# APPENDIX I

# LAKE WOHLFORD DAM REPLACEMENT PROJECT NOISE TECHNICAL REPORT

# NOISE TECHNICAL REPORT
# LAKE WOHLFORD DAM REPLACEMENT PROJECT

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# TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF IMAGES



## LIST OF TABLES

# GLOSSARY OF TERMS AND ACRONYMS

| | |
|---|---|
| ADT | average daily traffic |
| AMSL | above mean sea level |
| Caltrans | California Department of Transportation |
| CEQA | California Environmental Quality Act |
| CNEL | Community Noise Equivalent Level |
| City | City of Escondido |
| County | County of San Diego |
| dB | decibel |
| dBA | a-weighted decibel |
| EIR | environmental impact report |
| FTA | Federal Transit Administration |
| FHWA | Federal Highway Administration |
| in/sec | inches per second |
| LD | Larson-Davis, Inc. |
| $L_{eq}$ | equivalent noise level over a period of time |
| LT | long-term |
| mph | miles per hour |
| ppv | peak particle velocity |
| RCC | roller compacted concrete |
| SLM | sound level meter |
| ST | short-term |

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# EXECUTIVE SUMMARY

The City of Escondido (City) is proposing to construct a replacement dam downstream (west) of and adjacent to the existing Lake Wohlford Dam in San Diego County, near the City of Escondido, California. The majority of the land around the lake, including the project site is owned by the City but is not located within the City's jurisdictional boundaries. The City is the project proponent and the lead agency for environmental review under the California Environmental Quality Act (CEQA). Because the project is located outside the City's municipal boundaries, the City has elected to apply the County's noise regulations to analysis of the proposed project's impacts for CEQA purposes. This Noise Technical Report identifies the ambient noise environment of the project site; predicts project construction noise levels and potential impacts to noise sensitive receptors; and outlines avoidance, minimization, and mitigation measures to reduce potential significant noise impacts to noise sensitive receptors.

The County's Noise Ordinance limits the operation of construction equipment to Monday through Saturday from 7:00 a.m. to 7:00 p.m., and prohibits construction on Sundays and holidays. The County's Noise Ordinance also limits construction noise levels as not to exceed an average sound level of 75 A-weighted decibels (dBA) for an 8-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located, or on any occupied property where the noise is being received (County 2008). As construction activity is not normally allowed at night, the Noise Ordinance has no nighttime construction noise level limit. The general nighttime noise limit of 45 dBA hourly average contained in the Noise Ordinance is utilized in this report as a significance threshold.

The nearest noise-sensitive receptors in proximity to the project are single-family residences located north of Lake Wohlford Road and northeast of the proposed construction staging area. Another small group of residences that may receive project-related construction noise is located off Oakvale Road on the southern side of the reservoir. Daytime ambient noise levels of approximately 38.9 dBA $L_{eq}$ were measured at the nearest residence across Lake Wohlford Road from the marina, and approximately 57.5 dBA $L_{eq}$ at the nearest residence across Lake Wohlford to the west from the marina.

During the development of the staging area and access road, replacement dam excavation, and demolition of the existing dam, the construction activities would occur within the allowable hours of the County's Noise Ordinance. Daytime construction noise levels during these phases of the project would attenuate with distance at the nearest residences below the County's

construction noise level limit, and would result in a less-than-significant impact. However, during the 5 months of dam construction, noise would be continuous.

The roller compacted concrete (RCC) method requires a continuous application concrete for structural integrity. Therefore, dam construction would occur 24 hours per day, 7 days per week for an approximate 5-month period including the operation of a proposed temporary concrete batch plant and conveyor belt system along the access road to transport concrete to the dam construction zone. Dam construction activities would occur on Sundays, and outside the time of day allowed in the County's Noise Ordinance (i.e., evening and night construction). The noise resulting from combined sources during dam construction would not exceed daytime construction noise limits. Construction noise would be discernable, however, on Sundays during the 5-month period. This would be a significant impact. In addition, combined noise levels during nighttime hours would exceed the 45 dBA $L_{eq}$ threshold at nearby residential properties. This would be a significant impact.

Mitigation measures have been identified to reduce noise levels generated during project construction and create a system for identification and resolution of noise complaints, as listed in Section 8 of this report. Construction of temporary noise walls to reduce construction noise received from 24-hour operation of the batch plant was considered and deemed to be an infeasible and ineffective mitigation measure for this project. In order for noise walls to be effective, they must break the line of sight between noise source and receptor, which typically results in a reduction of construction noise levels at the source by approximately 5 to 10 dBA. A representative sample of profiles in the vicinity of the project show nearby residences sitting from 35 to 140 feet higher than the batch plant elevation; therefore, the line of sight from nearby residences to the north would potentially look over the top of a typical temporary noise wall placed adjacent to the plant at ground level. Many of the plant operation's noise sources would be higher than ground level; therefore, the barrier would need to be substantially higher than ground-level or mounted to pieces of the plant to block line of sight and achieve the needed noise reduction at neighboring residences. It is not feasible to safely build a noise wall that would be high enough to block line of sight to the residences, and mounting barriers to the plant would be infeasible and unsafe for workers. Therefore, construction of temporary construction noise barriers is not a viable mitigation measure for this project. With the implementation of other noise mitigation measures listed in Section 8, the nighttime construction activities at the concrete batch plant would still exceed the County's noise level limit for residential properties at nearby residences at night. Therefore, the project would contribute to a significant and unavoidable impact with respect to nighttime construction noise.

The proposed construction activities would not be located in proximity to structures or humans such that they would result in vibration impacts. This would be a less-than-significant impact.

Construction traffic noise would be generated on local roadways by workers commuting to and from the job site and by construction material deliveries and debris hauling by trucks; however, the project-related increase of traffic volumes compared to existing roadway volumes would result in a less-than-perceptible increase in noise levels along roadways and would be considered a less-than-significant impact.

Once construction is complete, the proposed project would not involve a change to current operational activities. Following completion of the proposed project, regular maintenance and inspection activities would not increase beyond existing conditions. Therefore, the project would not result in a permanent change in noise conditions.

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# 1.0 INTRODUCTION

The City of Escondido (City) proposes the Lake Wohlford Dam Replacement Project (proposed project) east of the City. The proposed project would construct a replacement dam downstream (west) of and adjacent to the existing dam, which would be partially or completely deconstructed. The proposed project is required based on a 2007 seismic analysis of the dam, in compliance with a directive from the Federal Energy Regulatory Commission, which identified a stability concern. In the event of a major earthquake, structural failure of the dam could occur, which in turn, could cause flood inundation downstream in Escondido Creek (GEI Consultants, Inc. 2007). The City was required to reduce the reservoir's water surface level and capacity to limit the risk of a potential failure of the dam. After completion of the project, the reservoir would be restored to its previous surface water level height and regain the lost water storage capability and capacity.

Lake Wohlford is located in the rural foothills of unincorporated San Diego County, approximately 0.5 mile east of the City's incorporated boundaries and 5 miles northeast of the City's downtown center (Figure 1). Regional access to the project site is from Interstate 15 approximately 7 miles to the west, and Valley Center Road approximately 2 miles to the west. Lake Wohlford is within San Diego County's unincorporated Valley Center Community Planning Area, on land owned by the City.

The proposed project site is adjacent to the northwest portion of Lake Wohlford. Figure 2 shows the project area boundary and surrounding area. The anticipated primary staging area for project construction would be located at the Lake Wohlford Marina along Lake Wohlford Road and a temporary concrete batch plant adjacent to and west of the marina. An access road would be constructed to connect the staging area to the dam construction zone. Local access to the project site is provided by Lake Wohlford Road along the northern side of the lake with Oakvale Road providing access to the southwestern side of the lake and the dam. Figure 3 shows the locations of the project construction activities and local access.

The land uses to the proposed staging area of the project site include single-family residential housing along Lake Wohlford Road and a small commercial area and restaurant near the Lake's recreational center and boat landing, and single-family residential housing along Oakvale Road until the road dead ends. Land uses adjacent to the proposed dam site are undeveloped open space and the existing dam and its facilities.


**Figure 1**
**Regional Map**


Source: GoogleEarth 2015

No Scale

**Figure 2**
**Project Vicinity Map**


Source: SanGIS 2012; Black & Veatch 2014; USGS 2013

1,000 500 0 1,000 Feet

Scale: 12,000; 1 inch = 1,000 feet

**Figure 3**
**Project Overview**

The majority of the land surrounding the lake, including the project site, is owned by the City but is located outside the City's jurisdictional boundaries, in unincorporated San Diego County. The City is the project proponent and the lead agency for environmental review under CEQA. However, because the project site is located outside the City's municipal boundaries, the City has elected to apply the County's noise regulations for analysis of project-related impacts pursuant to CEQA.

This noise technical report summarizes the ambient noise environment of the project site; analyzes impacts to noise-sensitive receptors resulting from the proposed project; and identifies avoidance, minimization, and mitigation measures to reduce potential significant noise impacts to noise-sensitive receptors.

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# 2.0 PROJECT DESCRIPTION

## 2.1 PROJECT BACKGROUND

Lake Wohlford is a man-made reservoir owned and operated by the City. Lake Wohlford Dam was originally constructed as a rock-fill structure in 1895 to create a reservoir for the City's municipal water supply. In 1924, the dam was enlarged and raised to expand the reservoir's capacity by placing hydraulic fill upstream and on top of the original rock-fill dam. A 2007 seismic analysis of the dam identified a stability concern for the raised portion of the dam in the event of a major earthquake. As a result, the City reduced the reservoir's water level to limit the risk of a potential failure. The water level reduction decreased the reservoir's capacity to approximately 40 percent of its prior size. To improve the dam's seismic safety and regain the lost water storage capability, the City is planning to construct a replacement dam and partially or completely deconstruct the existing dam. The project is intended to return the reservoir to its previous height and regain lost water storage capacity, but the project would not increase capacity beyond its historic level, so no changes to the historic high water level are proposed.

