technical report

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Sri Sairam Mandir

Noise Impact Study

City of Chino, CA

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0.0 Impact Table

	Issues	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a.	Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			✖	
b.	Generation of excessive ground born vibration or ground born noise levels?			✖	
c.	For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the project area to excessive noise levels?				✖

1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

a²v consulting group, llc has prepared this noise assessment to evaluate the potential noise impacts for the Sri Sairam Mandir area and to recommend noise mitigation measures, if necessary, to minimize the potential noise impacts to the surrounding residential areas. The assessment was conducted and compared to the noise standards set-forth by the Federal, State and Local agencies. Consistent with the City's Noise Guidelines, the project must demonstrate compliance to the applicable noise criterion as outlined within the City's Noise Element and Municipal Code.

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 analysis of traffic noise impacts to and from the project site
- An analysis of stationary noise impacts to and from the project site
- An analysis of construction noise impacts

1.2 Site Location and Study Area

The project site is located at 12594 Roswell Avenue, in the City of Chino, California, as shown in Exhibit A. The site is currently zoned as RD-1 residential, the general plan will be rezoned to worship/institutional. The surrounding areas are zoned residential (RD-2) to the south and west. The site plan currently has a 8-foot masonry unit boundary wall on the south and west boundary of the project location.

1.3 Proposed Project Description

The project proposed is a house of worship facility consisting of a 32,400 square foot building on 4.83 acres (209,088.2 square feet), and total of 154 physical parking stalls; including the logical 8 parking stalls for the carpooling, combing with the LOS C ADT values. This report assumes the project is built out in 1 phase.

Assessing both traffic and stationary noise to and from the project site, this report compares the results to the applicable city noise limits. The sources of traffic noise propagate from Walnut Avenue, the railroad triangulating the site, and Roswell Avenue. The primary recorded traffic noise during the study, besides the railroad, comes from Walnut Avenue.

Construction activities within the project area will consist of on-site grading, building, paving, and architectural coating.

2.0 Fundamentals of Noise

This section of the reports provides a basic understanding of noise and presents terms/abbreviations used within 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 defined as any sound that is undesired or interferes with one's hearing of something, especially one that lacks agreeable musical quality or is noticeably unpleasant. Acoustics is a science that deals with the production, control, transmission, reception, and effects of sound as defined by the Merriam-Webster dictionary.

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 and high-frequency sounds are high in pitch. These oscillations per second (cycles) are commonly referred to as hertz (Hz). The normal human ear can detect sounds that range in frequency from 20 Hz to 20,000 Hz. However, all sounds in this wide range of frequencies are not heard equally well by the human ear, which is most sensitive to frequencies between 1,000 Hz and 5,000 Hz. This frequency dependence can be taken into account as a correction to each frequency, discovered by Fletcher-Munson in 1933. This is commonly referred to as A-weighted scale.

2.3 Sound Pressure Levels and Decibels

The amplitude of a sound determines it loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measure in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (μPa). One μPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or Lp) 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. Figure 1 illustrates references sound levels for different noise sources.

