Quick Quack Car Wash Laurel Plaza(Store #8-034)

Noise Impact Study

City of Oakley, CA

Prepared for:

Quick Quack Development II, LLC
Mr. Cameron Drennan
1380 Lead hill Blvd #260
Roseville, CA 95661

Prepared by:

MD Acoustics, LLC
Mike Dickerson, INCE
Robert Pearson
1197 Los Angeles Avenue, Ste 256
Simi Valley, CA 93065

Date: 3/12/2021

MD ACOUSTICS
Sound Solutions for Planning and Design

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

This purpose of this noise impact study is to evaluate the potential noise impacts for the project study area and compare results to City and CEQA thresholds. The assessment was conducted and compared to the noise standards set forth by the Federal, State and Local agencies. Consistent with the California Environmental Quality Act (CEQA) and CEQA Guidelines, a significant impact related to noise would occur if a proposed project is determined to 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 agencies.
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- A description of the local noise guidelines and standards
- An evaluation of the existing ambient noise environment
- An analysis of stationary noise impacts from the project site to adjacent land uses
- Construction noise and vibration evaluation

1.2 Site Location and Study Area

The project site is located at the northwest corner of O'Hara avenue and Laurel Road, in the City of Oakley, CA as shown in Exhibit A. The land uses directly surrounding the project include future commercial uses to the north, south, east, and west with residential approximately 150 feet to the north.

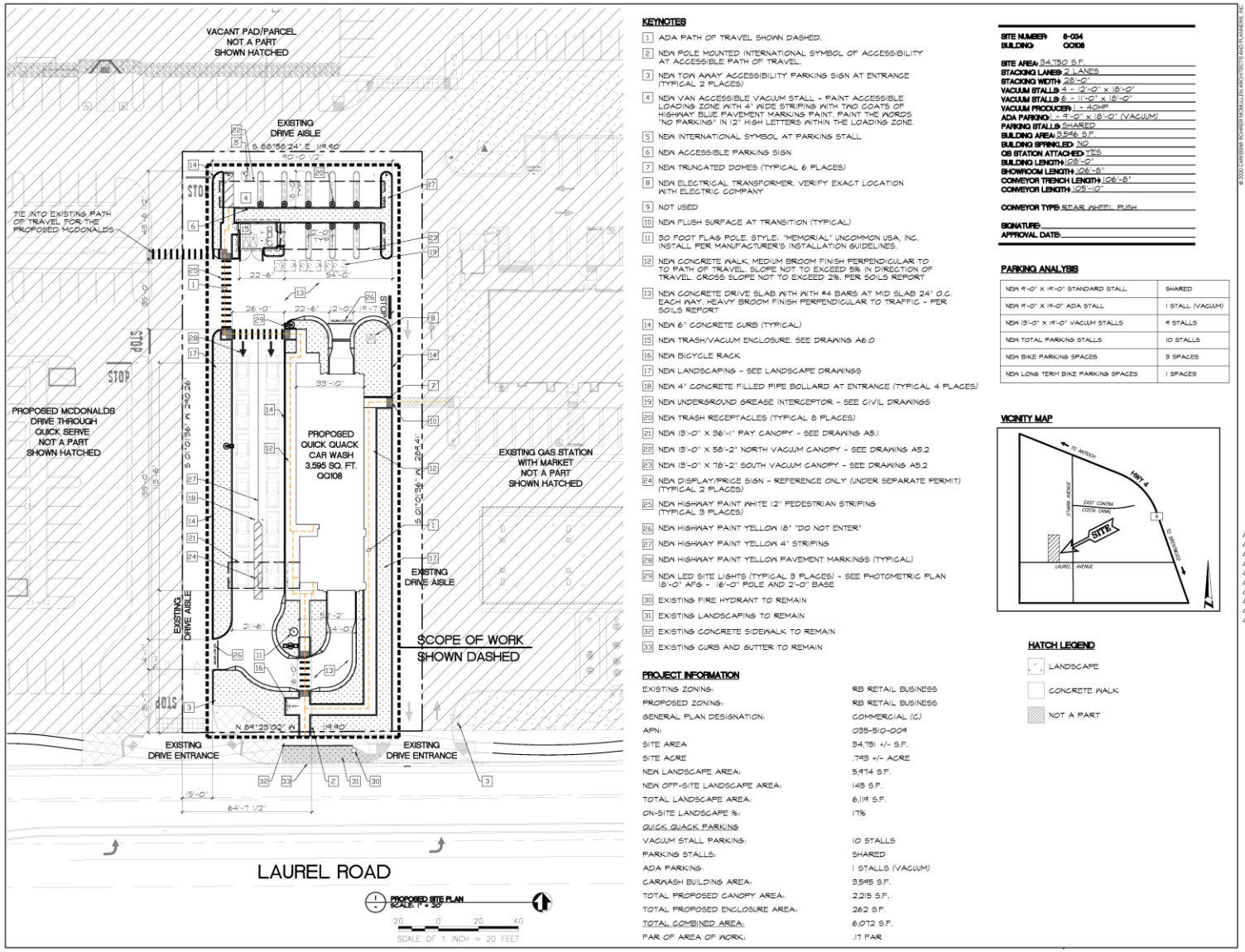
1.3 Proposed Project Description

The project proposes to develop 3,595 square foot car wash tunnel with ten (10) vacuum bays on approximately 34,750 square foot lot. The site plan used for this is illustrated in Exhibit B. The project car wash is proposed to operate during the allowable daytime hours (7AM to 10PM).

Exhibit A
Location Map

Exhibit B

Site Plan



KEYNOTES

1. ADA PATH OF TRAVEL SHOWN DASHED.
2. NEW POLE MOUNTED INTERNATIONAL SYMBOL OF ACCESSIBILITY AT ACCESSIBLE PATH OF TRAVEL.
3. NEW TOW AWAY ACCESSIBILITY PARKING SIGN AT ENTRANCE (TYPICAL 2 PLACES)
4. NEW VAN ACCESSIBLE VACUUM STALL - PAINT ACCESSIBLE LOADING ZONE WITH 4" WIDE STRIPING WITH TWO COATS OF HIGHWAY BLUE PAVEMENT MARKING PAINT. PAINT THE WORDS "NO PARKING" IN 12" HIGH LETTERS WITHIN THE LOADING ZONE.
5. NEW INTERNATIONAL SYMBOL AT PARKING STALL
6. NEW ACCESSIBLE PARKING SIGN
7. NEW TRUNCATED DOMES (TYPICAL 6 PLACES)
8. NEW ELECTRICAL TRANSFORMER. VERIFY EXACT LOCATION WITH ELECTRIC COMPANY
9. NOT USED
10. NEW FLUSH SURFACE AT TRANSITION (TYPICAL)
11. 30 FOOT FLAG POLE, STYLE: "MEMORIAL" UNCOMMON USA, INC. INSTALL PER MANUFACTURER'S INSTALLATION GUIDELINES.
12. NEW CONCRETE WALK, MEDIUM BROOM FINISH PERPENDICULAR TO TO PATH OF TRAVEL. SLOPE NOT TO EXCEED 5% IN DIRECTION OF TRAVEL. CROSS SLOPE NOT TO EXCEED 2%. PER SOILS REPORT
13. NEW CONCRETE DRIVE SLAB WITH WITH #4 BARS AT MID SLAB 24" O.C. EACH WAY. HEAVY BROOM FINISH PERPENDICULAR TO TRAFFIC - PER SOILS REPORT
14. NEW 6" CONCRETE CURB (TYPICAL)
15. NEW TRASH/VACUUM ENCLOSURE. SEE DRAWING A6.0
16. NEW BICYCLE RACK
17. NEW LANDSCAPING - SEE LANDSCAPE DRAWINGS
18. NEW 4" CONCRETE FILLED PIPE BOLLARD AT ENTRANCE (TYPICAL 4 PLACES)
19. NEW UNDERGROUND GREASE INTERCEPTOR - SEE CIVIL DRAWINGS
20. NEW TRASH RECEPTACLES (TYPICAL 8 PLACES)
21. NEW 13'-0" X 36'-1" PAY CANOPY - SEE DRAWING A5.1
22. NEW 13'-0" X 58'-2" NORTH VACUUM CANOPY - SEE DRAWING A5.2
23. NEW 13'-0" X 78'-2" SOUTH VACUUM CANOPY - SEE DRAWING A5.2
24. NEW DISPLAY/PRICE SIGN - REFERENCE ONLY (UNDER SEPARATE PERMIT) (TYPICAL 2 PLACES)
25. NEW HIGHWAY PAINT WHITE 12" PEDESTRIAN STRIPING (TYPICAL 3 PLACES)
26. NEW HIGHWAY PAINT YELLOW 18" "DO NOT ENTER"
27. NEW HIGHWAY PAINT YELLOW 4" STRIPING
28. NEW HIGHWAY PAINT YELLOW PAVEMENT MARKINGS (TYPICAL)
29. NEW LED SITE LIGHTS (TYPICAL 3 PLACES) - SEE PHOTOMETRIC PLAN 18'-0" AFG - 16'-0" POLE AND 2'-0" BASE
30. EXISTING FIRE HYDRANT TO REMAIN
31. EXISTING LANDSCAPING TO REMAIN
32. EXISTING CONCRETE SIDEWALK TO REMAIN
33. EXISTING CURB AND GUTTER TO REMAIN

PROJECT INFORMATION

EXISTING ZONING:	RB RETAIL BUSINESS
PROPOSED ZONING:	RB RETAIL BUSINESS
GENERAL PLAN DESIGNATION:	COMMERCIAL (C)
APN:	035-510-009
SITE AREA	34,751 +/- S.F.
SITE ACRE	.793 +/- ACRE
NEW LANDSCAPE AREA:	5,974 S.F.
NEW OFF-SITE LANDSCAPE AREA:	145 S.F.
TOTAL LANDSCAPE AREA:	6,119 S.F.
ON-SITE LANDSCAPE %:	17%
QUICK QUACK PARKING	
VACUUM STALL PARKING:	10 STALLS
PARKING STALLS:	SHARED
ADA PARKING:	1 STALLS (VACUUM)
CARWASH BUILDING AREA:	3,595 S.F.
TOTAL PROPOSED CANOPY AREA:	2,215 S.F.
TOTAL PROPOSED ENCLOSURE AREA:	262 S.F.
TOTAL COMBINED AREA:	6,072 S.F.
FAR OF AREA OF WORK:	.17 FAR

SITE NUMBER: 8-034
BUILDING: QQ108

SITE AREA: 34,750 S.F.
STACKING LANES: 2 LANES
STACKING WIDTH: 28'-0"
VACUUM STALLS: 4 - 12'-0" x 18'-0"
VACUUM STALLS: 6 - 11'-0" x 18'-0"
VACUUM PRODUCER: 1 - 40HP
ADA PARKING: 1 - 9'-0" x 18'-0" (VACUUM)
PARKING STALLS: SHARED
BUILDING AREA: 3,596 S.F.
BUILDING SPRINKLED: NO
QB STATION ATTACHED: YES
BUILDING LENGTH: 108'-0"
SHOWROOM LENGTH: 106'-8"
CONVEYOR TRENCH LENGTH: 106'-8"
CONVEYOR LENGTH: 105'-0"

CONVEYOR TYPE: REAR WHEEL PUSH

SIGNATURE:
APPROVAL DATE:

PARKING ANALYSIS

NEW 9'-0" X 18'-0" STANDARD STALL	SHARED
NEW 9'-0" X 18'-0" ADA STALL	1 STALL (VACUUM)
NEW 18'-0" X 18'-0" VACUM STALLS	9 STALLS
NEW TOTAL PARKING STALLS	10 STALLS
NEW BIKE PARKING SPACES	3 SPACES
NEW LONG TERM BIKE PARKING SPACES	1 SPACES

VICINITY MAP

HATCH LEGEND

- LANDSCAPE
- CONCRETE WALK
- NOT A PART

CRM Architects & Planners, Inc.

QUICK QUACK CAR WASH

REVISIONS
DATE DESCRIPTION

QUICK QUACK CAR WASH
AT LAUREL PLAZA
STORE #8-034
LAUREL AND O'HARA
OAKLEY, CA

PROPOSED
SITE PLAN

DATE: OCTOBER 2020
CRM PROJECT #: 1919

LICENSED ARCHITECT BRIAN MICHAEL LEE NO. C-29480 REN. 11/30/21 STATE OF CALIFORNIA

PLANNING DOCUMENTS

A2.1

2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used in the report.

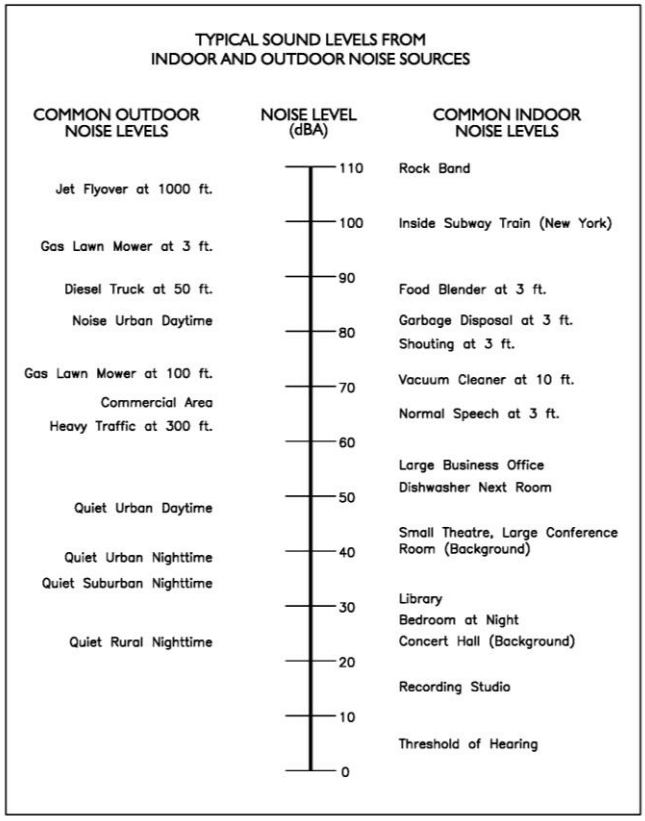
2.1 Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

Exhibit C: Typical A-Weighted Noise Levels



2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter ($\mu N/m^2$), also called micro-Pascal (µPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels, abbreviated dB. Exhibit D illustrates references sound levels for different noise sources.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two sounds or equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase. If two sounds differ by approximately 10 dB, the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibel (dBA), a scale designed to account for the frequency-dependent sensitivity of the ear. Typically, the human ear can barely perceive a change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels.

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high-frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level: The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code, or other applicable regulations, which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly L50, L90, and L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area: Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

2.8 Sound Propagation

As sound propagates from a source it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at a rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 7.5 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet from a noise source. Wind, temperature, air humidity, and turbulence can further impact have far sound can travel

3.0 Ground-Borne Vibration Fundamentals

3.1 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV – Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS – Known as root mean squared (RMS) can be used to denote vibration amplitude

VdB – A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

3.3 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 Regulatory Setting

The proposed project is located in the City of Oakley, California and noise regulations are addressed through the efforts of various federal, state and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) originally was tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible for regulating noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible for regulating noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers. The Housing and Urban Development (HUD) is responsible for establishing noise regulations as it relates to exterior/interior noise levels for new HUD-assisted housing developments near high noise areas.