## 2.2 PROJECT DESCRIPTION

The proposed project entails constructing a replacement dam immediately downstream (west) of the existing dam and deconstructing the existing dam by removing the hydraulic fill material that is at a higher elevation than the original rock fill. The replacement dam would feature an outlet tower integrated into the dam's upstream face; the top of the existing outlet tower would be demolished, and the bottom of the existing outlet tower and the outlet pipe would be abandoned in place.

The replacement dam is proposed to be constructed immediately downstream of the existing dam, with the replacement dam's crest approximately 200 feet west of the existing dam's crest. Material would be excavated from the downstream canyon floor and rocky slopes to create a solid foundation and suitable surfaces to place the abutments. Excavation may require blasting of rock encountered, which includes hydraulic drilling into the rock for explosive charges to fracture the rock. Fractured rock would be further broken for transport or reuse on-site.

The replacement dam is planned to be constructed of roller compacted concrete (RCC), which uses the materials of conventionally placed concrete (cement, coarse aggregate, sand, and water) but minimizes water content to allow material handling with conventional soil-placing methods using conveyors, dump trucks, dozers, and roller compactors. RCC is placed using conveyors,

dump trucks, dozers, and roller compactors in thin layers approximately 12 inches thick starting from the base of the dam. Material for the RCC mix would be created in a batch mixer set up in the western side of the staging area. RCC construction would require continuous (24-hours per day, 7 days per week) for a period of approximately 5 months.

The new dam crest would rise approximately 125 feet above the foundation grade, to an elevation of 1,490 feet above mean sea level (AMSL). A spillway would be constructed in the center of the dam, which would empty into a settling basin constructed of cast-in-place concrete at the foot of the dam, which would hold water before its release into the downstream channel. The dam crest would feature a maintenance access path for pedestrians and vehicles, and a pedestrian access bridge would be constructed over the spillway. A new outlet tower would be constructed on the upstream side of the dam, anchored to the dam's face, and the old outlet tower would be demolished above 1,442 feet AMSL, and filled and abandoned in place below 1,442 feet AMSL.

The replacement dam would be constructed so that the resultant reservoir level and storage capacity are equal to the elevation and capacity prior to the water level restriction, at 1,480 feet AMSL and 6,500 acre-feet, respectively. The project proposes no changes to Lake Wohlford's historic high water level or storage capacity.

The primary staging area for project construction is planned at the Lake Wohlford Marina and the adjacent lakeshore area to the west. Dam construction activity would occur in the canyon downstream of the dam, approximately 0.5 mile from the staging area. To enable construction traffic access to the dam construction area, an access road would be constructed from the proposed staging area to the dam area, which would require some excavation into the hillside to create a more level road surface for the heavy haul truck traffic anticipated.

## 2.3 PROJECT SCHEDULE

Project construction, including the realignment of Oakvale Road, is anticipated to require approximately 16 months. Excavation of the dam foundation and truck hauling are anticipated require approximately 2 to 3 months. Establishment of the access road between the staging area and dam is anticipated to require approximately 1 to 2 months. The dam raise construction is then anticipated to require approximately 5 months, including truck hauling of RCC components (aggregate, fly ash, and cement). The proposed RRC construction method requires continuous dam construction (i.e., 24 hours per day, 7 days per week). Excavation of the existing dam, including truck trips, would require approximately 2 to 3 months. Removal of the existing dam, including truck trips, would require approximately 1 to 2 months.

# 3.0 NOISE AND VIBRATION TERMINOLOGY

## 3.1 NOISE DESCRIPTORS

Noise is generally defined as unwanted or objectionable sound. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance and, in the extreme, hearing impairment. The unit of measurement used to describe a noise level is the decibel (dB); decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3-dB decrease.

### Human Perception of Noise

The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, a method called "A-weighting" is used to filter noise frequencies that are not audible to the human ear. The A-scale approximates the frequency response of the average young ear when listening to most ordinary everyday sounds. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. In this noise technical report, all noise levels are A-weighted and "dBA" is understood to identify the A-weighted dB. Table 1 Typical Noise Levels provides typical noise levels associated with common activities.

Human perception of noise has no simple correlation with acoustical energy. The perception of noise is not linear in terms of dBA or in terms of acoustical energy. Two noise sources do not sound twice as loud as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA (increase or decrease); that a change of 5 dBA is readily perceptible; and that an increase (or decrease) of 10 dBA sounds twice (or half) as loud (Caltrans 2009).

### Averaging Noise Levels

In addition to noise levels at any given moment, the duration and averaging of noise over time is also important for the assessment of potential noise disturbance. Noise levels varying over time are averaged over a period of time, usually hour(s), expressed as dBA $L_{eq}$. For example, $L_{eq(3)}$ would be a 3-hour average noise level. When no period is specified, a 1-hour average is assumed ($L_{eq(1)}$ or $L_{eq}$).

**Table 1**
**Typical Noise Levels**

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

Source: Caltrans 2009
Notes: m=meters ft=feet km/hr = kilometers per hour mph = miles per hour

The time of day of noise is also an important factor to consider when assessing potential community noise impacts, as noise levels that may be acceptable during the daytime hours may create disturbance during evening or nighttime hours, when people are typically at home and sleeping. The Community Noise Equivalent Level (CNEL) is a descriptor used to characterize average noise levels over a 24-hour period, calculated from hourly $L_{eq}$ values, with 5 dBA added to the hourly $L_{eq}$ levels occurring between 7:00 p.m. and 10:00 p.m. and 10 dBA added to the hourly $L_{eq}$ levels occurring between 10:00 p.m. and 7:00 a.m., to reflect the greater disturbance potential from evening and nighttime noise, respectively. The day/night average sound level ($L_{dn}$) is the same as the CNEL, except the evening period is included in the daytime period.

## Noise Attenuation

From the source to the receiver, noise changes both in level and frequency spectrum. The most obvious change is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on the following important factors: ground absorption, atmospheric effects and refraction, shielding by natural and man-made features, noise

barriers, diffraction, and reflection. For a point or stationary noise source, such as construction equipment, the attenuation or drop-off in noise level would be at least -6 dBA for each doubling of unobstructed distance between source and the receiver and could attenuate to -7.5 dBA depending on the acoustic characteristics of the intervening ground. For a linear noise source, such as vehicles traveling on a roadway, the attenuation or drop-off in noise level would be approximately -3 dBA for each doubling of unobstructed distance between source and the receiver and could attenuate to -4.5 dBA depending on the acoustic characteristics of the intervening ground.

A large object in the path between a noise source and a receiver can significantly attenuate noise levels at that receiver. The amount of attenuation provided by this "shielding" depends on the size of the object and the frequencies of the noise levels. Natural terrain features, such as hills and dense woods, as well as man-made features, such as buildings and walls, can significantly alter noise levels. Walls or berms are often specifically used to reduce, or attenuate, noise.

**Noise-Sensitive Receptors**

Some land uses are considered more sensitive to noise than others due to the types of persons or activities involved, such as sleeping, reading, talking, or convalescing. Noise-sensitive receptors are generally considered humans engaged in activities, or occupying land uses, that may be subject to the stress of significant interference from noise including, but not limited to, talking, reading, and sleeping. Typically, land uses associated with noise-sensitive human receptors include residential dwellings, hotels/motels, hospitals, nursing homes, educational facilities, and libraries. The County's General Plan Noise Element defines noise-sensitive land uses as including residential uses, public and private educational facilities, hospitals, convalescent homes, hotels/motels, daycare facilities, and passive recreational parks (County 2011).

In addition to human receptors, special-status wildlife species have been afforded protection or special recognition by federal, state, or local resource agencies or organizations. Special-status species typically have relatively limited distribution and may require specialized habitat conditions. Bird species protected under the Migratory Bird Treaty Act (MBTA) may be considered noise-sensitive receptors during their breeding season. Temporary, indirect impacts are likely to arise from construction-generated noise resulting in destruction and/or avoidance of habitat by wildlife.

**Construction Noise**

Construction noise varies depending on construction activities and duration, type of equipment involved, proximity to sensitive receptors, and the duration of the construction activities. Construction equipment used on the site may be mobile (e.g., loaders, graders, dozers) or stationary (e.g., air compressor, generator, concrete saw). Heavy construction equipment typically operates for short periods at full power followed by extended periods of operation at lower power, idling, or powered-off conditions. Typically, construction, demolition, grading, compacting, and excavating, include the use of backhoes, bulldozers, loaders, excavation equipment (e.g., graders and scrapers), and compaction equipment. If rock is encountered during excavation, rock blasting (including rock drilling) may be required for rock removal. Finishing activities may include the use of pneumatic hand tools, scrapers, concrete trucks, vibrators, and haul trucks. Typical noise levels associated with typical construction equipment operation range from approximately 70 to 95 dBA, depending upon the piece of equipment operating (FTA 2006). Impact equipment such as rock drills, pavement breakers, and pile drivers generate higher noise levels of approximately 85 to 100 dBA (FTA 2006).

## 3.2 VIBRATION

In addition to noise, construction activities generate vibration, which can be interpreted as energy transmitted in waves through the soil mass. These energy waves generally dissipate with distance from the vibration source, due to spreading of the energy and frictional losses. The energy transmitted through the ground as vibration, if great enough and in proximity to structures, can result in structural damage.

Typical outdoor sources of perceptible groundborne vibration are construction equipment and traffic on rough (i.e., unpaved or uneven) roads. Construction activity can also result in varying degrees of groundborne vibration, depending on the type of equipment, methods employed, distance between source and receptor, duration, number of perceived vibration events, and local geology.