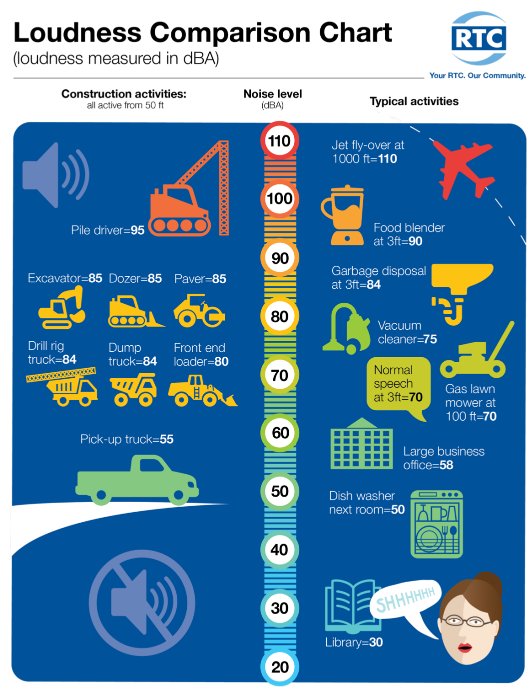

Figure 1. Typical A-weighted Noise Levels

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, they cannot be added or subtracted by simple addition or subtraction. When two equal SPL are combined, the resultant sound is 3dB greater than the original single SPL. When two or sounds which are 2-3dB apart are combined, the sum is 2dB greater than the higher original single SPL. Sounds that are 4-8dB apart, result in 1dB added to the higher SPL sound. If two sounds differ by approximately 10dB, 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, (A- weighted scale) 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 reported in terms of A-weighted decibel (dBA). Typically, the human ear can barely perceive the 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.

Sound Level Change	Relative Loudness
1dBA	Not Perceptible
3dBA	Barely Perceptible
5dBA	Clearly Perceptible
10dBA	Twice (or half) as loud

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

2.6 Noise Preceptors

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. Also known as percent noise levels.

Noise: Any 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).

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.

2.7 Traffic Noise Prediction

Noise levels associated with traffic depends on a variety of factors: (1) volume of traffic, (2) speed of traffic, (3) auto, medium truck (2–3 axle) and heavy truck percentage (4 axle and greater), and sound propagation. The greater the volume of traffic, higher speeds and truck percentages equate to a louder volume in noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3 dB; reasons for this are discussed in the sections above.

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-Born Vibration Fundamentals

3.1 Vibration Descriptors

Ground-born vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-born vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-born 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-born noise is an effect of ground-born 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- born noise or vibration. To counter the effects of ground-born vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-born vibration levels of 0.3 inches per second without experiencing structural damage.

3.3 Vibration Perception

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 wave front, 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 wave front. 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 wave front. 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 Federal, State, and City Regulations

The proposed project is located in the City of Chino, CA 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

In the United States, noise guidelines and standards exist for the greater community, such as, proximity of noise sources and their effects on noise pollution. 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 to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate 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 federal government advocates that local jurisdiction 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 evolving regularity tools to control and abate noise for use by local jurisdictions. 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 criteria as outlined in Title 24 and the Uniform Building Code (UBC). In some cases, this necessitates acoustical analyses to outline exterior noise levels and to ensure interior decibels do not exceed the interior threshold. The state mandates the legislative body of each county and city adopt a noise component as part of its comprehensive general plan.

The local noise component 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.

Land Use Categories	Community Noise Equivalent Level (CNEL, dBA			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential (Low Density, Single Family, Duplex, Mobile Homes)	50-60	55-70	70-75	75-85
Residential (Multiple Family)	50-65	60-70	70-75	70-85
Transient Lodging (Hotel, Motel)	50-65	60-70	70-75	70-85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50-70	60-70	70-80	80-85
Auditoriums, Concert Halls, Amphitheaters	NA	50-70	NA	65-85
Sports Arenas, Outdoor Spectator Sports	NA	50-75	NA	70-85
Playgrounds, Neighborhood Parks	60-70	NA	67.5-75	72.5-85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50-70	NA	70-80	80-85
Office Buildings, Business Commercial and Professional	50-75	67.5-77.5	75-85	NA
Industrial, Manufacturing, Utilities, Agriculture	50-75	70-80	75-85	NA

SOURCE: Office of Noise Control, California Department of Health

4.3 City of Chino Noise Regulations

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

City of Chino General Plan

Applicable policies and standards governing environmental noise in the City are set forth in the Code of Ordinances Chapter 9 (9.40.040) of the Chino Noise Element as part of the analysis Table N4 of the City's noise element was used to evaluate the projects potential impact to and existing land uses surrounding the site.

In addition to the noise standards, the city has outlined goals, policies and implementation measures to reduce potential noise impacts and are presented below:

<u>Goals, Policies, and Implementation Measures</u>

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

Goal N-1 – Protect Chino Residences from Excessive Noise

Objective N.1.1 Ensure appropriate Exterior and Interior noise levels for existing and new land uses.