The federal government advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

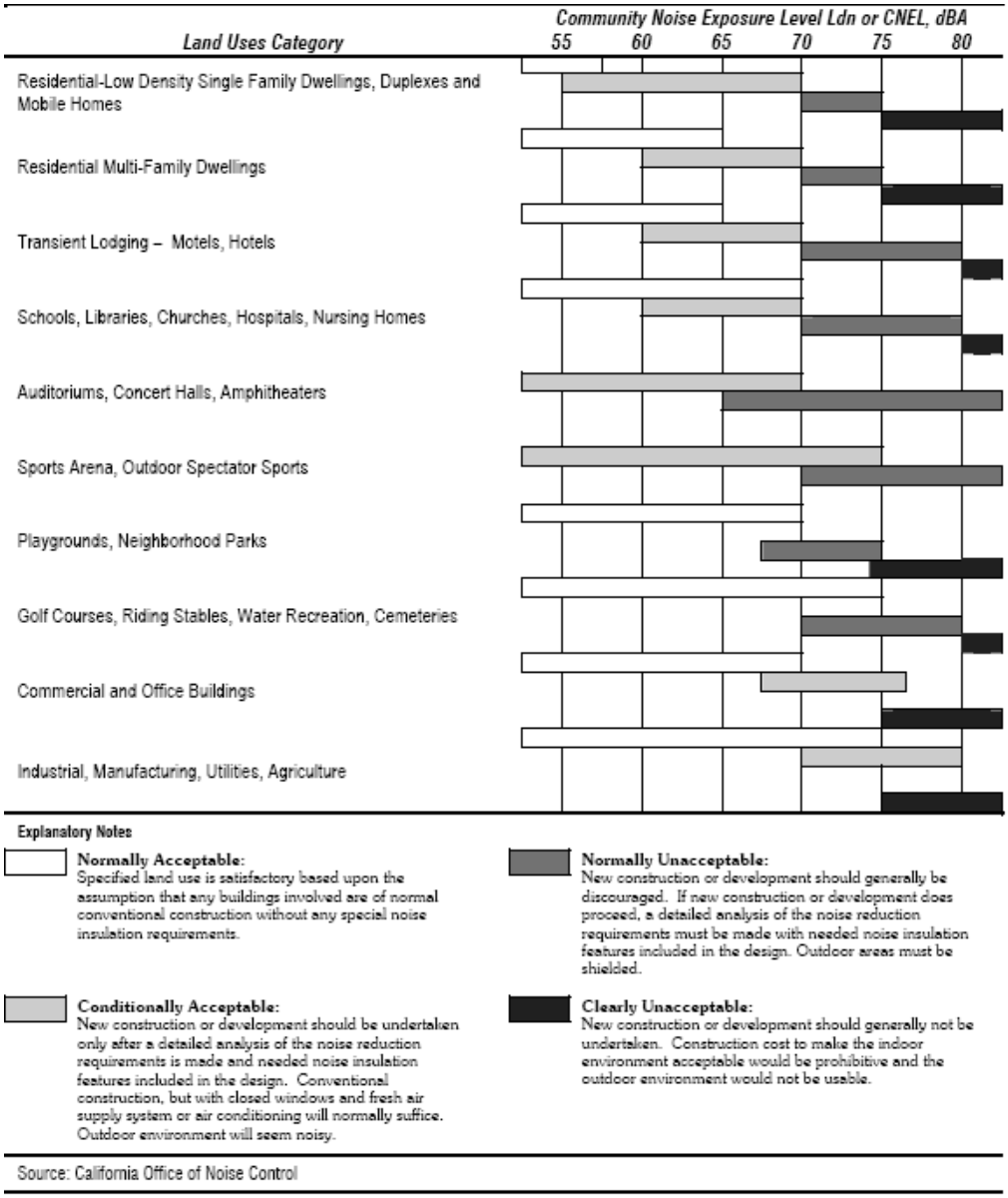
4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the “Land Use Compatibility for Community Noise Environments Matrix.” The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general

plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable as illustrated in Exhibit E.

Exhibit D: Land Use Compatibility Guidelines



4.3 City of Oakley Noise Regulations

The City of Oakley outlines their noise regulations and standards within the Municipal Code and the Noise Element of the City of Oakley General Plan.

City of Oakley General Plan

Applicable policies and standards governing environmental noise in the City are set forth in the General Noise Element. Chapter 9 table 9-1 of the Oakley noise ordinance outlines the acceptable noise standards as 55 dBA exterior limit during daytime hours (7AM-10PM) and 45 dBA during evening hours (10PM-7AM). Therefore, the project must demonstrate compliance to the City's noise standards. In addition to the noise standards, the City has outlined goals, policies and implementation measures to reduce potential noise impacts and are presented below:

Goals, Policies, and Implementation Measures

Policies, goals and implementation program measures from the Noise Element that would mitigate potential impacts on noise include the following.

GOAL 9.1

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

Policy 9.1.1: New development shall use the land use compatibility table shown in Figure 9.1 and the standards contained within Tables 9.1 and 9.3 for determining noise compatibility.

Policy 9.1.2: New development of noise-sensitive uses shall not be allowed where the noise level due to non-transportation noise sources will exceed the noise level standards of Table 9-1 as measured immediately within the property line or within the property line or within a designated outdoor activity area (location is at the discretion of the Community Development Director) of the new development, unless effective noise mitigation measures have been incorporated into the development design to achieve the standards specified in Table 9-1.

Policy 9.1.3: Noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of Table 9-1 as measured immediately within the property line of lands designated for noise sensitive uses.

Note: For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations, such as noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, Heating, Ventilation, Air conditioning (HVAC) units, loading docks, etc.

Policy 9.1.4: Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table 9-1 at existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design. The requirements for the contents of an acoustical analysis are given in Table 9-2.

Policy 9.1.5: Noise created by new transportation noise sources shall be mitigated so as not to exceed the levels specified in Table 9-3 at outdoor activity areas or interior spaces of existing noise-sensitive land uses.

Policy 9.1.6: It is anticipated that roadway improvement projects will be needed to accommodate build-out of the general plan. Therefore, existing noise-sensitive uses may be exposed to increased noise levels due to roadway improvement projects as a result of increased roadway capacity, increase travel speeds, etc. It may not be practical to reduce increased traffic noise levels consistent with those contained Table 9-3. Therefore, as an alternative, 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 Ldn at the outdoor activity areas of noise-sensitive uses, a +5 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant; and
- Where existing traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of noise sensitive uses, a +3 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant; and
- Where existing traffic noise levels range between 65 dB Ldn at the outdoor activity areas of noise sensitive uses, a +1.5 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant.

Policy 9.1.7: Where noise mitigation measures are required to achieve the standards of Tables 9-1 and 9-3, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving the noise standards only after all other practical design related noise mitigation measures have been integrated into the project.

Note: Existing dwellings and new single-family dwellings may not be subject to City review with respect to satisfaction of the standards of the Noise Element. As a consequence, such dwellings may be constructed in areas where noise levels exceed the standards of the Noise Element. It is not the responsibility of the City to ensure that such dwellings meet the noise standards of the Noise Element, or the noise standards imposed by lending agencies such as U.S. Department of Housing and Urban Development (HUD), the Federal Housing Administration (FHA) and the State of California Department of Federal Affairs (Cal Vet). If homes are located and constructed in accordance with the Noise Element, it is expected that the resulting exterior and interior noise levels will conform to the HUD/FHA/Cal Vet noise standards.

Policy 9.1.8: Obtrusive, discretionary noise generated from residencies, motor vehicles, commercial establishments, and/or industrial facilities should be minimized or prohibited.

Policy 9.1.9: Activities associated with agricultural operations are recognized as noise sources which may be considered annoying to some residents. These activities can occur during the daytime and nighttime hours. Activities include crop dusting, tractor operations, guns, etc. The City will require that all new development of residential uses adjacent to agricultural uses provide full disclosure of potential noise sources to future residents consistent with the City's right to farm ordinance.

Programs

Policy 9.1.A: The City has adopted and will update as necessary a Noise Ordinance to govern nuisance noise introduced by residential, commercial, or industrial uses. The purpose of this ordinance is to regulate excessive noise produced by sources including, but not limited to, car stereos, parties, commercial and industrial activities (except where approved by the City), and other discretionary noise observed to be a nuisance to adjacent communities or businesses.

GOAL 9.2

Protect the economic base of the City by preventing incompatible land uses from encroaching upon existing or planned noise-producing uses.

Policies

Policy 9.2.1: New development of noise-sensitive land uses shall not be permitted in areas exposed to existing or projected levels of noise from transportation noise sources which exceed the levels specified in Table 9-3, unless the project design includes effective mitigation measures to reduce exterior noise and noise levels in interior spaces to the levels specified in Table 9-3.

Policy 9.2.2: Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table 9-3 or the performance standards of Table 9-1 and acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

City of Oakley – Noise Ordinance

Chapter 9.0 Table 9-1 from the noise ordinance outlines the City's exterior noise limits as it relates to stationary noise sources.

Table 1: Allowable Noise Level[1]

Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly L_{eq}, dB	55	45

1. 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 to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

2. The City can impose noise level standards which are more restrictive than those specified above based upon determination of existing low ambient noise levels.

3. 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

4. The types of uses which may typically produce the noise sources described above include but are not limited to: industrial facilities including pump stations, 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.

Construction

Section 4.2.208 (d) states It is unlawful for a person to Operate or perform construction or repair work (which creates noise) within or adjacent to a residential land use district except during the hours of Monday through Friday 7:30 AM to 7:00 PM and Saturday, Sunday, and Holidays 9:00AM to 7:00 PM.

Regulatory Summary

The land uses directly surrounding the project include future commercial uses to the north, south, east, and west with residential approximately 150 feet to the north. The exterior noise standard is 55 dBA during operational hours.

5.0 Study Method and Procedure

The following section describes the noise modeling procedures and assumptions used for this assessment.

5.1 Noise Measurement Procedure and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance to Federal Highway Transportation (FHWA) and Caltrans (TeNS) technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA). The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed 5-feet above the ground for all measurements
- Sound level meters were calibrated (Larson Davis CAL 200) before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on “A” and slow response
- Results of the long-term noise measurements were recorded on field data sheets
- During any short-term noise measurements, any noise contaminations such as barking dogs, local traffic, lawn mowers, or aircraft fly-overs were noted
- Temperature and sky conditions were observed and documented

5.2 Noise Measurement Locations

Noise monitoring locations were selected based on the nearest sensitive receptors relative to the proposed onsite noise sources. One (1) long-term 24-hour noise measurements were conducted at or near the project site and are illustrated in Exhibit E. Appendix A includes photos, field sheet, and measured noise data.

5.3 Stationary Noise Modeling

SoundPLAN (SP) acoustical modeling software was utilized to model future worst-case stationary noise impacts to the adjacent land uses. SP is capable of evaluating multiple stationary noise source impacts at various receiver locations. SP’s software utilizes algorithms (based on the inverse square law and reference equipment noise level data) to calculate noise level projections. The software allows the user to input specific noise sources, spectral content, sound barriers, building placement, topography, and sensitive receptor locations.

The future worst-case noise level projections were modeled using referenced sound level data for the various stationary on-site sources (vacuums, vacuum turbine motors and car wash blowers at the exit). The model assumes that the car wash tunnel is approximately 108 feet long with an approximate 9 foot tall by 10 foot wide exit opening.

The blowers (a 14 Sonny Blower System or equivalent) was modeled at 10 to 12 feet high as a point source. It is anticipated that blowers will be located approximately 5 to 10 feet inside the exit of the tunnel. The reference equipment sound level data is provided in Appendix B.

The SP model (see Situation 1, Appendix B) assumes a total of 10 vacuums and the dryer system are operating simultaneously (worst-case scenario), when in actuality the noise will be intermittent and lower in noise level. The project proposes to house the vacuum turbine motor (25 HP or 30 HP turbine) inside a 4-sided 8-foot tall CMU enclosure with a roof. The reference vacuum equipment sound level data is provided in Appendix B. All other noise producing equipment (e.g., compressors, pumps) will be housed within mechanical equipment rooms.

Modeling assumes that project operations occur during daytime hours of 7AM to 10PM which is within the City's daytime allowable stationary noise hours.

5.4 Interior Noise Modeling

The interior noise level is the difference between the projected exterior noise level at the structure's facade and the noise reduction provided by the structure itself. Typical building construction will provide a conservative 12 dBA noise level reduction with a "windows open" condition and a very conservative 20 dBA noise level reduction with "windows closed". MD estimated the interior noise level by subtracting the building shell design from the predicted exterior noise level.

5.5 FHWA Roadway Construction Noise Model

The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RNCM), together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, % usage factor, and baseline parameters for the project site.