Groundborne vibrations from typical construction activities do not often reach levels that can damage structures in proximity to construction, but their effects may manifest and be noticeable in buildings that are within 25 feet of construction activities. One major concern with regard to construction vibration is potential building damage, which is assessed in terms of peak particle velocity (ppv), typically in units of inches per second (in/sec). In addition to structural damage, the vibration of room surfaces affects people as human annoyance. Human and structural

response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Typically, a vibration level of 0.1 in/sec ppv is the threshold of human annoyance, and 0.2 ppv is the threshold of risk of structural damage.

Construction operations generally include a wide range of activities that can generate various levels of groundborne vibration. In general, blasting and demolition of structures generate the highest vibrations. Heavy truck transport can also generate groundborne vibrations, which vary depending on vehicle type, weight, and pavement conditions. At 25 feet, some construction equipment generates vibration at levels exceeding the threshold of human annoyance (0.1 in/sec ppv), and at levels exceeding the threshold of risk of structural damage (0.2 in/sec ppv). However, at 50 feet, this same equipment is below the thresholds of human annoyance and structural damage (FTA 2006).

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# 4.0 REGULATORY FRAMEWORK

This section provides a summary of the applicable federal, state, and local noise regulations.

## 4.1 FEDERAL REGULATIONS

The federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise-sensitive" uses are prohibited from being sited adjacent to a highway or, alternately, that the developments are planned and constructed in such a manner that potential noise impacts are minimized. Federal noise policies and programs are developed by federal agencies of the U.S. Department of Transportation through its various operating agencies, i.e., the Federal Aviation Administration, the Federal Transit Administration (FTA), and the Federal Highway Administration.

## 4.2 STATE REGULATIONS

### California Administrative Code, Title 24, Interior Noise

Title 24 of the California Administrative Code requires that residential structures, other than detached single-family dwellings, be designed to prevent the intrusion of exterior noise so that the interior CNEL with windows closed and attributable to exterior sources does not exceed 45 dBA CNEL in any habitable room. This requirement is applicable to new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings. This standard is implemented by the California State Building Code Section 1208A.8.2 by stating that "interior noise levels attributable to exterior sources shall not exceed 45 dBA CNEL in any habitable room."

### California Government Code, General Plan Noise Elements

California does not promulgate statewide standards for environmental noise, but the California State Government Code Section 65302 (f) requires each local jurisdiction to draft a Noise Element for their General Plan to establish acceptable noise limits for various land uses.

### California Environmental Quality Act

The California Environmental Quality Act of 1970 (CEQA), Public Resources Code 21100 et seq., requires lead agencies to evaluate the environmental impact associated with a proposed

project. CEQA requires that a local agency prepare an environmental impact report (EIR) on any project it proposes to approve that may have a significant effect on the environment. Technical reports such as this noise technical report are used to develop noise sections of EIRs. Appendix G of CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387) provides thresholds of significance for noise.

### California Department of Transportation

The California Department of Transportation (Caltrans) provides vibration level thresholds for architectural and structural damage and human perception thresholds. The proposed Plan is not subject to Caltrans requirements; however, Caltrans provides vibration thresholds for reference. To assess the potential for structural damage associated with vibration from construction activities, the vibratory ground motion in the vicinity of an affected structure is measured in terms of ppv, typically in units of in/sec. Table 2 presents the vibration level thresholds for architectural and structural damage and human perception and annoyance.

**Table 2**
**Human and Structural Response to Vibration**

| Effects on Structures and People | Peak Vibration Threshold (ppv) (in/sec) |
|---|---|
| Structural damage to commercial structures | 6 |
| Structural damage to residential buildings | 2 |
| Architectural damage | 1.0 |
| General threshold of human annoyance | 0.1 |
| General threshold of human perception | 0.01 |

Source: Caltrans 2004

As shown in Table 2, structural damage occurs to various structures when vibration levels reach 2 to 6 in/sec ppv at the respective structures. One-half of the minimum of this threshold range (i.e., 1 in/sec ppv), is considered a safe criterion that would protect against structural damage. For its construction projects Caltrans uses a vibration criterion of 0.2 in/sec ppv, except for pile driving and blasting activities.

## 4.3 LOCAL REGULATIONS

Applicable plans and ordinances with respect to noise are included in the Noise Element of the County's General Plan (County 2011), and the County's Municipal Code, Noise Ordinance (County 2008).

County of San Diego General Plan, Noise Element

The Noise Element of the County's General Plan provides for control and abatement of environmental noise to protect citizens from excessive exposure. The Noise Element establishes noise/land use compatibility standards and outlines goals and policies that can be used to achieve these standards. Noise exposure criteria are incorporated into land use planning to reduce future conflicts between noise and land use. This is achieved by specifying acceptable noise exposure ranges for various land uses throughout the County. The County uses the Noise Compatibility Guidelines listed in Table 3 (Noise Compatibility Guidelines) to determine the compatibility of land use when evaluating proposed development projects (County 2011).

County of San Diego Noise Ordinance

The County Noise Ordinance, Section 36.404, sets limits on the noise levels generated from one property to another, such as from mechanical equipment. Section 36.410 of the Noise Ordinance also regulates noise generated by construction activities.

*Section 36.404. Sound Level Limits*

Unless a variance has been applied for by an applicant and granted by the County, it is unlawful for a person to cause or allow noise generated on a particular property to exceed the 1-hour average sound level set forth in Section 36.404 and shown herein as Table 4, measured at the property line of the property on which the noise is produced or at any location on a property that is receiving the noise. The sound level limits vary with the zoning of the properties concerned, which are described in the County Zoning Ordinance.

As shown in Table 4, the sound level limits vary with time of day (day/night) and the zoning of the properties concerned.

*Section 36.408. Hours of Operation of Construction Equipment*

Except for emergency work, it shall be unlawful for any person to operate or cause to be operated, construction equipment:

(a) Between 7 p.m. and 7 a.m.

## Table 3
## Noise Compatibility Guidelines

| Noise Compatibility Guidelines | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Land Use Category | | Exterior Noise Level (CNEL) | | | | | | | |
| | | | 55 | 60 | 65 | 70 | 75 | 80 | |
| A | Residential—single family residences, mobile homes, senior housing, convalescent homes | | | | | | | | |
| B | Residential—multi-family residences, mixed-use (commercial/residential) | | | | | | | | |
| C | Transient lodging—motels, hotels, resorts | | | | | | | | |
| D* | Schools, churches, hospitals, nursing homes, child care facilities | | | | | | | | |
| E* | Passive recreational parks, nature preserves, contemplative spaces, cemeteries | | | | | | | | |
| F* | Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation | | | | | | | | |
| G* | Office\professional, government, medical\dental, commercial, retail, laboratories | | | | | | | | |
| H* | Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair | | | | | | | | |
| | ACCEPTABLE—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements. | | | | | | | | |
| | CONDITIONALLY ACCEPTABLE—New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table N-2, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate county decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist. | | | | | | | | |
| | UNACCEPTABLE—New construction or development shall not be undertaken. | | | | | | | | |

* Denotes facilities used for part of the day; therefore, an hourly standard would be used rather than CNEL (refer to Table N-2).

*Note: For projects located within an Airport Influence Area of an adopted Airport Land Use Compatibility Plan (ALUCP), additional Noise Compatibility Criteria restrictions may apply as specified in the ALUCP.*

Source: County 2011

## Table 4
## Sound Level Limits

| Zone | Applicable Hours | Sound Level Limit dB $L_{eq\ (1\ hour)}$ |
|---|---|---|
| RS, RD, RR, RMH, A70, A72, S80, S81, S87, S90, S92, RV, and RU. Use Regulations with a density of less than 11 dwelling units per acre. | 7 a.m. to 10 p.m.<br>10 p.m. to 7 a.m. | 50<br>45 |
| RRO, RC, RM, C30, S86, RV, RU and V5. Use Regulations with a density of 11 or more dwelling units per acre. | 7 a.m. to 10 p.m.<br>10 p.m. to 7 a.m. | 55<br>50 |
| S94, V4, and all other commercial zones. | 7 a.m. to 10 p.m.<br>10 p.m. to 7 a.m. | 60<br>55 |
| V1, V2<br><br><br>V1<br><br>V2 | 7 a.m. to 7 p.m.<br>7 p.m. to 10 p.m.<br><br>10 p.m. to 7 a.m.<br><br>10 p.m. to 7 a.m. | 60<br>55<br><br>55<br><br>50 |
| V3 | 7 a.m. to 10 p.m.<br>10 p.m. to 7 a.m. | 70<br>65 |
| M50, M52, M54 | Anytime | 70 |
| S82, M56, and M58 | Anytime | 75 |
| S88 (see subsection (c) below) | | |

Source: County 2008.

Agricultural (A), Commercial (C), Industrial (M), Residential: (RS) Single Family, (RD) Duplex/Two Family, (RM) Multi Family, (RV) Variable Family, (RU) Urban, (RMH) Mobile home, (RR) Rural, (RRO) Recreation Oriented Residential, (RC) Residential/Commercial; Special Purpose (S).

Notes:

a) Except as provided in section 36.409 of this chapter, it shall be unlawful for any person to cause or allow the creation of any noise, which exceeds the one-hour average sound level limits in Table 4, when the one-hour average sound level is measured at the property line of the property on which the noise is produced or at any location on a property that is receiving the noise

(b) Where a noise study has been conducted and the noise mitigation measures recommended by that study have been made conditions of approval of a Major Use Permit, which authorizes the noise-generating use or activity and the decision making body approving the Major Use Permit determined that those mitigation measures reduce potential noise impacts to a level below significance, implementation and compliance with those noise mitigation measures shall constitute compliance with subsection (a) above.