- Policy 1
    - The city shall not locate noise-sensitive land uses (schools, medical centers and hospitals, senior centers, and residences) in areas with noise levels that exceed those considered normally acceptable for each land use unless measures can be implemented to reduce noise to acceptable levels.
- Policy 2
    - The city shall require measures to ensure noise-sensitive uses have appropriate interior noise environments when located in areas adjacent to major generators.
- Policy 3
    - The city shall require measures that attenuate exterior and/or interior noise levels to acceptable levels to be incorporated into all development projects where current and/or future noise levels may be unacceptable.
- Policy 4
    - The city shall require a noise impact study to evaluate impacts of projects that may exceed 65 Ldn as part of the design review process.
- Policy 5
    - The city shall require an acoustical study for all new residential developments that lie within the 65 Ldn noise contour on the Future Noise Contour Map, to ensure indoor levels will not exceed city standards. In addition, the city shall continue to enforce the California Building Code for indoor noise levels.
- Policy 6
    - The city shall only approve projects which comply with adopted noise standards or meet the provisions of the California Environmental Quality Act.
- Policy 7
    - The city shall require noise reduction features to be used in the site planning process for new projects where current and/or future noise levels may be unacceptable. The focus of these efforts shall be site design techniques, so long as they do not conflict with the goals of the Community Character Element. Techniques include:
        - Program 1
            - Designing landscaped building setbacks to serve as a buffer between the noise source and receptor
        - Program 2
            - Placing noise-tolerant land uses such as a parking lots, maintenance facilities, and utility areas between the noise source and receptor

- Program 3
  - Orienting buildings to shield noise-sensitive outdoor spaces from a noise source.
- Program 4
  - Locating bedrooms or balconies on the sides of buildings facing away from noise sources.
- Program 5
  - Utilizing noise barriers (e.g. fences, walls, or landscaped berms) to reduce adverse noise levels in noise-sensitive outdoor activity areas.

Objective N.1.2 Reduce Noise Impacts from Transportation

- Policy 1
  - The city shall minimize transportation noise through street and right-of-way design or route coordination including reducing speed limits or planting street trees along high-volume arterials.
- Policy 2
  - The city shall require mitigation of noise impacts for new roadway projects, including roadway alignment and noise barriers.
- Policy 3
  - The city shall use pavement surfaces that reduce noise from roadways when paving or repaving whenever feasible.
- Policy 4
  - The city shall seek to reduce impacts from ground born vibration associated with rail operations by requiring that vibration-sensitive buildings (e.g. residences) are sited at least 100 feet from the centerline of the railroad tracks whenever feasible. The development of vibration-sensitive buildings within 100 feet from the centerline of the rail-road tracks would re-quire a study demonstrating that ground born vibration issues associated with rail operations have been adequately addressed (i.e. through building siting, foundation design, and construction techniques).

Objective N.1.3 Control Sources of Construction Noise

- Policy 1
  - The city shall require a noise monitoring plan to be prepared and submitted prior to starting all construction projects. The noise monitoring plan shall identify monitoring locations and frequency, instrumentation to be used, and appropriate noise control measures that will be incorporated.
- Policy 2
  - The city shall limit all construction in the vicinity of noise-sensitive land uses, such as residences, hospitals, or senior centers, to daylight hours or 7:00 a.m. to 7:00 p.m. In addition, the following construction noise control measures shall be included as requirements at construction sites to minimize construction noise impacts:
    - Program 1
      - Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Program 2
  - Ensure that during construction, trucks and equipment are running only when necessary.
- Program 3
  - Shield all construction equipment with temporary noise barriers to reduce construction-related noise impacts.
- Program 4
  - Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors ad-join or are near a construction area.
- Program 5
  - Utilize "quiet" air compressors and similar equipment, where available.