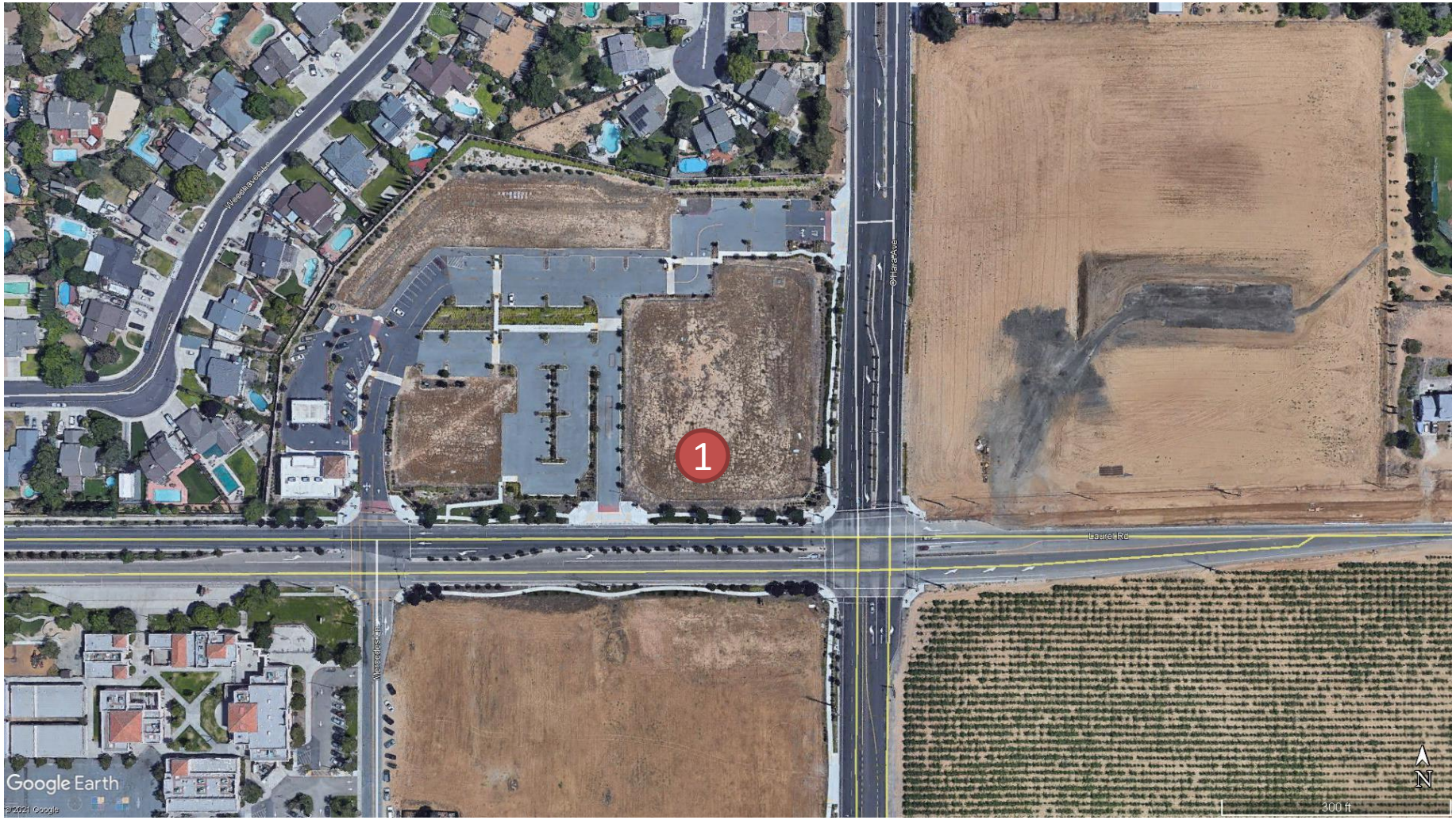
The project was analyzed based on the different construction phases. Construction noise is expected to be loudest during the grading, concrete and building phases of construction. The construction noise calculation output worksheet is located in Appendix D. The following assumptions relevant to short-term construction noise impacts were used:

- It is estimated that construction will occur over a 9 to 12-month time period. Construction noise is expected to be the loudest during the grading, concrete, and building phases.

1 = Long-term Monitoring Location

Exhibit E

Measurement Locations



6.0 Existing Noise Environment

A twenty-four hour (24) ambient noise measurement were performed at or near the project vicinity were conducted at the project site. Noise measurements were taken to determine the existing ambient noise levels. Noise data indicates that traffic is the primary sources of noise impacting the site and the surrounding area.

6.1 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Table 2.

Table 2: Long-Term Noise Measurement Data[1]

Date	Time	1-Hour dB(A)							
		L_{EQ}	L_{MAX}	L_{MIN}	L_2	L_8	L_{25}	L_{50}	L_{90}
3/5/2021	1PM-2PM	57.4	75.4	41.5	62.5	61.4	60.4	55.9	52.5
3/5/2021	2PM-3PM	57.7	75.7	41.8	62.8	61.7	60.7	56.2	52.8
3/5/2021	3PM-4PM	58.8	76.8	42.9	63.9	62.8	61.8	57.3	53.9
3/5/2021	4PM-5PM	60.4	78.4	44.5	65.5	64.4	63.4	58.9	55.5
3/5/2021	5PM-6PM	60.0	78.0	44.1	65.1	64.0	63.0	58.5	55.1
3/5/2021	6PM-7PM	58.3	76.3	42.4	63.4	62.3	61.3	56.8	53.4
3/5/2021	7PM-8PM	56.9	74.9	41.0	62.0	60.9	59.9	55.4	52.0
3/5/2021	8PM-9PM	55.8	73.8	39.9	60.9	59.8	58.8	54.3	50.9
3/5/2021	9PM-10PM	55.1	73.1	39.2	60.2	59.1	58.1	53.6	50.2
3/5/2021	10PM-11PM	54.1	72.1	38.2	59.2	58.1	57.1	52.6	49.2
3/5/2021	11PM-12AM	53.5	71.5	37.6	58.6	57.5	56.5	52.0	48.6
3/6/2021	12AM-1AM	52.0	70.0	36.1	57.1	56.0	55.0	50.5	47.1
3/6/2021	1AM-2AM	49.5	67.5	33.6	54.6	53.5	52.5	48.0	44.6
3/6/2021	2AM-3AM	48.3	66.3	32.4	53.4	52.3	51.3	46.8	43.4
3/6/2021	3AM-4AM	46.5	64.5	30.6	51.6	50.5	49.5	45.0	41.6
3/6/2021	4AM-5AM	47.5	65.5	31.6	52.6	51.5	50.5	46.0	42.6
3/6/2021	5AM-6AM	51.3	69.3	35.4	56.4	55.3	54.3	49.8	46.4
3/6/2021	6AM-7AM	57.7	75.7	41.8	62.8	61.7	60.7	56.2	52.8
3/6/2021	7AM-8AM	60.0	78.0	44.1	65.1	64.0	63.0	58.5	55.1
3/6/2021	8AM-9AM	58.1	76.1	42.2	63.2	62.1	61.1	56.6	53.2
3/6/2021	9AM-10AM	57.1	75.1	41.2	62.2	61.1	60.1	55.6	52.2
3/6/2021	10AM-11AM	57.0	75.0	41.1	62.1	61.0	60.0	55.5	52.1
3/6/2021	11AM-12PM	57.2	75.2	41.3	62.3	61.2	60.2	55.7	52.3
3/6/2021	12PM-1PM	57.3	75.3	41.4	62.4	61.3	60.3	55.8	52.4
CNEL		60.7							

Notes:

[1.] Long-term noise monitoring location (LT1) is illustrated in Exhibit F. Quietest Leq during operational hours highlighted in orange

Noise data indicates the ambient noise level ranges between 55.1 dBA Leq to 60.4 dBA Leq during the operational hours of 7AM to 10PM. The measured CNEL is 60.7 dBA. Additional field notes and photographs are provided in Appendix A.

For this evaluation, MD has utilized the quietest hourly level (during estimated hours of operation) and has compared the project's projected noise levels to the quietest hourly ambient. The quietest (lowest) relevant day hourly level occurred from 9PM to 10PM (55.1 dBA, Leq(h)).

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts as a result of the project. The analysis details the estimated exterior/interior noise levels. Stationary noise impacts are analyzed from the on-site noise sources such as dryers/blowers (associated with car wash equipment).

7.1 Future Exterior Noise

The following outlines the exterior noise levels associated with the proposed project.

7.1.1 Noise Impacts to Off-Site Receptors Due to Stationary Sources

Sensitive receptors that may be affected by project operational noise include commercial to the west, east, and residential to the north and northeast. The worst-case stationary noise was modeled using SoundPLAN acoustical modeling software. Worst-case assumes the blowers are always operational when in reality the noise will be intermittent and cycle on/off depending on customer usage. Project car wash operational are assumed to occur within 7AM to 10PM, which falls within the allowable time per the City's noise ordinance (Section 4.3).

A total of six (6) receptors were modeled to evaluate the proposed project's operational impact. A receptor is denoted by a yellow dot. All yellow dots represent either a calibration point, property line or a sensitive receptor such as an outdoor sensitive area (courtyard, patio, backyard, etc).

This study compares the Project's operational noise levels to two (2) different noise assessment scenarios: 1) Project Only operational noise level projections, 2) Project plus ambient noise level projections.

Project Operational Noise Levels

Exhibit F shows the "project only" operational noise levels at the property lines and/or sensitive receptor area. Operational noise levels at the adjacent uses are anticipated to range between 46 dBA to 55 dBA Leq (depending on the location).

The "project only" noise projections to the sensitive receptors do not exceed the City's 55 dBA daytime residential noise ordinance (see Chapter 9 Table 9-1).

Project Plus Ambient Operational Noise Levels

Table 3 demonstrates the project plus the ambient (quietest measured hourly average level) noise levels. Project plus ambient noise level projections are anticipated to range between 56 to 58 dBA Leq at nearby receptors (R1 – R6). The project has been compared to the quietest hourly average ambient noise level for comparative purposes.

(Table 3 Next Page)

Table 3: Worst-case Predicted Operational Noise Level[1]

Receptor[1]	Floor	Existing Ambient Noise Level (dBA, Leq)[2]	Project Noise Level (dBA, Leq)[3]	Total Combined Noise Level (dBA, Leq)	Daytime (7AM - 7PM) Stationary Noise Limit (dBA, Leq)[4]	Change in Noise Level as Result of Project
1	1	55	55	58	**55**	3
	2		55	58		3
2	1		54	58		2
	2		55	58		3
3	1		51	57		1
	2		51	57		1
4	1		50	57		1
	2		50	57		1
5	1		46	56		0
	2		46	56		0
6	1		51	57		1

Notes:
1. Receptor 1 -5 represents residential uses, Receptor 6 represents the nearest Commercial.
2. See Tables 3 representative ambient noise condition. MD has utilized the quietest measured daytime hourly noise level of 55 dBA (1-hour, Leq) to describe the baseline noise condition.
3. See Exhibit G for the operational noise level projections at said receptors.
4. Per Chapter 9 Table 9-1 from the City's Municipal Code.hours of operation are 7AM to 10PM.

As shown in Table 3, the project will increase the worst-case noise level by approximately 0 to 3 dBA Leq depending on location. Project operations are anticipated to remain below the City's exterior noise level. Therefore, the impact is less than significant.

Table 4 provides the characteristics associated with changes in noise levels.

Table 4: Change in Noise Level Characteristics[1]

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

1. https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

The change in noise level at all receptors will fall within the "Not Perceptible" acoustic characteristic.

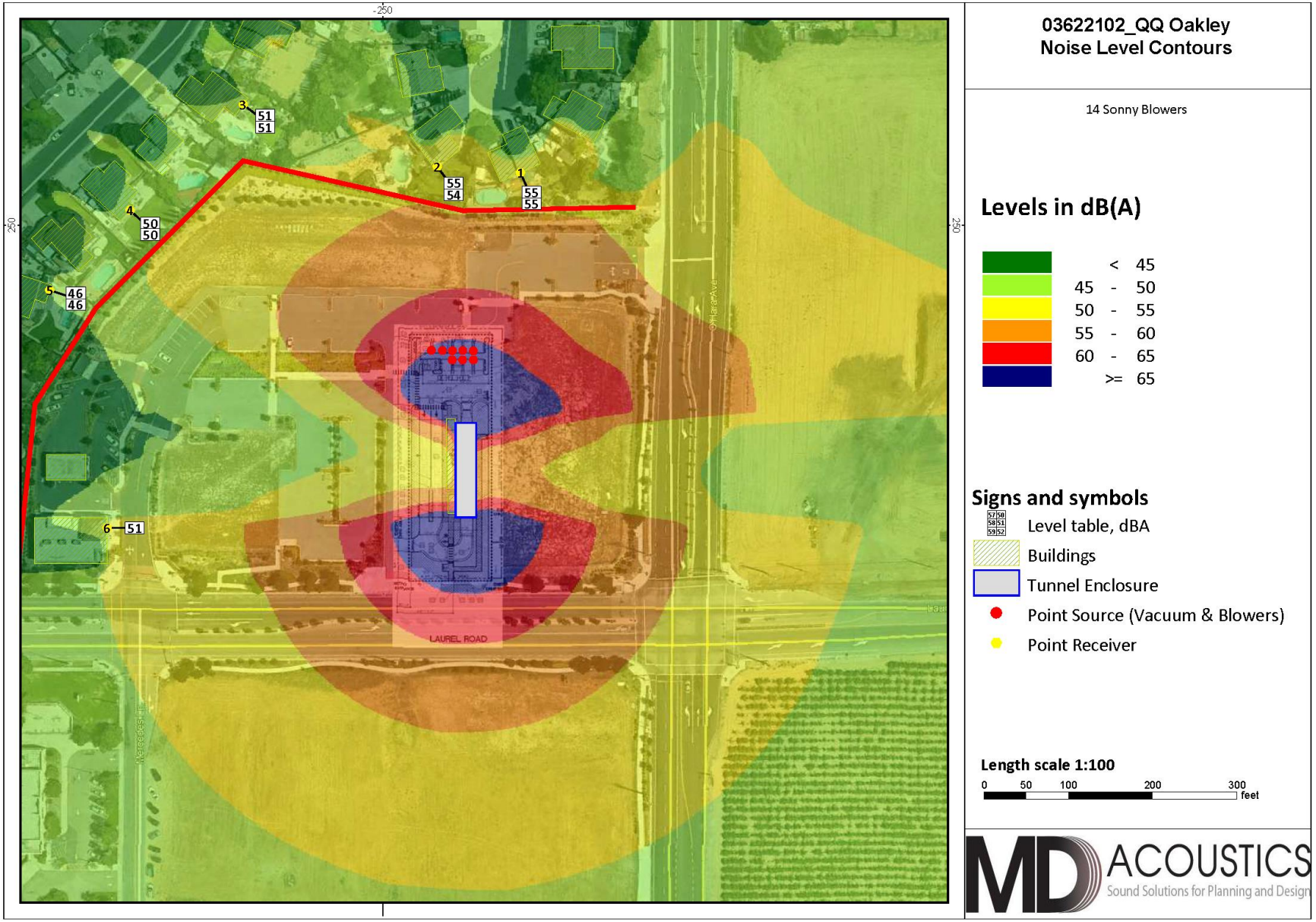
7.2 Project Design Features

The following project design features are provided to ensure compliance with the noise ordinance:

1. The project shall incorporate an 8-foot tall CMU enclosure around the vacuum turbine pumps.

Exhibit F

Operational Noise Levels Leq(h)/CNEL



8.0 Construction Noise Impact

The degree of construction noise may vary for different areas of the project site and also vary depending on the construction activities. Noise levels associated with the construction will vary with the different phases of construction.

8.1 Construction Noise

The Environmental Protection Agency (EPA) has compiled data regarding the noise generated characteristics of typical construction activities. The data is presented in Table 5.

Table 5: Typical Construction Equipment Noise Levels[1]

Type	Lmax (dBA) at 50 Feet
Backhoe	80
Truck	88
Concrete Mixer	85
Pneumatic Tool	85
Pump	76
Saw, Electric	76
Air Compressor	81
Generator	81
Paver	89
Roller	74

Notes:
[1] Referenced Noise Levels from FTA noise and vibration manual.

Construction noise is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the City's Municipal Code. Construction is anticipated to occur during the permissible hours according to the City's Municipal Code. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing within the project vicinity. Furthermore, noise reduction measures are provided to further reduce construction noise. The impact is considered less than significant however construction noise level projections are provided.

Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Noise levels will be loudest during grading phase. A likely worst-case construction noise scenario during grading assumes the use of a grader, a dozer, an excavator, and a backhoe operating at 337 feet from the nearest sensitive receptor.

Assuming a usage factor of 40 percent for each piece of equipment, unmitigated noise levels at 337 feet have the potential to reach 64 dBA L_{eq} at the nearest residential receptors during daytime hours (7AM-10PM).