(c) S88 zones are Specific Planning Areas which allow for different uses. The sound level limits in Table 4 above that apply in an S88 zone depend on the use being made of the property. The limits in Table 4, subsection (1) apply to property with a residential, agricultural or civic use. The limits in subsection (3) apply to property with a commercial use. The limits in subsection (5) apply to property with an industrial use that would only be allowed in an M50, M52 or M54 zone. The limits in subsection (6) apply to all property with an extractive use or a use that would only be allowed in an M56 or M58 zone.

(d) If the measured ambient noise level exceeds the applicable limit in Table 4, the allowable one-hour average sound level shall be the one-hour average ambient noise level, plus three decibels. The ambient noise level shall be measured when the alleged noise violation source is not operating.

(e) The sound level limit at a location on a boundary between two zones is the arithmetic mean of the respective limits for the two zones. The one-hour average sound level limit applicable to extractive industries, however, including but not limited to borrow pits and mines, shall be 75 decibels at the property line regardless of the zone in which the extractive industry is located.

(f) Fixed-location public utility distribution or transmission facilities located on or adjacent to a property line are subject to the noise level limits in this table, as measured at or beyond 6 feet from the boundary of the easement upon which the equipment is located.

(b) On a Sunday or a holiday. For purposes of this section, a holiday means January 1st, the last Monday in May, July 4th, the first Monday in September, December 25th and any day appointed by the President as a special national holiday or the Governor of the State as a special State holiday. A person may, however, operate construction equipment on a Sunday or holiday between the hours of 10 a.m. and 5 p.m. at the person's residence or for the purpose of constructing a residence for himself or herself, provided that the operation of construction equipment is not carried out for financial consideration or other consideration of any kind and does not violate the limitations in sections 36.409 and 36.410.

*Section 36.409. Sound Level Limitations on Construction Equipment*

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 decibels for an eight-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

*Section 36.410. Sound Level Limitations on Impulsive Noise*

In addition to the general limitations on sound levels in section 36.404 and the limitations on construction equipment in section 36.409, the following additional sound level limitations shall apply:

(a) Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 4, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period. The maximum sound level depends on the use being made of the occupied property.

# 5.0 EXISTING CONDITIONS

## 5.1 EXISTING LAND USES

The project site is located in unincorporated San Diego County, northeast of the jurisdictional limits of the City. The majority of the land surrounding the lake is owned by the City, but the land is not within the City's jurisdictional boundaries. Figure 2 shows the project area boundary and surrounding features for the dam replacement location.

The proposed project would perform construction activities on approximately 50 acres including the proposed dam site and construction staging area, both of which are currently undeveloped. The staging area is relatively flat with a gentle downward grade toward Lake Wohlford, and steeper sloping toward downstream at the proposed dam site. Elevation ranges from approximately 1,490 feet AMSL at the staging area to approximately 1,365 feet AMSL at the foundation of the proposed dam site. The area surrounding the staging area is relatively flat, sloping towards the lake with no topographic features that could serve as a noise barrier. Existing housing is within line of sight of the staging area across Lake Wohlford Road, and across the lake along Oakvale Road. The proposed dam site is located downstream and west of the existing dam; there are no existing noise-sensitive receptors (i.e., housing) within line of sight of the base of the proposed dam.

Land uses surrounding the staging area include noise-sensitive receptors (i.e., single-family residences) located along the northern side of Lake Wohlford Road, and the road and lake itself. Additional noise-sensitive receptors (i.e., single-family residences) are located across the lake to the south along the lake and along Oakvale Road.

## 5.2 NOISE-SENSITIVE RECEPTORS

The County's General Plan, Noise Element, defines noise-sensitive land uses as including areas where an excessive amount of noise would interfere with normal activities. Primary noise-sensitive land uses include residential uses, public and private educational facilities, hospitals, convalescent homes, hotels/motels, daycare facilities, and passive recreational parks (County 2008).

The nearest noise-sensitive receptors in proximity to the project site are single-family residences north of Lake Wohlford Road, which are as near as approximately 300 feet north of the entrance

to the staging area. The residences adjacent to the road would potentially have an obstructed view of the staging area and batch plant; farther to the northeast, the land slopes upward from Lake Wohlford Road. As a result, there are residences upslope approximately 0.25 mile to the northeast at a higher elevation that would have a direct line of sight of the staging area and batch plant. Another small group of single-family residences are located approximately 0.5 mile south of the staging area located on the southern side of the reservoir at the terminus of Oakvale Road. These residences are would have a direct line of sight of the staging area, concrete batch plant, and proposed access road.

## 5.3 EXISTING NOISE ENVIRONMENT

### Noise Sources

The primary existing noise source in the project area is vehicle traffic on roadways adjacent to the project area and residential areas including Lake Wohlford Road and Oakvale Road, which are both two-lane rural roadways. Lake Wohlford Road provides regional east-west access from the project area to the City and I-5 via Valley Center Road, and locally, to the project construction staging area and adjacent residences. Lake Wohlford Road is a two-lane collector winding through generally steep and mountainous terrain that becomes more level and less winding along the northern perimeter of Lake Wohlford and its marina and residential area, with a posted speed limit of 50 miles per hour (mph) and vehicle traffic of 29,700 average daily trips (ADT) (LL&G 2014). Oakvale Road is a two-lane collector winding through generally steep terrain to access the dam and residential area at its terminus, with a posted speed limit of 35 mph and vehicle traffic of 4,680 ADT (LL&G 2014).

The secondary existing noise source in the project area is aircraft flyovers. Several airports are in proximity to the project site including Ramona Airport (10 miles to the southeast), Pauma Valley Airport (10 miles to the north), Carlsbad Airport (16 miles to the west), and Fallbrook Airport (18 miles to the northwest). Other noise sources in the project area include heating, ventilation, and air conditioning equipment in the adjacent residential and commercial area; truck deliveries; and human and animal vocalizations.

### Ambient Noise Measurements and Observations

To determine the existing noise environment, ambient noise measurements and observations were performed at the nearest noise-sensitive receptors (i.e., residences) to the project construction and staging areas. On Monday, December 12, 2014, two long-term (LT) (24-hour) measurements and two associated short-term (ST) (15-minute) daytime noise measurements were taken by an AECOM noise specialist in proximity to the nearest noise-sensitive receptors

(i.e., residences) to the two major project site construction areas: the construction staging area off Lake Wohlford Road, and the dam demolition and construction area off Oakvale Road. Noise measurement locations are shown in Figure 4.

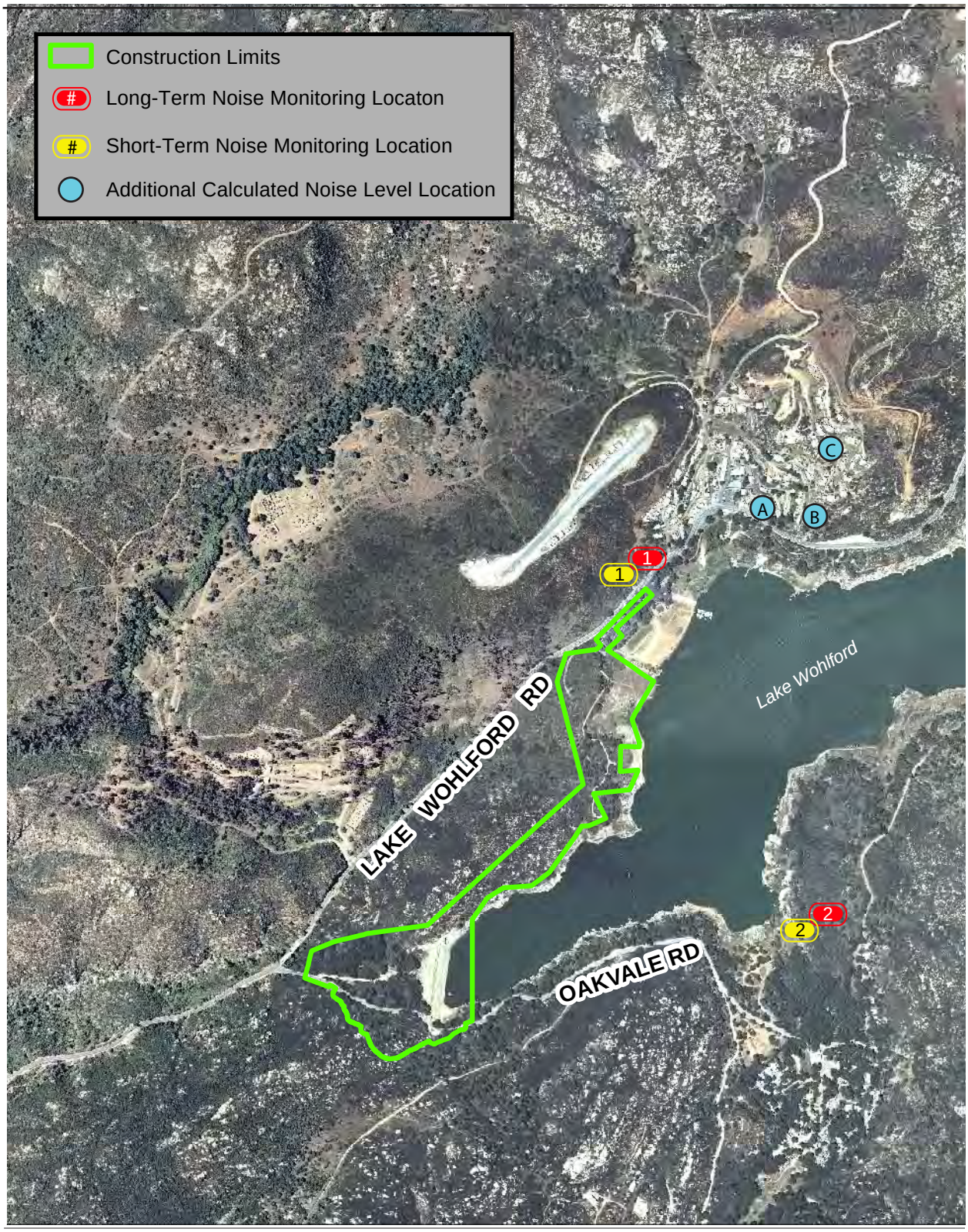
Noise measurements were taken by an AECOM noise specialist using sound level meters (SLMs) Model 824 SLM and Model 820 SLM. manufactured by Larson-Davis, Inc. (LD). The SLMs were programmed in "slow" response mode, to record noise levels in A-weighted mode. All noise measurements were taken approximately 5 feet above ground level using stationary tripods. SLMs were calibrated before and after each measurement using an LD Model CAL 200 calibrator. During the ST daytime measurements, the weather was clear and dry, with winds slightly breezy (2 to 2.5 mph), and temperatures ranging between 57 to 65 degrees Fahrenheit. There was no rainfall during the ST and LT measurements. The ambient noise measurement data are detailed in Table 5.