- Policy 3
  - The city shall evaluate new development projects for potential construction related noise impacts.

<u>City of Chino – Noise Ordinance</u>

Applicable policies and standards governing environmental noise in the city are set forth in the Code of Ordinances Chapter 9 9.40.040 of the Chino Noise Element as part of the analysis Table N4 of the city's noise element was used to evaluate the projects potential impact to and existing land uses surrounding the site.

a) The following exterior noise standards, unless otherwise specifically indicated, shall apply to all properties within a designated noise zone: Table 1 (next page) outlines the allowable exterior noise level.

These criteria are given in terms of allowable noise levels for a given period of time

at the residential property boundary. Higher noise levels are permitted during the day (seven a.m. to ten p.m.) than the night (ten p.m. to seven a.m.). The table below shows the acceptable

levels at residential land uses during the daytime and nighttime.

Chino Exterior Noise Ordinance Standards		
Maximum Time of Exposure	Level Not to Exceed 7am to 10pm	Level Not to Exceed 10pm to 7am
30 min/hr L_{50}	55 dBA	50 dBA
15 min/hr L_{25}	60 dBA	55 dBA
5 min/hr L_{08}	65 dBA	60 dBA
1 min/hr L_{02}	70 dBA	65 dBA
Any period of time L_{max}	75 dBA	70 dBA

Exemptions

The following activities shall be exempted from the provisions of this chapter:

1) Activities conducted on public parks, public playgrounds and public or private school grounds including school athletic and school entertainment events that are conducted under the sanction of the school or which a license or permit has been duly issued pursuant to any provision of the city code.
2) Occasional outdoor gatherings, public dances, show, sporting and entertainment events, provided said events are conducted pursuant to a permit or license issued by the appropriate jurisdiction relative to the staging of said events. Such permits and licenses may restrict noise
3) Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle, work or warning alarm or bell, provided the sounding of any bell or alarm on any building or motor vehicle shall terminate its operation within thirty minutes in any hour of its being activated;
4) Noise sources associated with or vibration created by construction, repair, remodeling or grading of any real property or during authorized seismic surveys, provided said activities do not take place outside the hours for construction as defined in Section 15.44.030 of this code, and provided the noise standard of sixty-five dBA plus the limits specified in Section 9.40.040(B) as measured on residential property and any vibration created does not endanger the public health, welfare and safety;
5) All mechanical devices, apparatus or equipment associated with agriculture operations provided:
    a) Operations do not take place between eight p.m. and seven a.m. on weekdays, including Saturday, or at any time Sunday or a Federal holiday.
    b) Such operations and equipment are utilized for the protection of salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.
    c) Such operations and equipment are associated with agricultural pest control through pesticide application, provided the application is made in accordance with permits issued by or regulations enforced by the California Department of Agriculture.
    d) Noise sources associated with the maintenance of real property, provided said activities take place between the hours of seven a.m. to eight p.m. on any day except Sunday, or between the hours of nine a.m. and eight p.m. on Sunday
    e) Any activity to the extent regulation thereof has been preempted by state or federal law

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

a^{2}v consulting group conducted the sound level measurements in accordance to CalTrans technical noise specifications. All measurement equipment meets the 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:

- Microphones for sound level meters were placed 5-feet above the ground for all measurements
- Sound level meters were calibrated (Larson Dave CAL 200) before and after each measurement
- Following the calibration of equipment, a wind screen 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 were noted
- Temperature and sky conditions were observed and documented

5.2 Long – Term Noise Measurement Locations

Noise monitoring locations were selected to represent the baseline conditions at or near the project site. Appendix A includes photos, field sheet, and measure noise data. Exhibit A illustrates the location of the measurements.

