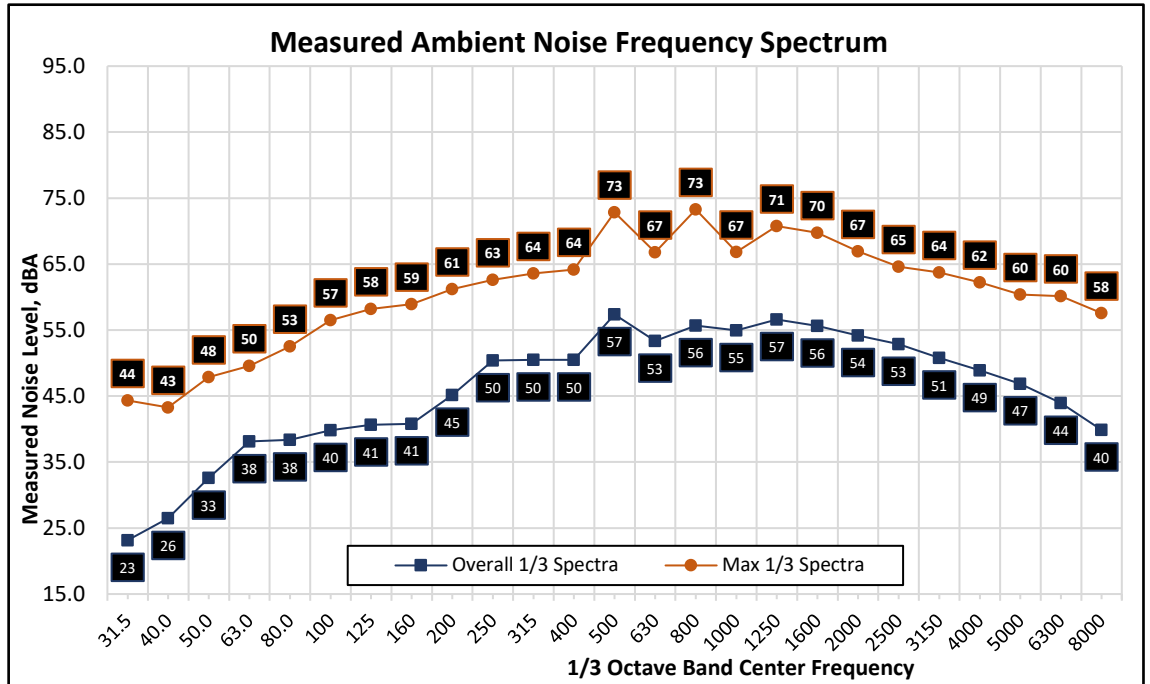
L_{min}: 44

L₅₀: 52

L₉₀: 48

Notes

Car wash blowers were primary noise source, and cars exiting from car wash were secondary noise source.



Appendix B4 : Short Term Noise Monitoring Results

Site: ST-4

Project: Bonny Knoll Auto Repair Facility

Meter: LDL 831-5

Location: Car Wash Exit Southern Boundary

Calibrator: CAL200

Coordinates: 38.743400°, -121.276310°

Start: 2021-05-28 15:51:06

Stop: 2021-05-28 16:18:45

SLM: Model 831

Serial: 2658

Measurement Results, dBA

Duration: 0:27

L_{eq}: 62

L_{max}: 76

L_{min}: 46

L₅₀: 53

L₉₀: 49

Notes

Car wash blowers were primary noise source, traffic was secondary noise source.