**Table 5**
**Ambient Noise Measurement Data**

| Site ID* | Location | Start Time | CNEL (dBA) | $L_{eq}$ (dBA) | $L_{max}$ (dBA) | $L_{min}$ (dBA) | Noise Sources |
|---|---|---|---|---|---|---|---|
| LT-1 | North of Lake Wohlford Road across from Marina | 12:10 | 41.7 | 44.3 | 70.4 | 32.6 | Adjacent traffic on Lake Wohlford Road, aircraft flyovers, bird vocalizations |
| ST-1 | North of Lake Wohlford Road across from Marina | 1:25 | - | 38.9 | 58.5 | 26.3 | Adjacent traffic on Lake Wohlford Road, aircraft flyovers, bird vocalizations |
| LT-2 | Lake Landing Area off Oakvale Road near foot bridge | 12:27 | 57.2 | 61.3 | 82.8 | 64.7 | Distant traffic on Lake Wohlford Road, aircraft flyovers, bird vocalizations |
| ST-2 | Lake Landing Area off Oakvale Road near foot bridge | 12:43 | - | 57.5 | 68.8 | 34.7 | Distant traffic on Lake Wohlford Road, aircraft flyovers, animal vocalizations |

* The Site ID corresponds to locations shown in Figure 4.
Short-term (ST) Measurements were taken on December 12, 2014, continuously over a 15-minute period; long-term (LT) measurements were taken on December 12-13, 2014, continuously over a 24-hour period.

As shown in Table 5, LT noise levels ranged from 41.7 to 57.2 dBA CNEL at LT-1 and LT-2, respectively, at the nearest residences; and daytime ST noise levels, taken concurrent with the LT measurements, ranged from 38.9 to 57.5 $L_{eq}$ at ST-1 and ST-2, respectively.




Source: SanGIS 2012; Black & Veatch 2014; USGS 2013

1,000 500 0 1,000 Feet

Scale: 12,000; 1 inch = 1,000 feet

**Figure 4**
**Noise Measurement Locations**

# 6.0 SIGNIFICANCE CRITERIA

For the purpose of this analysis, the following applicable noise thresholds of significance were used to determine whether implementing the project would result in a significant noise impact. Based on Appendix G of the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387),the proposed project cause a significant impact if it would result in any of the following:

1. expose persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

2. expose persons to, or generation of, excessive groundborne vibration or groundborne noise levels;

3. cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

4. cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Significant noise impacts would occur if the project exposed persons to, or generated noise levels in excess of, standards established in the local general plan or noise ordinance or applicable standards of other agencies; or exposed persons to, or generated excessive ground-borne vibration or ground-borne noise levels. The County's Noise Ordinance establishes allowable construction hours and noise-level limits, and sound-level limits for day and night at residential property lines.

**County of San Diego Guidelines for Determining Significance, Noise**

Guidelines for the determination of significance of environmental noise impacts for this report were promulgated by the County in January 2009 in the County's Noise Guidelines (County 2009). The County General Plan (including Noise Element) was updated and adopted by the County Board of Supervisors on August 3, 2011. However, as the County's Noise Guidelines have not been updated to reflect the new General Plan, and as the County has not provided additional guidance at this time, this analysis uses the County's adopted Noise Guidelines for determining significance under CEQA.

According to the County's Noise Guidelines applicable to the project, a significant noise impact would occur if the Project:

- Generates airborne noise (from all noise sources) that would exceed the following standards listed in the San Diego County Code of Regulatory Ordinances, Section 36.404, Sound Level Limits, at or beyond the property line:
    - 7 a.m. to 10 p.m. 50 dB
    - 10 p.m. to 7 a.m. 45 dB
- Generates construction noise at an average sound level greater than 75 dB for an 8-hour period between 7 a.m. and 7 p.m., when measured at the property line of the property where the noise source is located or on any occupied property where the noise is being received.
- Produces an impulsive noise that exceeds the maximum sound level of 82 decibels measured at the property line of occupied property of a residential, village zoning, or civic use; or 85 decibels at occupied property of an agricultural, commercial, or industrial use. For a public road project, the maximum sound level is 85 decibels measured at the property line of occupied property of a residential, village zoning, or civic use; or 90 decibels at occupied property of an agricultural, commercial, or industrial use.
- Produces an impulsive noise that exceeds Caltrans recommended vibration thresholds of 0.2 peak particle velocity (PPV) (Caltrans 2002).

# 7.0 IMPACT ANALYSIS

This section addresses project-related noise and vibration impacts that would occur during project construction and operation.

## 7.1 CONSTRUCTION

### Methodology

Noise impacts from construction are dependent on the noise generated by the construction equipment and the location and sensitivity of affected land uses, as well as the timing and duration of the activities. Noise levels adjacent to the active construction sites would increase during construction. Construction equipment can be stationary and mobile. Stationary equipment operates at one location for various periods of time with fixed-power operation, such as pumps, generators, and compressors, or a variable noise operation, such as pile drivers, rock drills, and pavement breakers. On this project, the primary stationary noise sources audible to nearby receptors would be the batch mixer and conveyor system, which would be a variable noise operation located on the western side of the staging yard. Mobile equipment moves around the construction site such as bulldozers, graders, and loaders (FTA 2006). On this project, the primary mobile sources would be heavy trucks, graders, and loaders. For purposes of noise impact analysis, all construction equipment is assumed to be powered by diesel engines. Typical noise maximum noise levels and duty cycles generated by various pieces of construction equipment are listed in Table 6.

As shown in Table 6, maximum noise levels range from 70 to 95 dBA $L_{max}$ at 50 feet. In typical construction projects, grading and impact activities typically generate the highest noise levels. Grading involves the largest heaviest equipment and typically includes bulldozers, excavators, dump trucks, front-end loaders, and graders. Impact equipment includes pile drivers, rock drills, pavement breakers, and industrial/concrete saws.

Each phase of construction has a specific equipment mix, depending on the work to be accomplished during that phase. Each phase also has its own noise characteristics; some phases will have higher continuous noise levels than others, and some have high-impact noise levels. The $L_{eq}$ of each phase is determined by combining the $L_{eq}$ contributions from each piece of equipment used in that phase (FTA 2006). Typical construction projects, with equipment moving from one point to another, work breaks, and idle time, have hourly average noise levels that are

**Table 6**
**Construction Equipment Noise Levels**

| Equipment | Noise Level (dBA $L_{max}$) at 50 Feet | Typical Duty Cycle |
|---|---|---|
| Auger Drill Rig | 85 | 20% |
| Backhoe | 80 | 40% |
| Blasting | 94 | 1% |
| Chain Saw | 85 | 20% |
| Clam Shovel | 93 | 20% |
| Compactor (ground) | 80 | 20% |
| Compressor (air) | 80 | 40% |
| Concrete Batch Plant* | 83 | 15% |
| Concrete Mixer Truck | 85 | 40% |
| Concrete Pump | 82 | 20% |
| Concrete Saw | 90 | 20% |
| Crane (mobile or stationary) | 85 | 20% |
| Dozer | 85 | 40% |
| Dump Truck | 84 | 40% |
| Excavator | 85 | 40% |
| Front End Loader | 80 | 40% |
| Generator (25 KVA or less) | 70 | 50% |
| Generator (more than 25 KVA) | 82 | 50% |
| Grader | 85 | 40% |
| Hydra Break Ram | 90 | 10% |
| Impact Pile Driver (diesel or drop) | 95 | 20% |
| Insitu Soil Sampling Rig | 84 | 20% |
| Jackhammer | 85 | 20% |
| Mounted Impact Hammer (hoe ram) | 90 | 20% |
| Paver | 85 | 50% |
| Pneumatic Tools | 85 | 50% |
| Pumps | 77 | 50% |
| Rock Drill | 85 | 20% |
| Scraper | 85 | 40% |
| Tractor | 84 | 40% |
| Vacuum Excavator (vac-truck) | 85 | 40% |
| Vibratory Concrete Mixer | 80 | 20% |
| Vibratory Pile Driver | 95 | 20% |

Sources: Thalheimer 2000, FTA 2006, *FHWA 2006
KVA = kilovolt amps

lower than loud short-term, or instantaneous, peak noise events, as shown in Table 6. Typically, hourly average noise levels are approximately 75 to 80 dBA $L_{eq}$ at 50 feet from the construction activity. For purposes of this project, a maximum 1-hour average noise level of 80 dBA $L_{eq}$ at 50 feet from the center of the construction area is assumed to occur; noise levels of other activities would be less. However, maximum noise levels of 90 dBA $L_{max}$ at 50 feet may occur during

grading and excavation, when several pieces of equipment are operating in combination with backup alarms, near the construction site periphery.