8.2 Construction Vibration

Construction activities can produce vibration that may be felt by adjacent land uses. The construction of the proposed project would not require the use of equipment such as pile drivers, which are known to generate substantial construction vibration levels. The primary vibration source during construction may be from a bulldozer. A large bulldozer has a vibration impact of 0.089 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage.

The fundamental equation used to calculate vibration propagation through average soil conditions and distance is as follows:

$$PPV_{equipment} = PPV_{ref} (100/D_{rec})^n$$

Where: PPV_{ref} = reference PPV at 100ft.
D_{rec} = distance from equipment to receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

The thresholds from the Caltrans Transportation and Construction Induced Vibration Guidance Manual in Table 6 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 6: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, Transportation and Construction Vibration Guidance Manual, Caltrans, Sept. 2013.
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 7 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 7: Vibration Source Levels for Construction Equipment[1]

Equipment	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

At a distance of 112 feet (distance nearest structure from the property line), a large bulldozer would yield a worst-case 0.017 PPV (in/sec) which may be perceptible for short periods of time during grading along the north property line of the project site, but is below any threshold of damage. The impact is less than significant, and no mitigation is required.

8.3 Construction Noise Reduction Measures

Construction operations must follow the City's General Plan and the Noise Ordinance, which states that construction, repair or excavation work performed must occur within the permissible hours. To further ensure that construction activities do not disrupt the adjacent land uses, the following measures should be taken:

1. Construction should occur during the permissible hours as defined in Section 4.2.208 (d).

2. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.

3. The contractor should locate equipment staging areas that will create the greatest distance between construction-related noise/vibration sources and sensitive receptors nearest the project site during all project construction.

4. Idling equipment should be turned off when not in use.

5. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 References

State of California General Plan Guidelines: 1998. Governor's Office of Planning and Research
City of Oakley: Municipal Code Section 4.2.208
City of Oakley: General Plan Noise Element Chapter 9

Appendix A:

Photographs and Field Measurement Data

MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

24-Hour Continuous Noise Measurement Datasheet

Project: QQ Oakley
Site Address/Location: Laurel and Ohara, Oakley, CA
Date: 3/5/2021 to 3/6/2021
Field Tech/Engineer: Jason Schuyler

Site Observations: Clear Sky, little to no wind. Minor traffic from the service station to the west.

General Location:
Sound Meter: NTi XL2 **SN:** 80206
Settings: A-weighted, slow, 1-min, 24-hour duration
Meteorological Con.: 73 degrees F, 2 to 5 mph wind, west to east diretion
Site ID: LT-1

Site Topo: Flat
Ground Type: Soft site, Open raw ground with a road

Noise Source(s) w/ Distance:
C/L of Laurel Rd is 184 feet from meter

Figure 1: LT-1 Monitoring Location

Figure 2: LT-1 Photo

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Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

24-Hour Noise Measurement Datasheet - Cont.

Project: QQ Oakley **Day:** 1 of 1
Site Address/Location: Laurel and Ohara, Oakley, CA
Site ID: LT-1

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
3/5/2021	1:00 PM	2:00 PM	57.4	75.4	41.5	62.5	61.4	60.4	55.9	52.5
3/5/2021	2:00 PM	3:00 PM	57.7	75.7	41.8	62.8	61.7	60.7	56.2	52.8
3/5/2021	3:00 PM	4:00 PM	58.8	76.8	42.9	63.9	62.8	61.8	57.3	53.9
3/5/2021	4:00 PM	5:00 PM	60.4	78.4	44.5	65.5	64.4	63.4	58.9	55.5
3/5/2021	5:00 PM	6:00 PM	60.0	78.0	44.1	65.1	64.0	63.0	58.5	55.1
3/5/2021	6:00 PM	7:00 PM	58.3	76.3	42.4	63.4	62.3	61.3	56.8	53.4
3/5/2021	7:00 PM	8:00 PM	56.9	74.9	41.0	62.0	60.9	59.9	55.4	52.0
3/5/2021	8:00 PM	9:00 PM	55.8	73.8	39.9	60.9	59.8	58.8	54.3	50.9
3/5/2021	9:00 PM	10:00 PM	55.1	73.1	39.2	60.2	59.1	58.1	53.6	50.2
3/5/2021	10:00 PM	11:00 PM	54.1	72.1	38.2	59.2	58.1	57.1	52.6	49.2
3/5/2021	11:00 PM	12:00 AM	53.5	71.5	37.6	58.6	57.5	56.5	52.0	48.6
3/6/2021	12:00 AM	1:00 AM	52.0	70.0	36.1	57.1	56.0	55.0	50.5	47.1
3/6/2021	1:00 AM	2:00 AM	49.5	67.5	33.6	54.6	53.5	52.5	48.0	44.6
3/6/2021	2:00 AM	3:00 AM	48.3	66.3	32.4	53.4	52.3	51.3	46.8	43.4
3/6/2021	3:00 AM	4:00 AM	46.5	64.5	30.6	51.6	50.5	49.5	45.0	41.6
3/6/2021	4:00 AM	5:00 AM	47.5	65.5	31.6	52.6	51.5	50.5	46.0	42.6
3/6/2021	5:00 AM	6:00 AM	51.3	69.3	35.4	56.4	55.3	54.3	49.8	46.4
3/6/2021	6:00 AM	7:00 AM	57.7	75.7	41.8	62.8	61.7	60.7	56.2	52.8
3/6/2021	7:00 AM	8:00 AM	60.0	78.0	44.1	65.1	64.0	63.0	58.5	55.1
3/6/2021	8:00 AM	9:00 AM	58.1	76.1	42.2	63.2	62.1	61.1	56.6	53.2
3/6/2021	9:00 AM	10:00 AM	57.1	75.1	41.2	62.2	61.1	60.1	55.6	52.2
3/6/2021	10:00 AM	11:00 AM	57.0	75.0	41.1	62.1	61.0	60.0	55.5	52.1
3/6/2021	11:00 AM	12:00 PM	57.2	75.2	41.3	62.3	61.2	60.2	55.7	52.3
3/6/2021	12:00 PM	1:00 PM	57.3	75.3	41.4	62.4	61.3	60.3	55.8	52.4

CNEL: 60.7

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Project: QQ Oakley **Day:** 1 of 1
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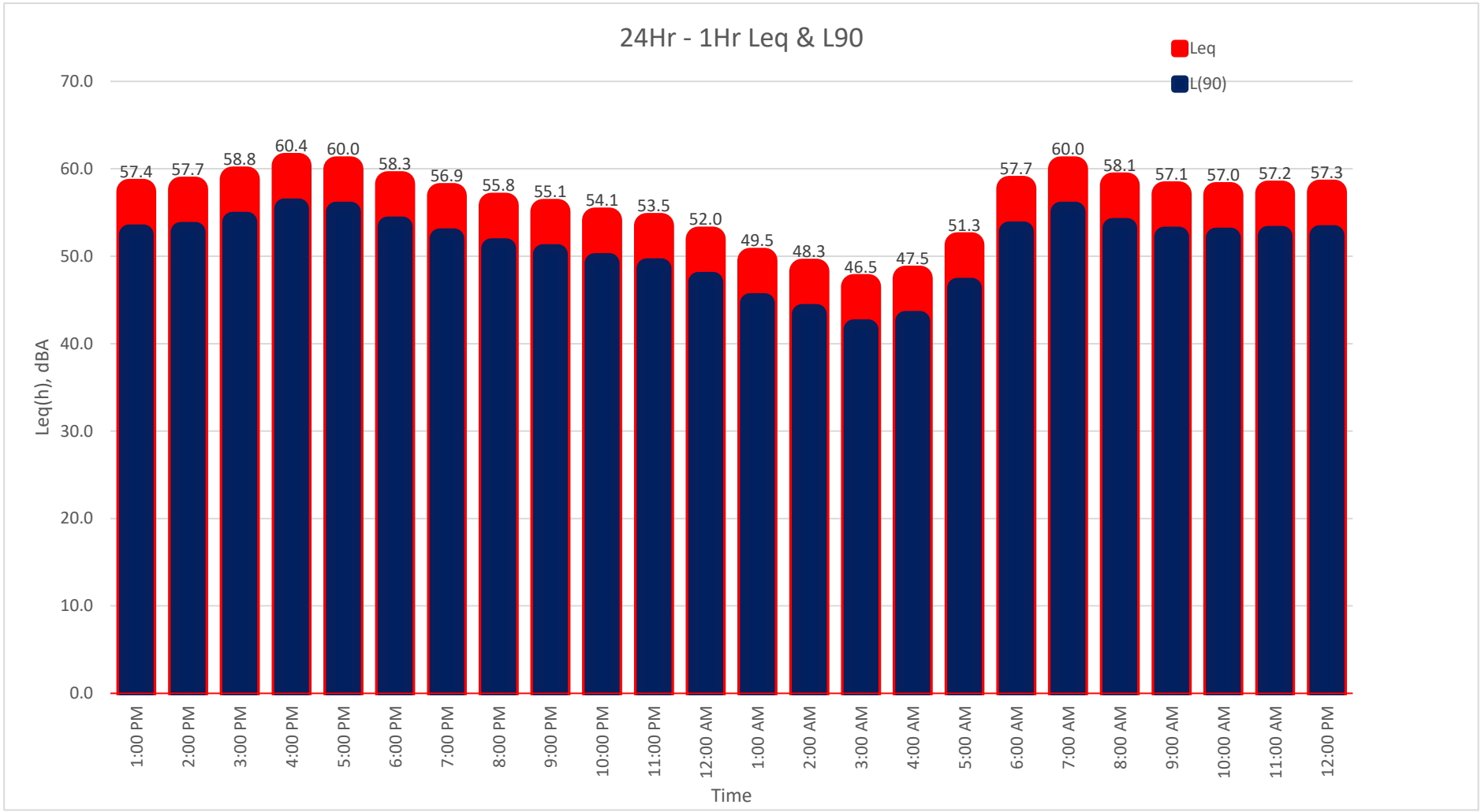


Appendix B:

SoundPLAN Input/Outputs

QQ Oakley
Octave spectra of the sources in dB(A) - Situation 2: Outdoor SP

Name	Source type	l or A	Li	R'w	L'w	Lw	KI	KT	LwMax	DO-Wall	Time histogram	Emission spectrum	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
		m,m²	dB(A)	dB	dB(A)	dB(A)	dB	dB	dB(A)	dB			dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Tunnel Enclosure 1 - Facade 01	Area	25.15	93.1	57.0	44.1	58.1	0.0	0.0		0	100%/24h	64_Facade 01	50.0	49.0	55.3	50.6	40.9	27.9	14.0	-0.2	
Tunnel Enclosure 1 - Facade 02	Area	153.98	93.5	57.0	44.5	66.4	0.0	0.0		0	100%/24h	66_Facade 02	58.3	57.3	63.5	58.9	49.1	36.0	22.4	9.3	
Tunnel Enclosure 1 - Facade 03	Area	25.15	94.0	57.0	44.8	58.8	0.0	0.0		0	100%/24h	67_Facade 03	50.7	49.7	56.0	51.4	42.0	29.4	16.1	4.5	
Tunnel Enclosure 1 - Facade 04	Area	153.98	93.5	57.0	44.5	66.4	0.0	0.0		0	100%/24h	69_Facade 04	58.3	57.3	63.5	58.9	49.1	36.0	22.4	9.3	
Tunnel Enclosure 1 - Roof 01	Area	254.81	92.9	57.0	43.9	68.0	0.0	0.0		0	100%/24h	60_Roof 01_	59.9	58.9	65.2	60.5	50.7	37.7	24.1	11.1	
Tunnel Enclosure 1 - Transmissive area 01	Area	8.36	93.1	0.0	93.1	102.3	0.0	0.0		3	100%/24h	65_Transmissive area 01	75.2	88.2	96.4	97.8	97.2	88.2	77.3	61.1	
Tunnel Enclosure 1 - Transmissive area 02	Area	8.36	93.5	0.0	93.5	102.7	0.0	0.0		3	100%/24h	68_Transmissive area 02	75.4	88.5	96.7	98.1	97.7	89.1	78.8	65.2	
Vac 1	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 2	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 3	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 4	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 5	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 6	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 7	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	
Vac 8	Point				72.6	72.6	0.0	0.0		0	100%/24h	Vacutech - 3'	57.6	53.6	52.3	57.7	61.7	67.7	69.0	61.6	

QQ Oakley
Contribution level - Situation 2: Outdoor SP

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Receiver Receiver 1 Fl GF Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		25.4	0.0	
Vac 2	Default industrial noise	Point		24.4	0.0	
Vac 3	Default industrial noise	Point		25.5	0.0	
Vac 4	Default industrial noise	Point		25.1	0.0	
Vac 5	Default industrial noise	Point		26.4	0.0	
Vac 6	Default industrial noise	Point		25.0	0.0	
Vac 7	Default industrial noise	Point		26.2	0.0	
Vac 8	Default industrial noise	Point		26.0	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		13.5	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-3.2	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		37.2	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		14.6	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		8.7	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		54.4	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		8.6	0.0	
Receiver Receiver 1 Fl 1.FL Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		25.4	0.0	
Vac 2	Default industrial noise	Point		24.4	0.0	
Vac 3	Default industrial noise	Point		25.5	0.0	
Vac 4	Default industrial noise	Point		25.1	0.0	
Vac 5	Default industrial noise	Point		25.3	0.0	
Vac 6	Default industrial noise	Point		25.0	0.0	
Vac 7	Default industrial noise	Point		25.1	0.0	
Vac 8	Default industrial noise	Point		24.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		13.8	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-3.0	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		37.3	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		14.7	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		8.7	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		54.4	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		8.8	0.0	
Receiver Receiver 2 Fl GF Lr,lim dB(A) Leq,d 54.7 dB(A) Sigma(Leq,d) 0.0 dB(A)						