5.3 Traffic Noise Prediction

Traffic noise for the roadway network at and around the project vicinity has been evaluated in the city's General Plan Noise Element, which evaluates the traffic noise for the Year 2025. Noise levels associated with traffic depends on a variety of factors:

1) Volume of traffic
2) Speed of traffic
3) Auto, medium truck (2-3 axle) and heavy truck percentage
4) Axle and greater
5) Sound propagation

The project did not require a traffic impact study and therefore traffic noise is discussed in general terms. It should be noted, however, that changes in traffic noise levels can be calculated using the following equation from the 2013 Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol (as shown below):

$$\text{dB Adjustment} = 10\log 10\frac{\text{x1}}{\text{x2}}$$

Where:

- X1 = project + existing roadway segment ADTs
- X2 = existing roadway segment ADTs

Generally, the greater the volume of traffic, higher speeds, and truck percentages equate to a louder volume of noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3dB.

5.4 Stationary Noise Modeling

The future worst-case noise level projections were modeled using reference sound level data for the proposed load/unloading for the building and peak hour trip generation data for the proposed parking lots, dining areas, and playgrounds. Noise include, but are not limited to, idling cars, exhaust and engine noise, starting engine noise, back up alarms, and breaking. Noise associated with parking lots include but are not limited to idling cars, doors closing, and starting engine noise. Noise levels associated with parking lots can reach peak levels of 80 dBA. In addition, the loading docks would include noise from ignition start-up, doors shutting, idling trucks, back-up alarms, (etc.) and was modeled as an area source with a reference noise level of 110 dBA feet across the surface area.

6.0 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.

6.1 Construction Noise

The Federal Transit Administration (FTA) has compiled data regarding the noise generated characteristics of typical construction activities. The data is presented in the table below:

Typical Construction Noise Levels		
Equipment	Typical Noise Level (dBA) at 50 feet from Source	Typical Noise Level (dBA) at 100 feet from Source[1]
Air Compressor	80	74
Backhoe	80	74
Compactor	82	76
Concrete Mixer	85	77
Concrete Pump	82	76
Concrete Vibrator	76	79
Crane, Derrick	88	76
Crane, Mobile	83	70
Dozer	85	82
Generator	82	77
Grader	85	79
Impact Wrench	85	76
Jack Hammer	88	79
Loader	80	79
Paver	85	82
Pile-driver (Impact)	101	74

Typical Construction Noise Levels		
Equipment	Typical Noise Level (dBA) at 50 feet from Source	Typical Noise Level (dBA) at 100 feet from Source[1]
Pile-driver (Sonic)	95	79
Pneumatic Tool	85	95
Pump	77	89
Roller	85	79
Saw	76	71
Scraper	85	84
Shovel	82	89
Truck	84	79

[1] Calculated using the inverse square law formula for sound attenuation: $dBA_2 = dBA_1 + 20Log(d_1/d_2)$

dBA_2 = estimated noise level at receptor; dBA_1 = reference noise level; d_1 = reference distance; d_2 = receptor location distance

Source: Federal Transit Administration. 2018. Transit Noise and Vibration Impact Assessment Manual. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf (accessed March 2020).

Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., land clearing, grading, excavation, paving). Noise generated by construction equipment, including earthmovers, material handlers, and portable generators, can reach high levels. During construction, exterior noise levels could affect the residential neighborhoods surrounding the construction site. Project construction would occur adjacent to an existing single-family residence to the north and multi-family residential uses to the west, with the closest receptors being approximately 50 feet away from the Project construction area. However, it is acknowledged that construction activities would occur throughout the Project site and would not be concentrated at a single point near sensitive receptors.

Construction activities would include demolition, site preparation, grading, building construction, paving, and architectural coating. Such activities would require concrete/industrial saws, excavators, and dozers during demolition; dozers and tractors during site preparation; excavators, graders, and dozers during grading; cranes, forklifts, generators, tractors, and welders during building construction; pavers, rollers, mixers, and paving equipment during paving; and air compressors during architectural coating. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). Noise generated by construction equipment, including earthmovers, material handlers, and portable generators, can reach high levels.

6.2 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:

$$PPVequipment = PPVref\ (100/Drec)n$$

Where:

- PPVref = reference PPV at 100ft.
- Drec = 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 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

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.