Noise levels from construction activities are considered point sources and would drop off at a rate of 6 dBA per doubling of distance over acoustically hard sites, such as streets and parking lots. However, intervening structures and/or topography would result in lower noise levels at greater distances. These factors generally limit the distance construction noise travels and ensure noise impacts from construction are localized.

**Project Construction (Daytime Monday through Saturday)**

Project construction activities would occur Monday through Saturday during daytime hours (i.e., within the allowable hours of the County Noise Ordinance), except during RCC construction, which would occur continuously during the day and night at the concrete batch plant, conveyor system, and the dam construction area. Daytime project construction activities would occur at the construction staging area and adjacent concrete batch plant along the construction access road and conveyor system from the staging area to the dam, and at the proposed and existing dam. The County's Noise Ordinance limits noise levels generated by construction equipment at an average sound level greater than 75 dB for an 8-hour period between 7 a.m. and 7 p.m., when measured at the property line of the property where the noise source is located or on any occupied property where the noise is being received (County 2008).

Access Road

Construction noise would be generated during the construction and operation of the construction access road from the staging area to the dam construction area. This construction activity would only occur during Monday through Saturday daytime hours. Noise levels generated by construction of the access road would be primarily from the operation of heavy trucks and graders rated at approximately 84 and 85 dBA $L_{max}$ (Table 6) with an hourly average of approximately 75 dBA $L_{eq}$ at 50 feet, which would attenuate to approximately 49 dBA $L_{eq}$ at the point closest to the nearest residences approximately 1,000 feet immediately across Lake Wohlford Road. Therefore, these construction noise levels would be below the County's daytime construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line and would be a **less than significant impact.**

Project construction equipment and materials would be transported by heavy trucks on the access road. Construction vehicle traffic would be approximately 70 dBA $L_{eq}$ at 50 feet, which would attenuate as a line source at a rate of 3 dBA per doubling of distance to approximately 63 dBA

$L_{eq}$ at the point closest to the nearest residences approximately 300 feet immediately across Lake Wohlford Road. The residences at LT-2 (Figure 4) are approximately 2,000 feet from the proposed access road at its nearest point, and these noise levels would be below the County's construction noise level limit. Therefore, these construction and operational levels would be below the County's daytime construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line and would be a **less than significant impact.**

Staging Area

Project construction equipment and materials would be stored and staged at the proposed project construction staging area to be developed at the marina adjacent to Lake Wohlford Road and the residential area. This construction activity would only occur during daytime hours Monday through Saturday. Construction noise would be generated at the staging area from truck traffic, equipment maintenance, materials storage, and dam construction staging activities. Construction vehicle traffic would utilize Lake Wohlford Road for delivery of dam construction materials and workers from the staging area to the dam construction area.

Noise levels from the staging area operations during these periods are anticipated to be approximately 75 dBA $L_{eq}$ at 50 feet, based on the operation of portable generators, and materials handling from front end loaders and haul trucks, which would attenuate to approximately 52 dBA $L_{eq}$ at the nearest residence (ST-1) approximately 700 feet northeast of the center of the staging area, across Lake Wohlford Road to the north. Therefore, these levels would be below the County's daytime construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line and would be a **less than significant impact.** Noise levels would further attenuate to below ambient levels of 58 dBA $L_{eq}$ measured at the residences approximately 2,500 feet to the south across the lake (ST-2 in Figure 4). This is a **less than significant impact**.

Concrete Batch Plant

Construction noise would be generated from the assembly and operation of the temporary concrete batch plant within the staging area. During the 5-month period of dam construction, the batch plant would operate 24 hours per day. Noise levels generated from the assembly of the batch plant would be approximately 75 dBA at 50 feet, primarily from the operation of heavy trucks and equipment. Noise levels generated from the operation of the batch plant during RCC dam construction are rated at approximately 83 dBA $L_{max}$ at 50 feet, and materials handling by front end loaders and haul trucks rated at 80 dBA $L_{max}$ and 84 dBA $L_{max}$ at 50 feet, respectively,

which would result in an hourly average of approximately 80 dBA $L_{eq}$ at 50 feet, and would attenuate to approximately 55 dBA $L_{eq}$ at the nearest residence approximately 900 feet immediately across Lake Wohlford Road. Noise levels received at receptors that are located farther from the batch plant activity would be further attenuated by distance. Therefore, these levels would be below the County's construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line (ST-1 in Figure 4) and would be a **less than significant impact.**

Conveyor Belt

Construction noise would be generated by the installation and operation of the conveyor belt system along the constructed access road. Noise levels generated from the assembly of the conveyor belt system would be approximately 75 dBA $L_{eq}$ at 50 feet primarily from the operation of heavy trucks and equipment. Noise levels generated from the operation of the conveyor belt system during conveyance of RCC construction materials would generate steady and constant noise levels of approximately 80 dBA $L_{eq}$ at 50 feet, which would attenuate to approximately 54 dBA $L_{eq}$ at the nearest residence (ST-1) approximately 1,000 feet to the northeast. Therefore, these levels would be below the County's construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line and would be a **less than significant impact.** Noise levels would further attenuate to below ambient levels of 58 dBA $L_{eq}$ measured at the residences approximately 2,500 feet to the south across the lake (ST-2 in Figure 4).

Dam Excavation, Construction, and Demolition

On-site construction noise would be generated by construction equipment during dam excavation, construction, and demolition. Excavation for the proposed dam could require the use of rock drilling, small commercial explosives, and heavy equipment including hydraulic breakers (e.g., hoe-rams) to break up rock to be hauled off-site by heavy trucks. Noise generated by a blasting event is an instantaneous impulse sound. Much of the acoustic energy (noise) released by a blasting event is in the form of very low frequency sound that is inaudible to humans; the audible noise portion (lasting 1 to 2 seconds) is approximately 85 dBA at 800 feet, which would attenuate by distance alone to approximately 76 dBA at the nearest residences approximately 2,500 feet to the east (ST-2) and would be below the County threshold for impulsive noise of a maximum sound level of 82 dB measured at the property line of occupied property of a residential, village zoning, or civic use. The pressure change from the blast can rattle windows and startle people in proximity to the blast.

Drilling into the material would be necessary to create bore holes for the explosive materials. Rock drills generate airborne noise levels of approximately 80 to 98 dB at a distance of 50 feet. Drilling holes for a blasting event can last from several hours to several days depending upon the material type, area to be blasted, number and depth of the holes, and the effort required to drill through the material. No more than one to two blast events are anticipated to occur in any single day due to the time required to drill the holes as well as insert and connect the explosive materials. Assuming drilling and blasting activities are conducted continuously for 8 hours with two blasts to be conducted in a day, a worst-case 8-hour average drilling noise level would be approximately 98 dBA $L_{eq}$ at 50 feet, which would attenuate by distance alone to approximately 64 dBA $L_{eq}$ at the nearest residences approximately 2,500 feet to the east (ST-2). The intervening topography would further attenuate noise levels by up to approximately 10 dBA to 54 dBA $L_{eq}$. Therefore, these levels would be below the County's construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line (ST-2) and would be a **less than significant impact.** This would not be a substantial increase (10 dBA or greater) in the measured daytime ambient noise levels of approximately 58 dBA $L_{eq}$ at ST-2 and would be a **less than significant impact**. At ST-1, noise levels would further attenuate by distance alone to approximately 62 dBA $L_{eq}$ at approximately 3,100 feet, and further attenuate due to intervening topography to approximately 52 dBA $L_{eq.}$

Construction activities for dam excavation, construction, and demolition would generate noise levels from heavy equipment such as excavators, heavy trucks, and front end loaders, which would generate a maximum 1-hour average noise level of 80 dBA $L_{eq}$ at 50 feet from the center of the dam construction activity. This noise level would attenuate by distance to approximately 46 dBA $L_{eq}$ at the nearest residence approximately 2,500 feet to the east (ST-2 in Figure 4) and would further attenuate due to intervening topography. Therefore, these levels would be below the County's construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line (ST-2) and would be a **less than significant impact.** At ST-1, noise levels would further attenuate by distance alone to approximately 44 dBA $L_{eq}$ at approximately 3,100 feet, and further attenuate due to intervening topography.

**Construction Traffic**

Off-site, construction noise would be generated on local roadways by workers commuting to and from the job site and by construction material deliveries, which would access the project site on adjacent roadways. The proposed project construction is calculated to generate 898 average ADT with 59 trips in the a.m. peak hour and 59 trips (28 inbound and 31 outbound) during the PM peak hour (LL&G 2014). These project trips were distributed regionally on roadways based on

potential destinations for truck hauling from construction activity; a few trips were distributed via Lake Wohlford Road and Valley Center Road to possible local destinations in the community of Valley Center, and the rest of the trips were distributed to regional destinations via the City's identified truck routes, ultimately utilizing I-15 for regional access (LL&G 2014). Existing ADT volume on Lake Wohlford Road from Valley Center Road to Oakvale Road is 4,680 ADT. As doubling traffic volumes would increase noise levels by 3 dBA, the project increase of 898 ADT would result in a less than 1 dBA $L_{eq}$ increase in noise levels along adjacent roadways during the peak a.m. period, which is not a perceivable change in noise level and would be considered a **less than significant impact.**

**Construction (Nighttime Monday through Saturday, and All Day Sunday)**

During the 5 months of RCC dam construction, RCC construction activities would also occur at night and on Sundays at the concrete batch plant, conveyor system, and the dam construction area, which would be outside of the allowable hours of the City Noise Ordinance (i.e., Monday through Friday from 6:00 p.m. to 7:00 a.m., Saturdays from 5:00 p.m. to 9:00 a.m., and on Sundays and City holidays, and therefore would result in a **significant impact.**

Nighttime construction noise level limits are not specified in the County's Noise Ordinance. Therefore, the County's noise level limit of 45 dBA for a 1-hour average at the property line of any residential property is assumed as the noise level limit for project construction at night, and 50 dBA $L_{eq}$ during the day on Sunday. Overall, worst-case combined noise levels from simultaneous operations at the concrete batch plant, conveyor belt, and RCC dam construction at the dam at the nearest residence (ST-1), and at the other measured location (ST-2) during nighttime RCC dam construction are summarized in Table 7.