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Vac 1	Default industrial noise	Point		25.4	0.0	
Vac 2	Default industrial noise	Point		25.1	0.0	
Vac 3	Default industrial noise	Point		25.5	0.0	
Vac 4	Default industrial noise	Point		25.2	0.0	
Vac 5	Default industrial noise	Point		25.5	0.0	
Vac 6	Default industrial noise	Point		25.2	0.0	
Vac 7	Default industrial noise	Point		24.9	0.0	
Vac 8	Default industrial noise	Point		24.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		13.1	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-4.0	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		36.1	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		9.6	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		8.5	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		54.6	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		12.0	0.0	
Receiver Receiver 2 Fl 1.FL Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		25.4	0.0	
Vac 2	Default industrial noise	Point		25.1	0.0	
Vac 3	Default industrial noise	Point		25.5	0.0	
Vac 4	Default industrial noise	Point		25.2	0.0	
Vac 5	Default industrial noise	Point		25.5	0.0	
Vac 6	Default industrial noise	Point		25.2	0.0	
Vac 7	Default industrial noise	Point		24.9	0.0	
Vac 8	Default industrial noise	Point		24.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		13.4	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-3.9	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		36.2	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		9.7	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		8.5	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		54.3	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		12.0	0.0	
Receiver Receiver 3 Fl GF Lr,lim dB(A) Leq,d 50.5 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		18.5	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Vac 2	Default industrial noise	Point		18.3	0.0	
Vac 3	Default industrial noise	Point		18.8	0.0	
Vac 4	Default industrial noise	Point		18.5	0.0	
Vac 5	Default industrial noise	Point		19.0	0.0	
Vac 6	Default industrial noise	Point		18.8	0.0	
Vac 7	Default industrial noise	Point		19.2	0.0	
Vac 8	Default industrial noise	Point		20.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		9.1	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-6.7	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		32.1	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		2.1	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		3.9	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		50.4	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		2.4	0.0	
Receiver Receiver 3 Fl 1.FL Lr,lim dB(A) Leq,d 50.6 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		18.7	0.0	
Vac 2	Default industrial noise	Point		18.5	0.0	
Vac 3	Default industrial noise	Point		18.9	0.0	
Vac 4	Default industrial noise	Point		18.7	0.0	
Vac 5	Default industrial noise	Point		19.2	0.0	
Vac 6	Default industrial noise	Point		18.9	0.0	
Vac 7	Default industrial noise	Point		19.4	0.0	
Vac 8	Default industrial noise	Point		21.1	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		9.3	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-6.6	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		32.2	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		2.2	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		4.3	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		50.5	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		2.5	0.0	
Receiver Receiver 4 Fl GF Lr,lim dB(A) Leq,d 50.3 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		17.8	0.0	
Vac 2	Default industrial noise	Point		17.6	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Vac 3	Default industrial noise	Point		18.1	0.0	
Vac 4	Default industrial noise	Point		17.9	0.0	
Vac 5	Default industrial noise	Point		18.3	0.0	
Vac 6	Default industrial noise	Point		18.2	0.0	
Vac 7	Default industrial noise	Point		18.6	0.0	
Vac 8	Default industrial noise	Point		18.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		8.2	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-5.3	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		34.0	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		1.1	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		3.1	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		50.2	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		1.5	0.0	
Receiver Receiver 4 Fl 1.FL Lr,lim dB(A) Leq,d 50.4 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		17.7	0.0	
Vac 2	Default industrial noise	Point		17.6	0.0	
Vac 3	Default industrial noise	Point		18.0	0.0	
Vac 4	Default industrial noise	Point		17.9	0.0	
Vac 5	Default industrial noise	Point		18.3	0.0	
Vac 6	Default industrial noise	Point		18.2	0.0	
Vac 7	Default industrial noise	Point		18.6	0.0	
Vac 8	Default industrial noise	Point		18.9	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		8.4	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-5.2	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		34.2	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		1.2	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		3.2	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		50.2	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		1.6	0.0	
Receiver Receiver 5 Fl GF Lr,lim dB(A) Leq,d 46.2 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		16.3	0.0	
Vac 2	Default industrial noise	Point		16.3	0.0	
Vac 3	Default industrial noise	Point		16.6	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Vac 4	Default industrial noise	Point		16.6	0.0	
Vac 5	Default industrial noise	Point		16.9	0.0	
Vac 6	Default industrial noise	Point		16.8	0.0	
Vac 7	Default industrial noise	Point		17.1	0.0	
Vac 8	Default industrial noise	Point		17.4	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		7.7	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-4.4	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		35.9	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		0.1	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		1.4	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		45.7	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		1.1	0.0	
Receiver Receiver 5 Fl 1.FL Lr,lim dB(A) Leq,d 46.2 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		16.2	0.0	
Vac 2	Default industrial noise	Point		16.2	0.0	
Vac 3	Default industrial noise	Point		16.5	0.0	
Vac 4	Default industrial noise	Point		16.4	0.0	
Vac 5	Default industrial noise	Point		16.7	0.0	
Vac 6	Default industrial noise	Point		16.7	0.0	
Vac 7	Default industrial noise	Point		17.0	0.0	
Vac 8	Default industrial noise	Point		17.3	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		7.8	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		-4.3	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		36.0	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		0.2	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		1.5	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		45.8	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		1.2	0.0	
Receiver Receiver 6 Fl GF Lr,lim dB(A) Leq,d 50.9 dB(A) Sigma(Leq,d) 0.0 dB(A)						
Vac 1	Default industrial noise	Point		16.7	0.0	
Vac 2	Default industrial noise	Point		16.8	0.0	
Vac 3	Default industrial noise	Point		17.0	0.0	
Vac 4	Default industrial noise	Point		17.1	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Vac 5	Default industrial noise	Point		17.2	0.0	
Vac 6	Default industrial noise	Point		17.4	0.0	
Vac 7	Default industrial noise	Point		17.5	0.0	
Vac 8	Default industrial noise	Point		17.8	0.0	
Tunnel Enclosure 1 - Roof 01	Default industrial noise	Area		9.2	0.0	
Tunnel Enclosure 1 - Facade 01	Default industrial noise	Area		4.7	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		50.7	0.0	
Tunnel Enclosure 1 - Facade 02	Default industrial noise	Area		1.7	0.0	
Tunnel Enclosure 1 - Facade 03	Default industrial noise	Area		-3.4	0.0	
Tunnel Enclosure 1 - Transmissive area 0	Default industrial noise	Area		36.4	0.0	
Tunnel Enclosure 1 - Facade 04	Default industrial noise	Area		5.0	0.0	

QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 1 Fl GF Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-3.2					-6.2			-12.3			-8.7			-13.8			-25.5			-40.5			-58.4			-83.9
Tunnel Enclosure 1 - Facade 02	Leq,d	14.6					9.7			5.4			10.2			7.1			-2.0			-15.4			-31.6			-53.5
Tunnel Enclosure 1 - Facade 03	Leq,d	8.7					3.5			-0.8			4.4			1.3			-7.4			-20.5			-35.9			-55.4
Tunnel Enclosure 1 - Facade 04	Leq,d	8.6					5.1			-0.3			3.6			-1.9			-13.1			-28.6			-46.6			-70.1
Tunnel Enclosure 1 - Roof 01	Leq,d	13.5					6.6			3.0			10.1			6.8			-2.9			-16.1			-30.8			-51.7
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	37.2					20.4			27.7			31.8			32.0			31.3			21.3			7.2			-19.9
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	54.4					31.0			41.2			46.8			48.8			50.8			42.1			29.6			8.2
Vac 1	Leq,d	25.4	-7.7	0.3	5.4	8.5	9.8	5.7	2.3	1.9	-0.1	-3.8	-1.5	-1.1	1.2	4.8	6.0	9.4	7.9	13.3	15.4	16.1	17.7	18.3	15.6	13.8	9.4	0.7
Vac 2	Leq,d	24.4	-8.1	0.0	5.0	8.1	9.4	5.3	1.9	1.5	-0.5	-4.2	-2.0	-1.6	0.7	4.3	5.6	8.2	6.8	12.2	14.3	15.0	16.6	17.3	14.6	12.9	8.5	-0.2
Vac 3	Leq,d	25.5	-7.9	0.1	5.2	8.4	9.7	5.5	2.2	1.8	-0.2	-3.9	-1.6	-1.2	1.1	4.6	5.9	9.5	8.0	13.4	15.5	16.2	17.8	18.4	15.6	13.8	9.4	0.6
Vac 4	Leq,d	25.1	-8.2	-0.2	4.8	7.9	9.2	5.1	1.7	1.3	-0.7	-4.4	-2.1	-1.7	0.6	4.2	6.5	9.2	7.7	13.1	15.3	15.9	17.4	18.1	15.3	13.4	8.8	-0.1
Vac 5	Leq,d	26.4	-8.1	-0.1	4.9	8.2	9.5	5.4	2.0	1.6	-0.4	-4.1	-1.8	-1.4	1.9	5.6	7.1	10.5	9.1	14.5	16.6	17.2	18.8	19.4	16.5	14.6	10.0	1.0
Vac 6	Leq,d	25.0	-8.4	-0.4	4.7	7.8	9.1	5.0	1.6	1.2	-0.8	-4.6	-2.3	-1.9	0.4	4.0	6.3	9.1	7.6	13.0	15.1	15.8	17.3	17.9	15.1	13.2	8.6	-0.4
Vac 7	Leq,d	26.2	-8.3	-0.4	4.6	8.0	9.3	5.2	1.8	1.4	-0.6	-4.3	-2.0	-1.6	1.8	5.5	7.0	10.4	8.9	14.3	16.5	17.1	18.6	19.2	16.4	14.5	9.8	0.8
Vac 8	Leq,d	26.0	-8.6	-0.7	4.2	7.8	9.1	5.0	1.6	1.2	-0.8	-4.5	-2.2	-1.9	1.6	5.4	6.8	9.5	8.1	13.5	16.4	17.0	18.5	19.1	16.3	14.3	9.6	0.5
Receiver Receiver 1 Fl 1.FL Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-3.0					-6.0			-11.9			-8.6			-13.7			-25.4			-40.5			-58.4			-83.9
Tunnel Enclosure 1 - Facade 02	Leq,d	14.7					9.7			6.0			10.2			7.1			-2.0			-15.4			-31.6			-53.6
Tunnel Enclosure 1 - Facade 03	Leq,d	8.7					3.5			-0.2			4.4			1.2			-7.4			-20.5			-36.0			-55.4
Tunnel Enclosure 1 - Facade 04	Leq,d	8.8					5.2			0.3			3.8			-1.7			-12.9			-28.3			-46.3			-69.9
Tunnel Enclosure 1 - Roof 01	Leq,d	13.8					6.6			3.1			10.4			7.4			-1.4			-13.6			-28.9			-50.6
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	37.3					20.4			28.4			31.8			32.1			31.3			21.3			7.1			-19.9
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	54.4					31.0			41.8			46.8			48.8			50.8			42.0			29.6			8.2
Vac 1	Leq,d	25.4	-5.4	1.8	5.3	8.4	9.7	5.6	2.8	2.4	0.4	-3.8	-1.5	-1.1	1.2	4.7	6.0	9.3	7.9	13.3	15.4	16.1	17.6	18.3	15.6	13.8	9.4	0.7
Vac 2	Leq,d	24.4	-5.7	1.4	4.9	8.0	9.3	5.2	2.4	2.0	0.0	-4.2	-2.0	-1.6	0.7	4.3	5.6	8.2	6.7	12.1	14.3	15.0	16.5	17.2	14.5	12.8	8.4	-0.3
Vac 3	Leq,d	25.5	-5.5	1.7	5.2	8.3	9.6	5.5	2.7	2.3	0.3	-3.9	-1.6	-1.3	1.0	4.6	5.9	9.4	8.0	13.4	15.5	16.2	17.7	18.4	15.6	13.8	9.3	0.5
Vac 4	Leq,d	25.1	-5.9	1.3	4.8	7.9	9.2	5.1	2.3	1.9	-0.2	-4.4	-2.1	-1.7	0.6	4.1	6.5	9.2	7.7	13.1	15.2	15.9	17.4	18.0	15.2	13.4	8.8	-0.1
Vac 5	Leq,d	25.3	-5.6	1.6	5.1	8.2	9.5	5.4	2.5	2.1	0.1	-4.1	-1.8	-1.4	0.8	4.4	5.7	9.3	7.8	13.2	15.4	16.0	17.6	18.2	15.4	13.6	9.1	0.2
Vac 6	Leq,d	25.0	-6.0	1.2	4.7	7.8	9.1	5.0	2.1	1.7	-0.3	-4.6	-2.3	-1.9	0.4	4.0	6.3	9.0	7.6	13.0	15.1	15.8	17.3	17.9	15.1	13.2	8.6	-0.4
Vac 7	Leq,d	25.1	-5.8	1.4	4.9	8.0	9.3	5.2	2.4	1.9	-0.1	-4.3	-2.0	-1.6	0.7	4.2	5.5	9.1	7.7	13.1	15.2	15.9	17.4	18.0	15.2	13.4	8.8	-0.1
Vac 8	Leq,d	24.9	-6.0	1.2	4.7	7.8	9.1	5.0	2.2	1.7	-0.3	-4.5	-2.2	-1.9	0.4	4.0	5.3	7.9	6.5	11.9	15.1	15.7	17.3	17.9	15.1	13.2	8.6	-0.4

QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Receiver Receiver 2 Fl GF Lr,lim dB(A) Leq,d 54.7 dB(A) Sigma(Leq,d) 0.0 dB(A)																													
Tunnel Enclosure 1 - Facade 01	Leq,d	-4.0					-6.5			-13.2			-9.9			-16.1			-28.1			-43.7			-61.9			-87.7	
Tunnel Enclosure 1 - Facade 02	Leq,d	9.6					5.7			0.6			4.9			-0.1			-10.7			-25.8			-43.8			-67.5	
Tunnel Enclosure 1 - Facade 03	Leq,d	8.5					3.3			-1.0			4.2			1.0			-7.3			-20.5			-36.0			-55.6	
Tunnel Enclosure 1 - Facade 04	Leq,d	12.0					9.6			1.3			5.8			1.5			-8.2			-22.5			-39.8			-62.7	
Tunnel Enclosure 1 - Roof 01	Leq,d	13.1					7.2			2.8			9.6			5.6			-4.2			-17.4			-32.1			-53.4	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	36.1					20.3			27.5			31.5			30.1			29.3			19.1			4.7			-22.4	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	54.6					31.0			41.1			46.7			48.8			51.3			42.5			29.8			8.1	
Vac 1	Leq,d	25.4	-8.1	-0.1	4.8	8.3	9.6	5.5	2.1	1.7	-0.3	-3.9	-1.7	-1.3	1.0	4.6	5.9	9.4	8.0	13.4	15.5	16.2	17.7	18.4	15.6	13.8	9.3	0.5	
Vac 2	Leq,d	25.1	-8.4	-0.4	4.5	7.9	9.2	5.1	1.7	1.3	-0.7	-4.4	-2.1	-1.7	0.6	4.2	6.4	9.2	7.7	13.1	15.2	15.9	17.4	18.0	15.2	13.4	8.8	-0.1	
Vac 3	Leq,d	25.5	-7.9	0.1	5.1	8.4	9.7	5.6	2.2	1.8	-0.2	-3.8	-1.5	-1.2	1.1	4.7	6.0	9.5	8.1	13.5	15.6	16.3	17.8	18.5	15.7	13.9	9.5	0.7	
Vac 4	Leq,d	25.2	-8.3	-0.3	4.8	8.0	9.3	5.2	1.8	1.4	-0.6	-4.3	-2.0	-1.7	0.7	4.2	6.5	9.2	7.8	13.2	15.3	15.9	17.5	18.1	15.3	13.4	8.9	0.0	
Vac 5	Leq,d	25.5	-7.8	0.2	5.3	8.5	9.8	5.7	2.3	1.9	-0.1	-3.8	-1.5	-1.1	1.2	4.8	6.0	8.6	7.2	12.6	15.7	16.4	17.9	18.6	15.8	14.0	9.6	0.8	
Vac 6	Leq,d	25.2	-8.2	-0.1	4.9	8.0	9.3	5.2	1.8	1.4	-0.6	-4.3	-2.0	-1.6	0.7	4.3	5.6	8.2	6.7	13.3	15.4	16.1	17.6	18.2	15.4	13.6	9.0	0.1	
Vac 7	Leq,d	24.9	-7.7	0.3	5.4	8.5	9.8	5.7	2.3	1.9	-0.1	-3.7	-1.4	-1.1	1.2	4.8	6.1	8.7	7.2	12.6	14.8	15.5	17.1	17.8	15.1	13.5	9.2	0.6	
Vac 8	Leq,d	24.9	-7.6	0.4	5.4	8.5	9.8	5.7	2.3	1.9	-0.1	-3.7	-1.4	-1.1	1.2	4.8	6.1	8.7	7.2	12.6	14.8	15.5	17.1	17.8	15.1	13.5	9.2	0.6	
Receiver Receiver 2 Fl 1.FL Lr,lim dB(A) Leq,d 54.5 dB(A) Sigma(Leq,d) 0.0 dB(A)																													
Tunnel Enclosure 1 - Facade 01	Leq,d	-3.9					-6.5			-12.8			-9.8			-16.0			-28.0			-43.6			-61.8			-87.6	
Tunnel Enclosure 1 - Facade 02	Leq,d	9.7					5.7			1.2			5.0			0.1			-10.5			-25.6			-43.6			-67.3	
Tunnel Enclosure 1 - Facade 03	Leq,d	8.5					3.2			-0.4			4.2			1.0			-7.6			-20.7			-36.2			-55.7	
Tunnel Enclosure 1 - Facade 04	Leq,d	12.0					9.6			1.9			5.8			1.5			-8.2			-22.5			-39.8			-62.8	
Tunnel Enclosure 1 - Roof 01	Leq,d	13.4					7.2			3.0			9.9			6.3			-2.4			-15.2			-30.8			-52.5	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	36.2					20.3			28.2			31.6			30.2			29.4			19.1			4.8			-22.4	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	54.3					31.0			41.7			46.7			48.7			50.7			42.0			29.5			8.1	
Vac 1	Leq,d	25.4	-5.5	1.7	5.2	8.3	9.6	5.5	2.7	2.2	0.2	-4.0	-1.7	-1.3	1.0	4.6	5.8	9.4	7.9	13.3	15.5	16.1	17.7	18.3	15.6	13.7	9.3	0.5	
Vac 2	Leq,d	25.1	-5.9	1.3	4.8	7.9	9.2	5.1	2.2	1.8	-0.2	-4.4	-2.1	-1.8	0.5	4.1	6.4	9.1	7.7	13.1	15.2	15.9	17.4	18.0	15.2	13.3	8.7	-0.2	
Vac 3	Leq,d	25.5	-5.4	1.8	5.3	8.4	9.7	5.6	2.8	2.3	0.3	-3.8	-1.6	-1.2	1.1	4.7	6.0	9.5	8.0	13.4	15.6	16.2	17.8	18.4	15.7	13.9	9.4	0.6	
Vac 4	Leq,d	25.2	-5.8	1.4	4.9	8.0	9.3	5.2	2.3	1.9	-0.1	-4.3	-2.1	-1.7	0.6	4.2	6.5	9.2	7.7	13.1	15.3	15.9	17.4	18.1	15.3	13.4	8.9	-0.1	
Vac 5	Leq,d	25.5	-5.4	1.8	5.3	8.4	9.7	5.6	2.8	2.4	0.4	-3.8	-1.5	-1.1	1.1	4.7	6.0	8.6	7.1	12.5	15.6	16.3	17.9	18.5	15.8	14.0	9.5	0.8	
Vac 6	Leq,d	25.2	-5.8	1.4	4.9	8.0	9.3	5.2	2.4	2.0	-0.1	-4.3	-2.0	-1.6	0.7	4.3	5.5	8.2	6.7	13.2	15.4	16.0	17.6	18.2	15.4	13.5	9.0	0.1	
Vac 7	Leq,d	24.9	-5.3	1.9	5.4	8.5	9.8	5.7	2.8	2.4	0.4	-3.7	-1.5	-1.1	1.2	4.8	6.0	8.6	7.2	12.6	14.7	15.4	17.0	17.7	15.1	13.4	9.1	0.5	
Vac 8	Leq,d	24.9	-5.3	1.9	5.4	8.5	9.8	5.7	2.8	2.4	0.4	-3.7	-1.5	-1.1	1.2	4.8	6.1	8.6	7.2	12.6	14.7	15.4	17.0	17.7	15.1	13.4	9.1	0.5	

QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 3 Fl GF Lr,lim dB(A) Leq,d 50.5 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-6.7					-9.1			-15.7			-12.8			-20.1			-33.2			-49.7			-69.1			-98.4
Tunnel Enclosure 1 - Facade 02	Leq,d	2.1					-0.4			-6.9			-4.0			-10.4			-22.3			-37.9			-56.4			-83.1
Tunnel Enclosure 1 - Facade 03	Leq,d	3.9					-1.7			-5.3			-0.1			-3.3			-12.0			-25.4			-42.0			-65.5
Tunnel Enclosure 1 - Facade 04	Leq,d	2.4					-0.1			-6.6			-3.8			-9.9			-20.7			-35.7			-53.8			-80.2
Tunnel Enclosure 1 - Roof 01	Leq,d	9.1					4.4			-0.6			5.3			0.3			-10.9			-25.9			-44.1			-70.2
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	32.1					17.8			24.8			28.0			25.9			23.3			12.6			-3.1			-34.0
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	50.4					25.8			37.4			42.7			44.8			46.9			38.0			24.5			-1.0
Vac 1	Leq,d	18.5	-14.6	-7.2	-3.4	0.1	1.9	-1.4	-3.9	-3.6	-5.7	-9.8	-7.5	-7.1	-4.6	-1.0	0.2	3.2	1.7	7.0	9.1	9.7	11.0	11.3	8.1	5.4	-0.3	-11.1
Vac 2	Leq,d	18.3	-14.7	-7.3	-3.5	0.0	1.8	-1.4	-3.7	-3.8	-5.8	-10.0	-7.7	-7.3	-4.8	-1.2	0.0	3.0	1.5	6.9	9.0	9.5	10.8	11.1	7.8	5.1	-0.7	-11.6
Vac 3	Leq,d	18.8	-14.4	-7.0	-3.2	0.3	2.2	-1.1	-3.4	-3.4	-5.5	-9.6	-7.3	-6.9	-4.4	-0.8	0.4	3.4	1.9	7.3	9.4	9.9	11.3	11.6	8.3	5.8	0.1	-10.6
Vac 4	Leq,d	18.5	-14.5	-7.1	-3.3	0.2	2.1	-1.0	-3.2	-3.6	-5.7	-9.8	-7.5	-7.1	-4.6	-1.0	0.2	3.2	1.7	7.1	9.2	9.7	11.0	11.3	8.1	5.4	-0.3	-11.1
Vac 5	Leq,d	19.0	-14.2	-6.8	-2.9	0.6	2.5	-0.7	-2.9	-3.3	-5.3	-9.4	-7.1	-6.7	-4.2	-0.6	0.6	3.6	2.1	7.4	9.5	10.1	11.5	11.8	8.6	6.0	0.4	-10.2
Vac 6	Leq,d	18.8	-14.3	-6.9	-3.0	0.5	2.4	-0.7	-3.0	-3.5	-5.5	-9.6	-7.3	-6.9	-4.4	-0.8	0.4	3.4	1.9	7.2	9.3	9.9	11.2	11.6	8.3	5.7	0.0	-10.6
Vac 7	Leq,d	19.2	-14.0	-6.5	-2.7	0.8	2.8	-0.4	-2.7	-3.1	-5.1	-9.2	-6.9	-6.5	-4.0	-0.4	0.8	3.8	2.3	7.6	9.7	10.3	11.7	12.0	8.9	6.4	0.8	-9.7
Vac 8	Leq,d	20.9	-13.7	-6.3	-2.4	1.1	3.1	0.0	-2.4	-2.9	-4.9	-8.9	-6.7	-6.3	-3.8	-0.2	1.0	5.7	4.2	9.6	11.7	12.2	13.6	13.9	10.7	8.1	2.4	-8.2
Receiver Receiver 3 Fl 1.FL Lr,lim dB(A) Leq,d 50.6 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-6.6					-9.0			-15.2			-12.7			-20.0			-33.1			-49.5			-69.0			-98.4
Tunnel Enclosure 1 - Facade 02	Leq,d	2.2					-0.3			-6.4			-3.8			-10.3			-22.2			-37.8			-56.4			-83.1
Tunnel Enclosure 1 - Facade 03	Leq,d	4.3					-0.7			-4.6			-0.1			-3.3			-12.0			-25.4			-42.0			-65.5
Tunnel Enclosure 1 - Facade 04	Leq,d	2.5					-0.1			-6.1			-3.7			-9.9			-20.7			-35.7			-53.8			-80.3
Tunnel Enclosure 1 - Roof 01	Leq,d	9.3					4.5			-0.4			5.5			0.6			-10.5			-25.3			-43.3			-68.9
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	32.2					17.8			25.4			28.1			25.9			23.3			12.6			-3.1			-34.1
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	50.5					27.4			38.0			42.7			44.8			46.9			38.0			24.5			-1.0
Vac 1	Leq,d	18.7	-13.7	-6.0	-1.7	2.6	4.5	0.4	-2.6	-3.0	-5.0	-9.7	-7.5	-7.1	-4.6	-1.1	0.2	3.2	1.7	7.0	9.1	9.7	11.0	11.3	8.0	5.4	-0.4	-11.1
Vac 2	Leq,d	18.5	-13.8	-6.1	-1.6	2.8	4.4	0.3	-2.7	-3.2	-5.2	-9.9	-7.7	-7.3	-4.8	-1.2	0.0	3.0	1.5	6.9	8.9	9.5	10.8	11.1	7.8	5.1	-0.7	-11.6
Vac 3	Leq,d	18.9	-13.5	-5.7	-1.3	3.1	4.7	0.6	-2.4	-2.8	-4.8	-9.5	-7.3	-6.9	-4.4	-0.8	0.4	3.4	1.9	7.2	9.3	9.9	11.2	11.6	8.3	5.7	0.0	-10.6
Vac 4	Leq,d	18.7	-13.5	-5.8	-1.3	3.3	4.5	0.4	-2.6	-3.0	-5.0	-9.7	-7.5	-7.1	-4.6	-1.0	0.2	3.2	1.7	7.0	9.1	9.7	11.0	11.3	8.1	5.4	-0.3	-11.1
Vac 5	Leq,d	19.2	-13.2	-5.4	-1.0	3.6	4.9	0.8	-2.2	-2.6	-4.6	-9.3	-7.1	-6.7	-4.2	-0.7	0.6	3.6	2.1	7.4	9.5	10.1	11.4	11.8	8.6	6.0	0.4	-10.2
Vac 6	Leq,d	18.9	-13.3	-5.5	-0.9	3.4	4.7	0.6	-2.4	-2.8	-4.8	-9.5	-7.3	-6.9	-4.4	-0.9	0.4	3.4	1.9	7.2	9.3	9.9	11.2	11.6	8.3	5.7	0.0	-10.7
Vac 7	Leq,d	19.4	-12.9	-5.2	-0.6	3.8	5.1	1.0	-2.0	-2.4	-4.4	-9.1	-6.9	-6.5	-4.0	-0.5	0.8	3.8	2.3	7.6	9.7	10.3	11.7	12.0	8.8	6.3	0.8	-9.7
Vac 8	Leq,d	21.1	-12.7	-4.8	-0.2	4.0	5.3	1.2	-1.8	-2.2	-4.2	-8.9	-6.7	-6.3	-3.8	-0.2	1.0	5.7	4.2	9.6	11.7	12.2	13.6	13.9	10.6	8.0	2.4	-8.3

QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 4 Fl GF Lr,lim dB(A) Leq,d 50.3 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-5.3					-7.9			-14.1			-11.1			-18.2			-31.5			-48.4			-68.0			-97.2
Tunnel Enclosure 1 - Facade 02	Leq,d	1.1					-1.3			-7.9			-5.1			-12.1			-24.3			-39.9			-58.3			-85.1
Tunnel Enclosure 1 - Facade 03	Leq,d	3.1					-1.7			-6.4			-1.2			-4.5			-13.5			-27.0			-43.7			-67.7
Tunnel Enclosure 1 - Facade 04	Leq,d	1.5					-1.0			-7.5			-4.7			-10.8			-20.2			-34.7			-52.4			-78.6
Tunnel Enclosure 1 - Roof 01	Leq,d	8.2					3.8			-1.4			4.3			-1.1			-12.9			-28.4			-47.3			-74.3
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	34.0					19.1			26.7			30.1			28.0			25.0			13.3			-2.7			-33.5
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	50.2					27.2			37.1			42.4			44.5			46.7			37.7			24.1			-1.6
Vac 1	Leq,d	17.8	-14.1	-6.2	-1.5	2.4	3.7	-0.4	-4.1	-4.5	-6.6	-10.7	-8.4	-8.1	-5.5	-2.0	-0.7	2.3	0.8	6.2	8.4	8.9	10.2	10.3	6.9	4.0	-2.1	-13.4
Vac 2	Leq,d	17.6	-14.1	-6.3	-1.5	2.3	3.6	-0.5	-4.2	-4.6	-6.6	-10.8	-8.5	-8.1	-5.6	-2.0	-0.8	2.2	0.7	6.1	8.1	8.6	9.9	10.1	6.7	3.8	-2.3	-13.6
Vac 3	Leq,d	18.1	-13.9	-6.0	-1.2	2.7	4.0	-0.2	-3.9	-4.3	-6.3	-10.4	-8.2	-7.8	-5.3	-1.7	-0.5	2.6	1.1	6.4	8.7	9.2	10.4	10.7	7.2	4.4	-1.6	-12.7
Vac 4	Leq,d	17.9	-13.9	-6.0	-1.2	2.6	3.9	-0.2	-4.0	-4.4	-6.4	-10.5	-8.3	-7.9	-5.4	-1.8	-0.5	2.5	1.0	6.3	8.4	8.9	10.2	10.4	7.0	4.2	-1.8	-13.0
Vac 5	Leq,d	18.3	-13.6	-5.8	-1.0	2.9	4.2	0.1	-3.6	-4.0	-6.1	-10.2	-7.9	-7.5	-5.0	-1.4	-0.2	2.8	1.3	6.7	8.7	9.3	10.6	10.9	7.5	4.8	-1.1	-12.1
Vac 6	Leq,d	18.2	-13.7	-5.8	-1.0	2.8	4.1	0.0	-3.7	-4.1	-6.2	-10.3	-8.0	-7.6	-5.1	-1.5	-0.3	2.7	1.2	6.6	8.6	9.2	10.5	10.7	7.4	4.6	-1.3	-12.4
Vac 7	Leq,d	18.6	-13.4	-5.5	-0.8	3.1	4.4	0.3	-3.4	-3.8	-5.8	-9.9	-7.6	-7.3	-4.8	-1.2	0.1	3.0	1.6	6.9	9.0	9.5	10.9	11.2	7.9	5.2	-0.6	-11.5
Vac 8	Leq,d	18.9	-13.1	-5.3	-0.5	3.4	4.7	0.6	-3.1	-3.5	-5.5	-9.6	-7.4	-7.0	-4.5	-0.9	0.3	3.3	1.8	7.2	9.3	9.8	11.2	11.5	8.2	5.6	-0.1	-10.8
Receiver Receiver 4 Fl 1.FL Lr,lim dB(A) Leq,d 50.4 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-5.2					-7.9			-13.6			-11.0			-18.1			-31.4			-48.3			-68.0			-97.2
Tunnel Enclosure 1 - Facade 02	Leq,d	1.2					-1.3			-7.5			-5.0			-12.0			-24.2			-39.9			-58.3			-85.1
Tunnel Enclosure 1 - Facade 03	Leq,d	3.2					-1.7			-5.8			-1.2			-4.5			-13.5			-27.0			-43.8			-67.7
Tunnel Enclosure 1 - Facade 04	Leq,d	1.6					-0.9			-7.0			-4.7			-10.8			-20.2			-34.7			-52.4			-78.6
Tunnel Enclosure 1 - Roof 01	Leq,d	8.4					3.9			-1.1			4.5			-0.8			-12.5			-27.9			-46.7			-73.5
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	34.2					19.2			27.4			30.1			28.1			25.0			13.3			-2.7			-33.5
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	50.2					27.2			37.8			42.5			44.5			46.7			37.7			24.1			-1.6
Vac 1	Leq,d	17.7	-11.4	-4.2	-0.7	2.4	3.7	-0.4	-3.4	-3.9	-5.9	-10.7	-8.4	-8.0	-5.5	-2.0	-0.7	2.3	0.8	6.1	8.2	8.7	10.0	10.2	6.8	4.0	-2.1	-13.4
Vac 2	Leq,d	17.6	-11.5	-4.3	-0.8	2.3	3.6	-0.5	-3.5	-3.9	-6.0	-10.8	-8.5	-8.1	-5.6	-2.1	-0.8	2.2	0.7	6.1	8.1	8.6	9.9	10.1	6.7	3.8	-2.3	-13.6
Vac 3	Leq,d	18.0	-11.1	-3.9	-0.4	2.6	3.9	-0.2	-3.2	-3.6	-5.6	-10.4	-8.1	-7.8	-5.3	-1.7	-0.5	2.6	1.1	6.4	8.5	9.0	10.3	10.5	7.2	4.4	-1.6	-12.8
Vac 4	Leq,d	17.9	-11.2	-4.0	-0.5	2.6	3.9	-0.3	-3.3	-3.7	-5.7	-10.5	-8.2	-7.9	-5.4	-1.8	-0.6	2.5	1.0	6.3	8.4	8.9	10.2	10.4	7.0	4.2	-1.8	-13.0
Vac 5	Leq,d	18.3	-10.9	-3.7	-0.2	2.9	4.2	0.1	-3.0	-3.4	-5.4	-10.2	-7.9	-7.5	-5.0	-1.5	-0.2	2.8	1.3	6.6	8.7	9.3	10.6	10.8	7.5	4.8	-1.1	-12.1
Vac 6	Leq,d	18.2	-11.0	-3.8	-0.3	2.8	4.1	0.0	-3.0	-3.5	-5.5	-10.3	-8.0	-7.6	-5.1	-1.6	-0.3	2.7	1.2	6.5	8.6	9.2	10.5	10.7	7.4	4.6	-1.3	-12.4
Vac 7	Leq,d	18.6	-10.7	-3.5	0.0	3.1	4.4	0.3	-2.7	-3.1	-5.1	-9.9	-7.6	-7.3	-4.8	-1.2	0.0	3.0	1.5	6.9	9.0	9.5	10.8	11.1	7.8	5.2	-0.6	-11.5
Vac 8	Leq,d	18.9	-10.4	-3.2	0.3	3.4	4.7	0.6	-2.4	-2.9	-4.9	-9.6	-7.3	-7.0	-4.5	-0.9	0.3	3.3	1.8	7.2	9.3	9.8	11.2	11.5	8.2	5.6	-0.1	-10.8

QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

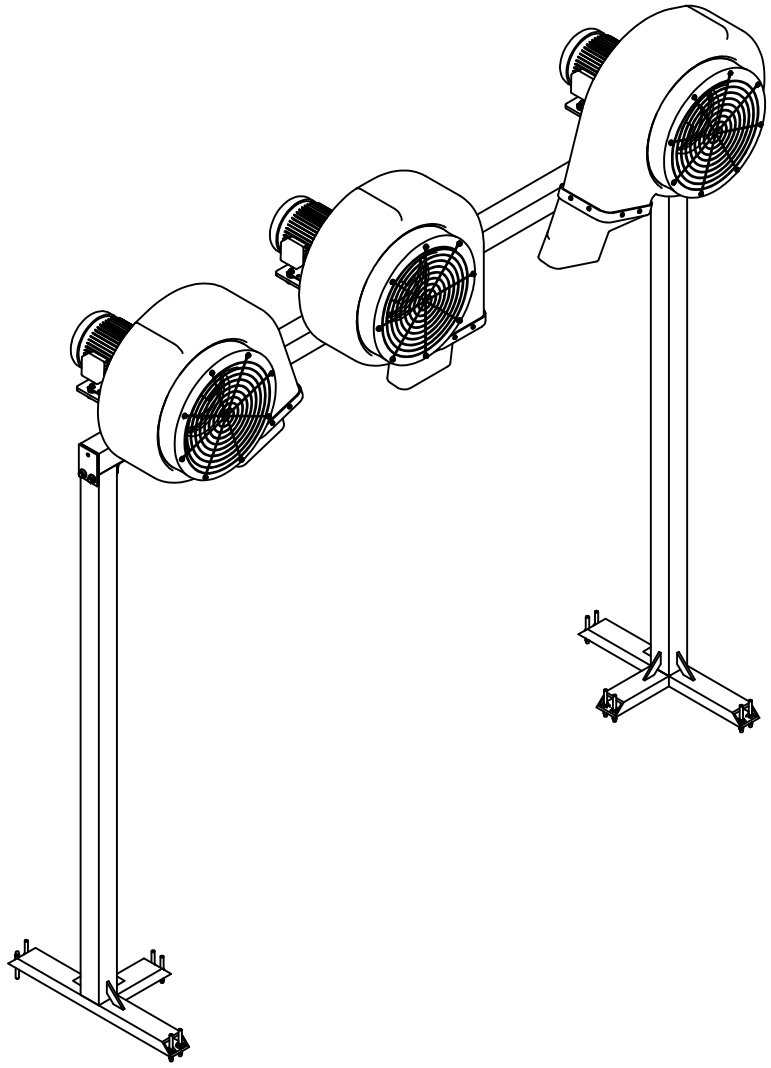
Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 5 Fl GF Lr,lim dB(A) Leq,d 46.2 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-4.4					-7.4			-13.2			-9.7			-16.2			-29.1			-46.1			-66.2			-96.3
Tunnel Enclosure 1 - Facade 02	Leq,d	0.1					-2.2			-8.8			-6.1			-13.5			-26.0			-41.8			-60.6			-88.2
Tunnel Enclosure 1 - Facade 03	Leq,d	1.4					-3.2			-8.0			-3.1			-6.6			-15.5			-29.2			-46.3			-71.6
Tunnel Enclosure 1 - Facade 04	Leq,d	1.1					-1.5			-7.9			-4.8			-10.6			-18.2			-31.4			-49.6			-77.4
Tunnel Enclosure 1 - Roof 01	Leq,d	7.7					3.4			-2.0			3.7			-1.8			-13.7			-29.8			-48.3			-76.5
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	35.9					20.0			28.1			31.7			30.3			27.3			15.0			-1.9			-33.7
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	45.7					23.8			33.3			38.6			40.3			41.7			32.4			17.9			-9.7
Vac 1	Leq,d	16.3	-15.7	-7.9	-3.5	1.0	2.5	-1.6	-5.4	-5.8	-7.9	-12.0	-9.8	-9.4	-6.8	-3.3	-2.1	1.0	-0.5	5.1	7.2	7.6	8.7	8.8	5.1	1.8	-4.9	-17.0
Vac 2	Leq,d	16.3	-15.7	-7.9	-3.4	1.1	2.5	-1.7	-5.5	-5.9	-7.9	-12.1	-9.8	-9.4	-6.9	-3.3	-2.1	1.0	-0.5	5.1	7.1	7.5	8.7	8.7	5.0	1.8	-4.9	-17.1
Vac 3	Leq,d	16.6	-15.5	-7.7	-3.3	1.2	2.7	-1.4	-5.2	-5.6	-7.6	-11.8	-9.5	-9.2	-6.6	-3.1	-1.8	1.2	-0.3	5.3	7.4	7.8	9.0	9.1	5.4	2.2	-4.4	-16.4
Vac 4	Leq,d	16.6	-15.4	-7.7	-3.2	1.3	2.7	-1.4	-5.2	-5.7	-7.7	-11.8	-9.6	-9.2	-6.6	-3.1	-1.9	1.2	-0.3	5.3	7.4	7.8	9.0	9.0	5.4	2.2	-4.4	-16.4
Vac 5	Leq,d	16.9	-15.2	-7.5	-3.1	1.4	2.9	-1.2	-5.0	-5.4	-7.4	-11.6	-9.3	-8.9	-6.4	-2.8	-1.6	1.5	-0.1	5.6	7.6	8.1	9.3	9.3	5.7	2.6	-3.9	-15.7
Vac 6	Leq,d	16.8	-15.2	-7.5	-3.0	1.5	2.9	-1.2	-5.0	-5.4	-7.4	-11.6	-9.3	-9.0	-6.4	-2.9	-1.6	1.4	-0.1	5.5	7.6	8.0	9.2	9.3	5.7	2.6	-3.9	-15.8
Vac 7	Leq,d	17.1	-15.0	-7.3	-2.9	1.6	3.1	-1.0	-4.7	-5.2	-7.2	-11.3	-9.1	-8.7	-6.2	-2.6	-1.4	1.7	0.2	5.8	7.9	8.3	9.5	9.6	6.1	3.0	-3.4	-15.1
Vac 8	Leq,d	17.4	-14.8	-7.1	-2.6	1.8	3.4	-0.7	-4.5	-4.9	-6.9	-11.1	-8.8	-8.4	-5.9	-2.3	-1.1	1.9	0.4	6.1	8.1	8.6	9.8	10.0	6.4	3.4	-2.8	-14.4
Receiver Receiver 5 Fl 1.FL Lr,lim dB(A) Leq,d 46.2 dB(A) Sigma(Leq,d) 0.0 dB(A)																												
Tunnel Enclosure 1 - Facade 01	Leq,d	-4.3					-7.4			-12.7			-9.6			-16.2			-29.1			-46.0			-66.2			-96.3
Tunnel Enclosure 1 - Facade 02	Leq,d	0.2					-2.2			-8.4			-6.0			-13.3			-25.9			-41.7			-60.6			-88.2
Tunnel Enclosure 1 - Facade 03	Leq,d	1.5					-3.2			-7.4			-3.1			-6.6			-15.5			-29.2			-46.4			-71.6
Tunnel Enclosure 1 - Facade 04	Leq,d	1.2					-1.5			-7.4			-4.7			-10.6			-18.2			-32.7			-50.5			-77.6
Tunnel Enclosure 1 - Roof 01	Leq,d	7.8					3.4			-1.7			3.9			-1.6			-13.4			-29.4			-47.9			-75.8
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	36.0					20.0			28.8			31.8			30.3			27.3			15.0			-1.9			-33.8
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	45.8					23.8			34.0			38.7			40.3			41.7			32.4			17.9			-9.7
Vac 1	Leq,d	16.2	-12.9	-5.4	-1.9	1.2	2.5	-1.6	-4.7	-5.2	-7.2	-12.0	-9.8	-9.4	-6.9	-3.3	-2.1	1.0	-0.5	4.8	6.8	7.3	8.5	8.6	4.9	1.7	-4.9	-17.0
Vac 2	Leq,d	16.2	-12.8	-5.4	-1.9	1.2	2.4	-1.7	-4.8	-5.2	-7.2	-12.0	-9.8	-9.4	-6.9	-3.3	-2.1	1.0	-0.5	4.8	6.8	7.3	8.4	8.5	4.9	1.6	-5.0	-17.1
Vac 3	Leq,d	16.5	-12.7	-5.2	-1.7	1.4	2.7	-1.4	-4.5	-4.9	-7.0	-11.8	-9.5	-9.2	-6.6	-3.1	-1.8	1.2	-0.3	5.0	7.1	7.5	8.7	8.9	5.2	2.1	-4.4	-16.4
Vac 4	Leq,d	16.4	-12.6	-5.2	-1.7	1.4	2.7	-1.5	-4.5	-5.0	-7.0	-11.8	-9.6	-9.2	-6.7	-3.1	-1.9	1.2	-0.3	5.0	7.1	7.5	8.7	8.8	5.2	2.0	-4.5	-16.5
Vac 5	Leq,d	16.7	-12.5	-5.0	-1.5	1.6	2.9	-1.2	-4.3	-4.7	-6.7	-11.5	-9.3	-8.9	-6.4	-2.8	-1.6	1.5	-0.1	5.3	7.3	7.8	9.0	9.1	5.6	2.5	-3.9	-15.7
Vac 6	Leq,d	16.7	-12.4	-5.0	-1.5	1.6	2.9	-1.2	-4.3	-4.7	-6.8	-11.6	-9.3	-9.0	-6.4	-2.9	-1.6	1.4	-0.1	5.2	7.3	7.8	9.0	9.1	5.5	2.4	-4.0	-15.8
Vac 7	Leq,d	17.0	-12.3	-4.8	-1.3	1.8	3.1	-1.0	-4.1	-4.5	-6.5	-11.3	-9.1	-8.7	-6.2	-2.6	-1.4	1.7	0.2	5.5	7.6	8.0	9.3	9.4	5.9	2.9	-3.4	-15.1
Vac 8	Leq,d	17.3	-12.0	-4.5	-1.0	2.1	3.4	-0.8	-3.8	-4.2	-6.2	-11.1	-8.8	-8.4	-5.9	-2.3	-1.1	1.9	0.4	5.8	7.8	8.3	9.6	9.8	6.3	3.3	-2.9	-14.4