7.0 Noise Study Results

7.1 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive uses typically include residences, hospitals, schools, childcare facilities, and places of assembly. These noise sensitivities are categorized by CalTrans (23CFR772) below:

Activity Category	Activity L_{eq} [h][1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted

[1] The Leq(h) activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

[2] Includes undeveloped lands permitted for this activity category.

Vibration sensitive receivers are generally similar to noise-sensitive receivers but may also include businesses, such as research facilities and laboratories that use vibration-sensitive equipment. Sensitive receptors near the Project site consist mostly of single-family and multi-family residences, religious institutions, and educational institutions.

Sensitive land uses nearest to the project are shown in the table below.

Sensitive Receptors	
Receptor Description	Distance and Direction from the Project
Single-Family Residential Home	291' Northeast
Single-Family Residential Home	72' South
Single-Family Residential Home	81' South
Single-Family Residential Home	214' West
Single-Family Residential Home	248' Northwest

7.2 Mobile Noise

Surrounding land uses include residential uses around all sides of the site. The east side of the site is terminated by a railroad. The existing mobile noise sources in the project area is the traffic located on the north end of the site (Walnut Avenue) and the southeast end of the site (Roswell Avenue). With Walnut Avenue being the primary mobile noise propagating to the site, the position of the building on site is located toward the southeast corridor.

Because of the project's proximity to the City of Chino Hills, CA and is located within the Chino Hills Sphere of Influence, the Chino Hills General Plan policies were considered. According to the Chino Hills General Plan, vehicular transportation is the primary contributor to long term noise in the city. This includes noise from automobiles, trucks, and motorcycles on arterial streets, the Pomona Freeway (SR-60), and the Chino Valley Freeway (SR-71). This project location is adjacent to 2 arterial streets (Walnut Avenue and Roswell Avenue) and the Pomona Freeway (SR-60); categorizing this site within the Chino Hills General Plan CNEL contour of 65-70dBA.

The Community Mobility Circulation Element of the Chino Hills General Plan has identified the Pomona Freeway (SR-60) as a primary highway, Walnut Avenue as a modified major highway, and Roswell Avenue as a secondary highway. The City of Chino's Noise Assessment says the city's major streets, such as Walnut Avenue and Roswell Avenue, have higher noise levels than residential blocks. According the Chino Hills General Plan, the highest levels are 60 dBA off of Walnut Avenue; about 5dBA lower than the City of Chino's threshold of 65dBA for external noise impacts on residential areas. Other mobile noise sources in the project vicinity include train pass-by's and horns from the Union Pacific Railroad on the east boundary of the project site.

Therefore, no further noise mitigation is required for mobile noise sources.

7.3 Stationary Noise

The primary sources of stationary noise in the project vicinity are those associated with residential operations, such as pool pumps, mechanical units [HVAC], domestic animals, residents talking, etc. Due to the amount of residential uses surrounding the project site, noise associated with these sources may represent a single-event noise occurrence or short-term noise.

Therefore, no further noise mitigation is required.

7.4 Project Noise

This project is required to provide 154 physical automobile parking stalls, including 7 handicap stalls. Parking is located on the northwestern and southeastern portion of the site along the main ingress and egress from Walnut Avenue and Roswell Avenue. Normal parking noise would occur within the on-site parking facilities. Traffic associated with parking lots is typically not of sufficient volume to exceed community noise standards, which are based on a time-averages scale such as the CNEL scale. The instantaneous noise caused by a car door slamming, engine starting up, and car pass-bys range from 52dBA to 61dBA. At the closest residential dwelling, this will be between 9.3dBA and 18.3dBA due to the existing concrete masonry unit barrier.

Conversation in parking areas may also be an annoyance to adjacent sensitive receptors. Sound levels of speech typically range from 33dBA at 50 feet for normal speech to 50dBA at 50 feet for very loud speech. It should be noted, however, the closest noise sensitive receptor will hear these noises to be a maximum of 7.3dBA.