**Table 7**
**Combined Construction Activity Noise Levels**

| Activity | Noise level dBA $L_{eq}$ at 50 feet | Distance to nearest receptor (ST-1) | Noise level dBA $L_{eq}$ at ST-1 | Distance to nearest receptor (ST-2) | Noise level dBA $L_{eq}$ at ST-2 |
|---|---|---|---|---|---|
| RCC Dam Construction | 80 | 3,100 | 44 | 2,500 | 46 |
| Concrete Batch Plant | 80 | 900 | 55 | 2,000 | 48 |
| Conveyor Belt | 80 | 1000 | 54 | 1,900 | 49 |
| Combined Activities | - | - | 58 | - | 53 |

As shown in Table 7, based on the rules of decibel addition, the resultant noise level of combined activity of nighttime construction operations during the 5 months of RCC dam construction is anticipated to be approximately 58 dBA $L_{eq}$ at ST-1 and 53 dBA $L_{eq}$ at ST-2, and would exceed the County's sound level limit of 45 dBA $L_{eq}$ at residential property lines at night (Table 4) by approximately 13 and 8 dBA $L_{eq}$, respectively. This is a **significant impact.** In addition, the occurrence of construction noise on a Sunday and exceeding the County's sound level limit of 50 dBA $L_{eq}$ at residential property lines during the day (Table 4) on Sundays is a **significant impact**. Noise levels from combined batch plant and conveyor belt operations were also calculated for three additional residential locations (Points A, B, and C in Figure 4) of approximately 54, 53, and 51 dBA $L_{eq}$ at approximately 1,350, 1,500, and 1,900 feet, respectively, northeast from the proposed batch plant location, which would also exceed the night sound level limit of 45 dBA $L_{eq}$ at residential property lines by approximately 9, 8, and 6 dBA $L_{eq}$, respectively, thereby resulting in a **significant impact**.

## 7.2 VIBRATION

Project construction activities would generate vibration from dam excavation including rock drilling and blasting and truck hauling; dam construction including truck hauling, and existing dam excavation and removal including truck hauling. Groundborne vibration generated by construction projects is usually highest during pile driving, soil compacting, jackhammering, and demolition-related activities. Table 8 shows typical vibration levels for various pieces of construction equipment that generate high vibration levels (FTA 2006).

As shown in Table 8, vibration levels at 25 feet from construction equipment, with the exception of pile drivers, are at or below the threshold of risk of structural building damage (0.2 ppv in/sec). However, at distances beyond 65 feet, vibration levels would be below the threshold of risk of structural damage and below the threshold for human perception (0.1 ppv in/sec) beyond 80 feet. The proposed dam excavation, construction, demolition, and removal would not be located in proximity to building structures or humans, which are located approximately 1,500 feet from the dam construction site. At these distances, typical construction activities would result in a **less than significant impact** for structural damage and human annoyance.

Transport of materials by heavy trucks to and from construction sites has the potential to generate higher levels of groundborne vibration than mechanical equipment. However, heavy trucks generally operate at very low speeds on-site. Therefore, the groundborne vibration induced by heavy truck traffic is not anticipated to be perceptible at distances greater than 25 feet and would be a **less than significant impact**.

**Table 8**
**Construction Equipment Vibration Levels**

| Equipment | | PPV at 25 Feet (in/sec) |
|---|---|---|
| Pile Driver (impact) | Upper range | 1.518 |
| | Typical | 0.644 |
| Pile Driver (sonic) | Upper range | 0.734 |
| | Typical | 0.170 |
| Hydromill (slurry wall) | Soil | 0.008 |
| | Rock | 0.017 |
| Clam Shovel Drop (slurry wall) | | 0.202 |
| Vibratory Roller | | 0.210 |
| Hoe Ram | | 0.089 |
| Large Bulldozer | | 0.089 |
| Caisson Drilling | | 0.089 |
| Loaded Trucks | | 0.076 |
| Jackhammer | | 0.035 |
| Small Bulldozer | | 0.003 |

Source: FTA 2006

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# 8.0 MITIGATION MEASURES

## 8.1 MITIGATION MEASURES

In summary, project construction would result in significant noise impacts on human noise-sensitive receptors, as determined in the preceding analysis. Daytime construction noise levels at the construction staging area, concrete batch plant, conveyor belt, and dam access road, as well as, rock drilling for blasting activities for dam excavation would result in a substantial temporary increase in daytime ambient noise levels. However, these levels would be below the County's daytime construction noise level limit of 75 dBA $L_{eq}$ averaged over an 8-hour period at the nearest residential property line and would be a **less than significant impact.** Project construction on Sundays would occur outside of the County's allowable construction hours. Nighttime construction activities at the concrete batch plant and conveyor belt system would result in a substantial temporary increase in nighttime ambient noise levels at residential property lines at night and would occur outside of the County's allowable construction hours and exceed the County's established sound-level limits at residential property lines at night This is a **significant impact** warranting mitigation.

**Construction**

The following construction noise reduction measures are required to reduce and minimize noise levels during construction:

- NOI-1 (Implement Noise Complaint Reporting) – The project (via construction contractor) would establish a telephone hot-line for use by the public to report any significant adverse noise conditions associated with the construction of the project. If the telephone is not staffed 24 hours per day, the contractor shall be required to include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This hot-line telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been considered commissioned and ready for operation.

- NOI-2 (Implement Noise Complaint Investigation) – Throughout the construction of the project, the contractor shall be required to document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The contractor or its authorized agent shall be required to:

- Use a Noise Complaint Resolution Form to document and respond to each noise complaint;
- Contact the person(s) making the noise complaint within 24 hours;
- Conduct an investigation to attempt to determine the source of noise related to the complaint; and
- Take all reasonable measures to reduce the noise at its source.

- NOI-3 (Implement Construction Practices) – The following are typical field techniques for reducing noise from construction activities, with the purpose of reducing aggregate construction noise levels at nearby noise-sensitive receivers. The contractor or its authorized agent shall be required to:
  - Adjust all audible back-up alarms downward in sound level, reflecting locations that have expected lower background level, while still maintaining adequate signal-to-noise ratio for alarm effectiveness. Consider signal persons and strobe lights, or alternative safety equipment and/or processes as allowed, for reducing reliance on high-amplitude sonic alarms.
  - Place stationary noise sources, such as generators and air compressors, away from affected noise-sensitive receivers to the farthest extent practical on the project site. Place non-noise-producing mobile equipment such as trailers in the direct sound pathways between suspected major noise-producing sources and these sensitive receivers. To minimize flanking underneath or through vertical gaps, the construction contractor shall cover the openings with at least 0.5-inch-thick plywood, hay bales, or other sufficiently dense material.

- NOI-4 (Equipment Noise Reduction) – The following are typical practices for construction equipment selection (or preferences) and expected function that can help reduce noise and shall be implemented:
  - Use concrete crushers or pavement saws rather than impact devices such as jackhammers, pavement breakers, and hoe rams for tasks such as concrete or asphalt demolition and removal.
  - Pneumatic impact tools and equipment used at the construction site shall have intake and exhaust mufflers recommended by the manufacturers thereof, to meet relevant noise limitations.