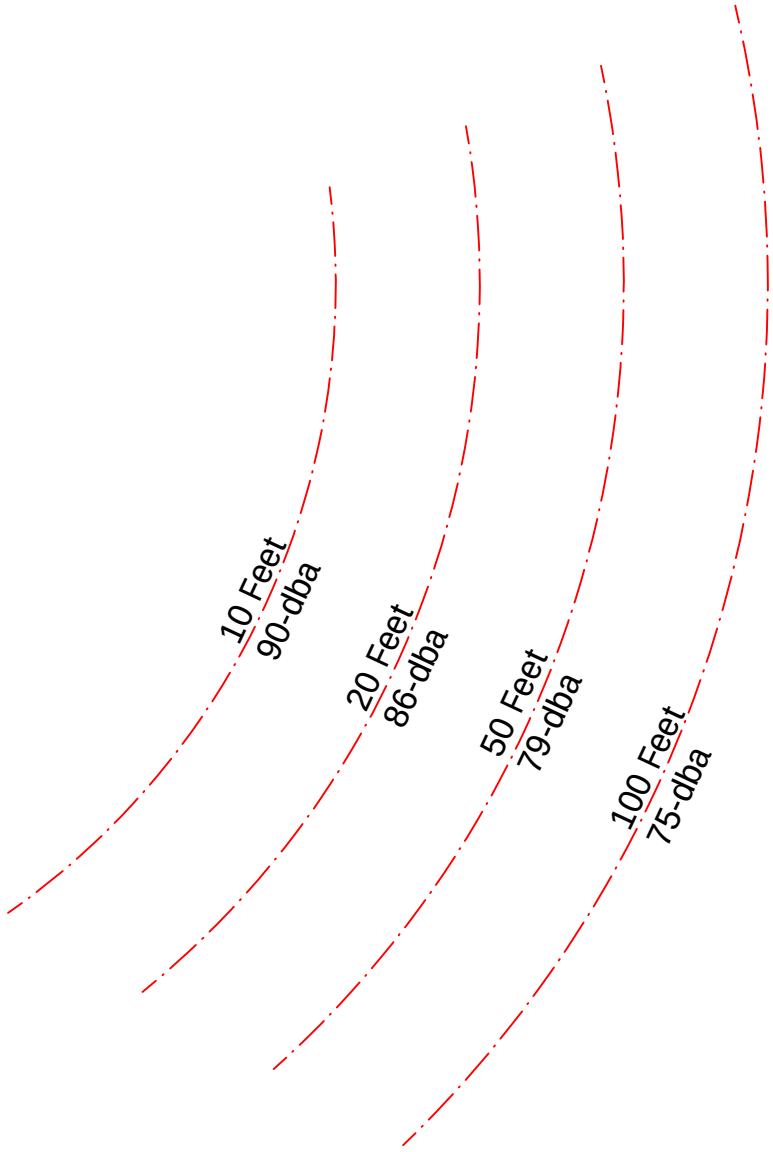
QQ Oakley
Contribution spectra - Situation 2: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Receiver Receiver 6 Fl GF Lr,lim dB(A) Leq,d 50.9 dB(A) Sigma(Leq,d) 0.0 dB(A)																													
Tunnel Enclosure 1 - Facade 01	Leq,d	4.7					-0.3			-4.7			0.4			-2.7			-11.7			-25.5			-42.3			-67.4	
Tunnel Enclosure 1 - Facade 02	Leq,d	1.7					-0.7			-7.1			-4.3			-11.6			-24.1			-39.6			-57.5			-82.6	
Tunnel Enclosure 1 - Facade 03	Leq,d	-3.4					-6.0			-12.3			-9.3			-16.6			-29.9			-46.1			-64.1			-87.9	
Tunnel Enclosure 1 - Facade 04	Leq,d	5.0					1.4			-4.2			-0.3			-4.2			-13.5			-27.3			-44.0			-67.8	
Tunnel Enclosure 1 - Roof 01	Leq,d	9.2					5.0			-0.3			5.2			-0.2			-11.8			-27.1			-44.7			-69.0	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	50.7					27.9			37.8			43.2			45.1			47.2			37.8			23.9			-3.2	
Tunnel Enclosure 1 - Transmissive area 0	Leq,d	36.4					21.2			28.9			32.4			30.5			27.4			16.3			1.6			-24.2	
Vac 1	Leq,d	16.7	-12.2	-5.0	-1.5	1.6	2.9	-1.2	-5.0	-5.4	-7.4	-11.6	-9.3	-8.9	-6.4	-2.8	-1.6	1.5	0.0	5.3	7.3	7.8	9.0	9.2	5.6	2.5	-3.9	-15.7	
Vac 2	Leq,d	16.8	-12.1	-4.9	-1.4	1.7	3.0	-1.1	-4.9	-5.3	-7.3	-11.5	-9.2	-8.8	-6.3	-2.7	-1.5	1.6	0.1	5.4	7.4	7.9	9.1	9.3	5.7	2.7	-3.7	-15.4	
Vac 3	Leq,d	17.0	-12.0	-4.8	-1.3	1.8	3.1	-1.0	-4.7	-5.2	-7.2	-11.3	-9.1	-8.7	-6.2	-2.6	-1.4	1.7	0.2	5.5	7.6	8.0	9.3	9.4	5.9	2.9	-3.4	-15.1	
Vac 4	Leq,d	17.1	-11.9	-4.7	-1.2	1.9	3.2	-0.9	-4.6	-5.1	-7.1	-11.2	-9.0	-8.6	-6.1	-2.5	-1.3	1.8	0.3	5.6	7.7	8.2	9.4	9.6	6.1	3.1	-3.2	-14.8	
Vac 5	Leq,d	17.2	-11.8	-4.6	-1.1	2.0	3.3	-0.8	-4.5	-4.9	-7.0	-11.1	-8.8	-8.5	-5.9	-2.4	-1.1	1.9	0.4	5.7	7.8	8.3	9.5	9.7	6.2	3.3	-3.0	-14.5	
Vac 6	Leq,d	17.4	-11.7	-4.5	-1.0	2.1	3.4	-0.7	-4.4	-4.8	-6.9	-11.0	-8.7	-8.4	-5.8	-2.3	-1.0	2.0	0.5	5.8	7.9	8.4	9.7	9.9	6.4	3.5	-2.8	-14.2	
Vac 7	Leq,d	17.5	-11.6	-4.4	-0.9	2.2	3.5	-0.6	-4.3	-4.7	-6.8	-10.9	-8.6	-8.3	-5.7	-2.2	-0.9	2.1	0.6	5.9	8.0	8.5	9.8	10.0	6.5	3.6	-2.5	-13.9	
Vac 8	Leq,d	17.8	-11.3	-4.1	-0.6	2.5	3.7	-0.4	-4.1	-4.5	-6.5	-10.7	-8.4	-8.0	-5.5	-1.9	-0.7	2.3	0.8	6.2	8.3	8.8	10.1	10.3	6.9	4.0	-2.0	-13.3	

Appendix C:
Manufacturers Cut Sheet

Enviromental Noise with Dryer OFF: 70 dba





THIRD ANGLE PROJECTION	*MACHINING TOLERANCES*	DRAWN LVerdecia	8/26/2011
BREAK ALL SHARP CORNERS. PART TO BE FREE OF BURRS.	FRACTION± 1/16"	APPROVED	8/1/2012
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES	.XX DECIMAL ± 0.030	CATEGORY BLOWER	
MATERIAL	.XXX DECIMAL ± 0.005		
	ANGULARITY ± 2°		
	FINISH 125		

SONNY'S ENTERPRISES
THE CARWASH FACTORY

DESCRIPTION	BLOWER ASSEMBLY, ONE ARCH 45HP		
PART NUMBER	BL1-45HP-1		
SHEET 2 OF 2	SIZE A	SCALE N.T.S.	

MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249
p. (602) 774-1950

CA Office
1197 Los Angeles Ave, Ste C-256
Simi Valley, CA 93065
p. (805) 426-4477

Project: SuperStar Car Wash Chula Vista
Site Location: 1555 W Warner Rd, Gilbert, AZ 85233
Date: 4/5/2018
Field Tech/Engineer: Robert Pearson
Source/System: Vacutec System

Location: Vac Bay 1
Sound Meter: NTi XL2 **SN:** A2A-05967-E0
Settings: Z-weighted, slow, 1-sec, 10-sec duration
Meteorological Cond.: 80 degrees F, 2 mph wind

Site Observations:
Clear sky, measurements were performed within 1.5ft of source. Measurements were performed while the vacuum was positiioned at threee (3) different positions. Holstered, unholstered and inside a car. This data is utilized for acoustic modeling purposes and represents an average sound level at a vacuum station.

Table 1: Summary Measurement Data

Source	System	Overall dB(A)	3rd Octave Band Data (dBA)																														
			20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1K	1.25K	1.6K	2K	2.5K	3.15K	4K	5K	6.3K	8K	10K	12.5K	16K	20K
Vacutech (Holstered)	Vacuum	63.3	9	17	22	29	31	35	40	41	44	43	46	48	47	49	51	51	51	52	53	52	52	50	52	53	50	47	47	48	45	39	30
Vacutech (Un Holstered)	Vacuum	80.7	6	19	22	28	34	37	40	43	47	46	48	48	48	49	54	55	58	58	62	65	68	70	74	75	73	69	67	65	63	60	55
Vacutech (Inside Car)	Vacuum	69.6	16	28	31	38	42	45	49	51	52	55	60	61	57	55	59	53	55	56	54	57	57	57	57	57	55	54	51	48	46	42	36
Arth. Average Level*	Vacuum	71.2	11	21	25	32	36	39	43	45	47	48	52	53	51	51	55	53	55	55	56	58	59	59	61	62	59	56	55	53	51	47	40

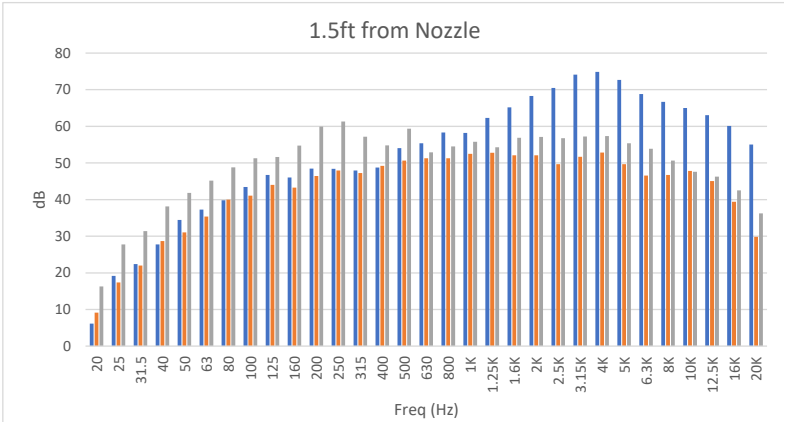
* Refers to the arthitmetic average of all measurements. This measurement represents an average of the multiple vacuum positions.

Figure 1: Example Measurement Position

Figure 1: Holstered

Figure 2: Un Holstered

Figure 3: Inside Car



Vacutech sound levels

Appendix D:

Construction Noise Modeling Output

Activity	L_{eq} at 337 feet dBA	L_{Max} at 337 feet dBA
Grading	64	68
Building Construction	62	63
Paving	64	66

Equipment Summary	Reference (dBA) 50 ft Lmax
Rock Drills	96
Jack Hammers	82
Pneumatic Tools	85
Pavers	80
Dozers	85
Scrappers	87
Haul Trucks	88
Cranes	82
Portable Generators	80
Rollers	80
Tractors	80
Front-End Loaders	86
Hydraulic Excavators	86
Graders	85
Air Compressors	86
Trucks	86

Grading

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Leq	Energy
1	Grader	85	1	40	337	0.5	0	64.3	60.3	1072531.98
2	Dozer	85	1	40	337	0.5	0	64.3	60.3	1072531.98
3	Tractor/Backhoe	80	1	40	337	0.5	0	59.3	55.3	339164.392
4										
							Lmax*	**68**	**Leq**	**64**
							Lw	**100**	**Lw**	**96**

Source: MD Acoustics, March 2021.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**64**	**63**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**
60	18.3	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
70	21.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
80	24.4	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
90	27.4	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
100	30.5	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
110	33.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
120	36.6	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
130	39.6	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
140	42.7	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
150	45.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
160	48.8	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
170	51.8	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
180	54.9	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
190	57.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
200	61.0	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
210	64.0	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
220	67.1	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
230	70.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
240	73.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
250	76.2	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
260	79.2	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
270	82.3	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
280	85.3	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
290	88.4	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
300	91.4	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
310	94.5	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
320	97.5	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
330	100.6	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
340	103.6	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
350	106.7	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
360	109.7	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
370	112.8	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27

Building Construction

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Cranes	82	1	40	337	0.5	0	61.3	57.3	537539.335
2	Forklift/Tractor	80	1	40	337	0.5	0	59.3	55.3	339164.392
3	Generator	80	1	40	337	0.5	0	59.3	55.3	339164.392
4	Tractor/Backhoe	80	1	40	337	0.5	0	59.3	55.3	339164.392
							Lmax*	**63**	**Leq**	**62**
							Lw	**95**	**Lw**	**94**

Source: MD Acoustics, March 2021.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**
60	18.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
70	21.3	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
80	24.4	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
90	27.4	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
100	30.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
110	33.5	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
120	36.6	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
130	39.6	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
140	42.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
150	45.7	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
160	48.8	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
170	51.8	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
180	54.9	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
190	57.9	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
200	61.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
210	64.0	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
220	67.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
230	70.1	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
240	73.1	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
250	76.2	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
260	79.2	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
270	82.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
280	85.3	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
290	88.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
300	91.4	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
310	94.5	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
320	97.5	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
330	100.6	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
340	103.6	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
350	106.7	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
360	109.7	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
370	112.8	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25

Paving

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Pavers	86	1	40	337	0.5	0	65.3	61.3	1350237.76
2	Rollers	80	1	40	337	0.5	0	59.3	55.3	339164.392
3	Paving Equipment	80	1	40	337	0.5	0	59.3	55.3	339164.392
4	Tractor/Backhoe	80	1	40	337	0.5	0	59.3	55.3	339164.392
							Lmax*	**66**	**Leq**	**64**
							Lw	**98**	**Lw**	**95**

Source: MD Acoustics, March 2021.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**64**	**63**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**
60	18.3	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
70	21.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
80	24.4	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
90	27.4	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
100	30.5	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
110	33.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
120	36.6	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
130	39.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
140	42.7	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
150	45.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
160	48.8	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
170	51.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
180	54.9	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
190	57.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
200	61.0	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
210	64.0	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
220	67.1	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
230	70.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
240	73.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
250	76.2	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
260	79.2	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
270	82.3	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
280	85.3	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
290	88.4	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
300	91.4	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
310	94.5	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
320	97.5	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
330	100.6	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
340	103.6	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
350	106.7	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
360	109.7	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
370	112.8	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27

VIBRATION LEVEL IMPACT

Project:	QQ Oakley		Date: 3/12/21
Source:	Large Bulldozer		
Scenario:	Unmitigated		
Location:	Project Site		
Address:			

PPV = PPVref(25/D)^n (in/sec)

DATA INPUT

Equipment = Type	2	Large Bulldozer	INPUT SECTION IN BLUE
PPVref =	0.089	Reference PPV (in/sec) at 25 ft.	
D =	112.00	Distance from Equipment to Receiver (ft)	
n =	1.10	Vibration attenuation rate through the ground	

Note: Based on reference equations from Vibration Guidance Manual, California Department of Transportation, 2006, pgs 38-43.

DATA OUT RESULTS

PPV =	**0.017**	IN/SEC	OUTPUT IN RED