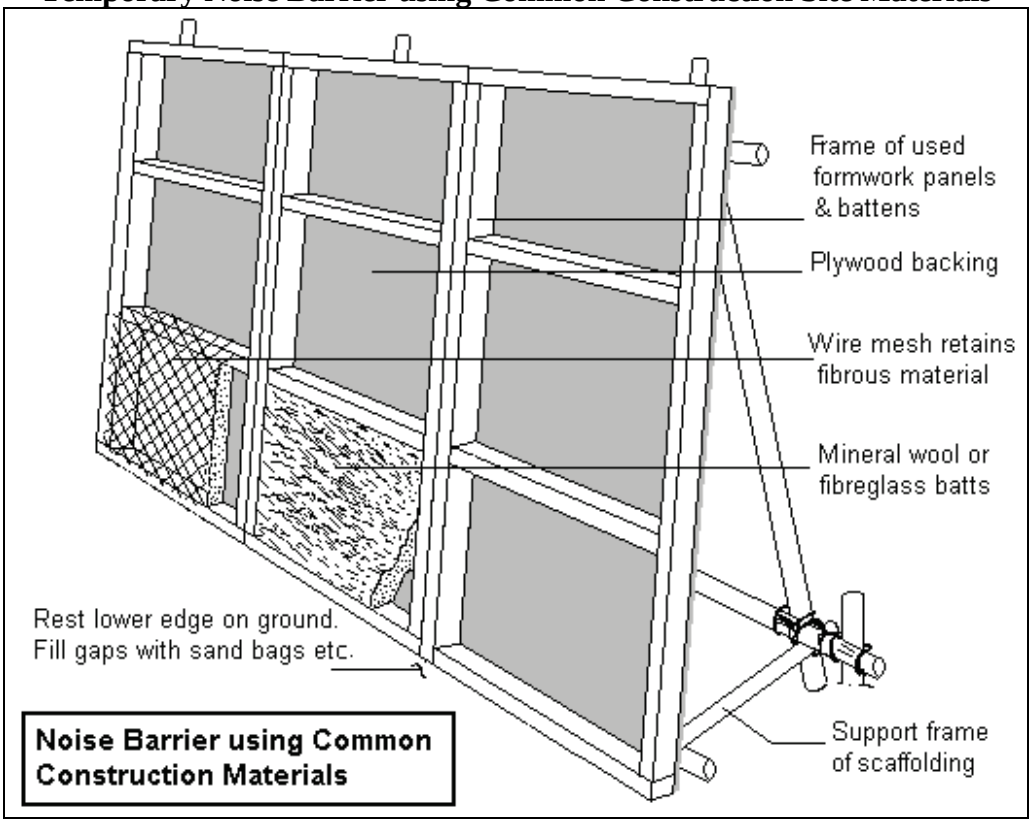
- Provide impact noise producing equipment (i.e., jackhammers and pavement breaker[s]) with noise attenuating shields, shrouds or portable barriers or enclosures, to reduce operating noise.
- Line or cover hoppers, storage bins, and chutes with sound-deadening material (e.g., apply wood or rubber liners to metal bin impact surfaces).
- Provide upgraded mufflers, acoustical lining, or acoustical paneling for other noisy equipment, including internal combustion engines.
- Use alternative procedures of construction and select a combination of techniques that generate the least overall noise and vibration.
- Use construction equipment manufactured or modified to reduce noise and vibration emissions, such as:
    - Electric instead of diesel-powered equipment.
    - Hydraulic tools instead of pneumatic tools.
    - Electric saws instead of air- or gasoline-driven saws.
- Locate construction staging area as far as feasible from occupied residences.
- Utilize noise attenuation techniques for all construction activity on the project site, as needed to reduce noise levels at occupied residences. Such techniques may include, but are not limited to, the use of sound blankets on noise-generating equipment and the construction of temporary sound barriers adjacent to construction sites, between affected uses.

*Noise Barriers*

Temporary noise barriers may include but are not necessarily limited to using appropriately thick wooden panel walls (at least ½ inch thick), or mobile "blocking vehicles" (e.g., semi-truck trailers, moving vans, etc.) high enough to block the line of sight from the dominant construction noise source(s) to the noise-sensitive receiver. Noise barriers are most effective when located adjacent to the noise source or noise receptor, where line of sight between the source and receptor is blocked by the barrier.

Refer to Image 1 for a sample illustration of a temporary construction noise barrier. Such barriers could, depending on factors such as barrier height, barrier length, and distance between the barrier and the noise-producing equipment or activity, reduce construction noise by 5 to 10 dBA at nearby noise-sensitive receiver locations.

**Image 1**
**Temporary Noise Barrier using Common Construction Site Materials**




Source: Eaton, Construction Noise, 2000

Alternately, field-erected noise curtain assemblies can be installed around specific equipment sites or zones of anticipated mobile or stationary activity, resembling the sample shown in Image 2. These techniques are most effective and practical when the construction activity noise source is stationary (e.g., auger or drill operation) and the specific source locations of noise emission are near the ground and can be placed as close to the equipment/activity-facing side of the noise barrier as possible.

**Image 2**
**Sample Site-Erected Curtain-type Noise Barrier**

Source: AECOM 2015

The residences that may receive noise from this project's 24-hour construction activities are all located at higher elevations from the construction site, without intervening topography or other obstructions that would the block line of sight to the construction work. Figure 5 provides several elevation cross-sections between the concrete batch plant location and a sampling of residential locations north, northeast, and southeast of the primary staging area. As shown in Figure 5, all of the residential receptors are higher in elevation than the plant, ranging from 35 to 140 feet higher than the plant. Assuming all noise sources at the batch plant are on the ground, it would not be possible to effectively reduce noise with noise walls because of this elevation difference, as the walls would not block the line of sight. Furthermore, the batch plant operations would include noise-generating machinery that would be elevated off the ground, possibly 10 to 30 feet high, depending on the design, which would make standard noise walls even more ineffective at reducing the noise received by nearby residences. Building noise walls high enough such that they would block line of sight to the nearby receptors would be unsafe and impractical. It would also be unsafe and impractical to mount noise barriers to the noise-generating equipment at the

batch plant. Therefore, it is infeasible to reduce construction-related noise levels on this project by means of noise barriers.

**Project Operation**

The project's BTR identified significant indirect impacts on special-status bird species (BIO-6) would potentially result from construction noise and affect breeding activity (AECOM 2014). The BTR identified that Mitigation Measure BIO-6.1 would be employed to ensure that the project's indirect noise impacts would be reduced to less than significant levels including, if necessary, the preparation of a noise attenuation plan to identify site-specific measures to reduce construction-related noise impacts on applicable bird species from vegetation clearing or earthwork within a 500-foot buffer of any listed species or bird breeding activity in the vicinity (AECOM 2014).

No project operation-related noise impacts to noise-sensitive receptors were determined in the preceding analysis. As a result, no mitigation is required.

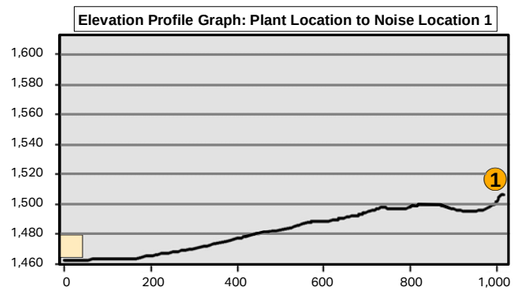
**LEGEND**

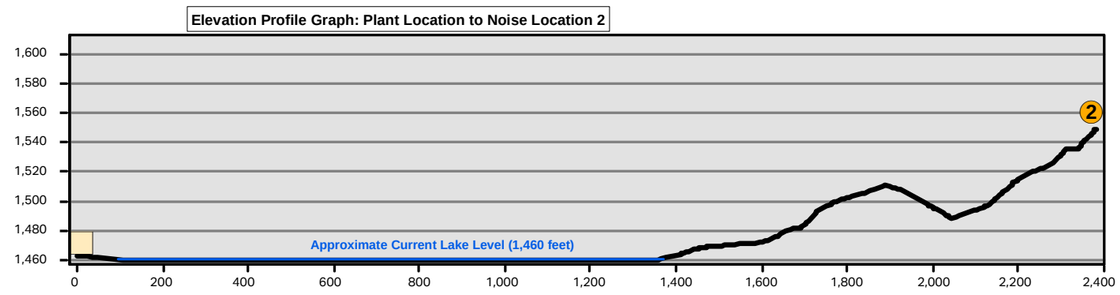
- Construction Limits
- Profile Line
- Noise Monitoring Location
- Additional Calculated Noise Level Location
- Plant Location

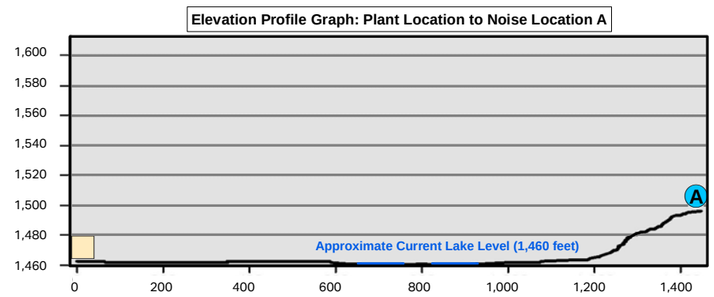

Source: SanGIS 2014, 2015; SANDAG Technical Services - GIS; Black&Veatch 2014

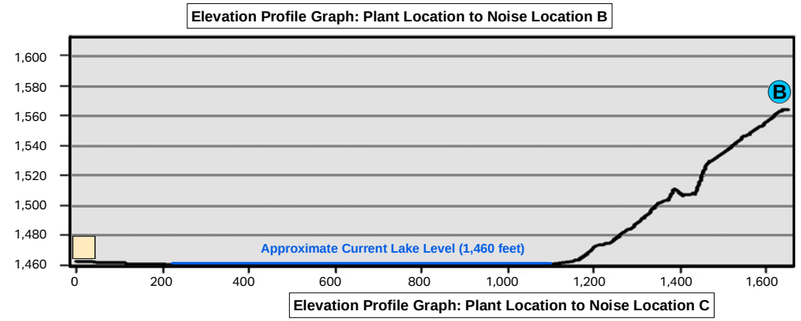
500 250 0 500 Feet

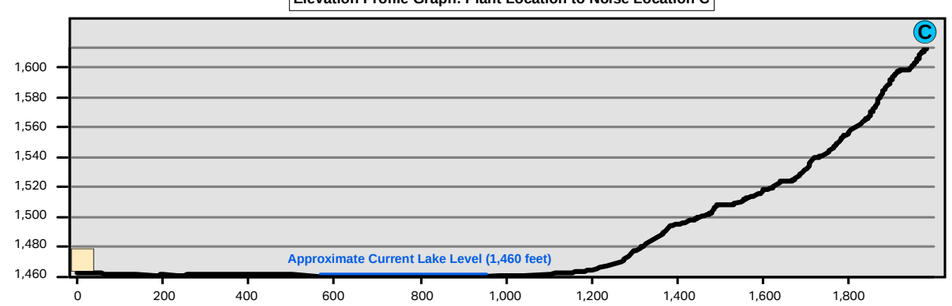
Scale: 1:6,000; 1 inch = 500 feet




**Note:** Vertical axis exaggerated to highlight topographic variation.

**Figure 5**
**Elevation Profiles**

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