Parking lot noises are instantaneous noise levels compared to the hourly L_{eq} metric in the noise standards, which are averaged over the entire duration of a time period.

By this understanding, no further mitigation is required for project related noise.

7.5 Future Exterior Noise – Noise Impacts to Off-Site Receptors Due to Traffic

As previously mentioned, the City of Chino's General Plan Noise Element, outlines the Year 2025 traffic noise levels along the roadway segments at or within the vicinity of the project site. The General Plan Noise Element assumes buildout conditions based on planned roadway width and not for the various land uses and therefore would already take into account the traffic noise levels generated by the project.

According to the city's General Plan Transportation Element the buildout ADT volume for Walnut Avenue at the project site (the location where the highest increase in noise level would occur due to proximity to the project site) varies between 11,000 to 20,000 based on a level of service (LOS) C for a 2-lane or 4-lane primary arterial, respectively (see Table from City of General Plan Transportation Element).

According the current site plan, the parking stall counts are based off the maximum occupancy level of each of the spaces in the building. With 154 physical stalls including 8 logical parking stalls for carpooling and combining with the LOS C ADT values, the additional 162 trips to the roadway network, the worst case increase in traffic noise levels would be 0.06dBA using the dB adjustment calculator detailed in section 5.3.

The worst-case change in noise level above the City of Chino's General Plan Noise Element as a result of the project is less than 3dBA and would be considered not significant.

Therefore, no further mitigation is required for future noise abatement of project related traffic noise.

7.6 Future Exterior Noise – Noise Impact to On-Site Receptors Due to Traffic

Existing noise measurement data presents the baseline stationary noise at the project site is approximately 24.3dBA CNEL at about 50 feet away from the centerline of Walnut Avenue. The project falls within the City of Chino's compatible noise matrix for churches and house of worship uses. The City of Chino has an interior 55dBA CNEL compatible level and the project would comply with the city's limit based on the proposed design.

Therefore, no further mitigation is required for on-site receptors of traffic noise.

7.7 Construction Related Noise

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 (Section 15.11.030.) Construction is anticipated to occur during the permissible hours according to San Bernardino County Code Section 83.01.080(g)(3) states that construction activities are exempt from the county's noise standards between the hours of 7:00am and 6:00pm on weekdays and between the hours of 8:00am and 5:00pm on Saturdays, except in the case of urgent necessity or otherwise approved by the city. All motorized equipment used in such activity shall be equipped with functioning mufflers as mandated by the state.

The site plan has been amended to an 8-foot masonry wall located on the south and western boundary line. During construction this boundary wall will be constructed first to serve as a single sound barrier providing noise abatement to the surrounding sensitive receptors.

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, and two (2) excavators, two (2) backhoes and a scrapper operating at 72 feet from the nearest sensitive receptor.

Assuming a usage factor of 40% for each piece of equipment, unmitigated noise levels at 72 feet with a 8-foot concrete masonry unit barrier, the resulting noise at the sensitive receptor has the potential to reach 48dBA L_{eq} and 50 dBA L_{max}. Noise levels for the other construction phases would be lower and range between 44 dBA to 48 dBA.

Construction activities may also cause increased noise along site access routes due to movement of equipment and workers. Compliance with the San Bernardino County Code and City of Chino Municipal Code would minimize impacts from construction noise, as construction would be limited to the county's and city's allowable construction hours.

By following the local noise standards, the project construction activities would result in a less than significant noise impact, **provided the noted 8-foot concrete masonry unit wall on the south and west boundary lines are constructed before the grading phase of construction**.

7.8 Construction Related Vibration Impact

Ground born vibration generated by construction equipment spread through the ground and diminish in magnitude with increases in distance. Vibration velocities from typical heavy construction equipment operation used during project construction range from 0.003 to 0.089 in/sec PPV at 25 feet from the source of activity as shown in the table below.

The nearest off-site structure is a building located approximately 72 feet south of the project site on a residential property. As shown in the table below, at 50 feet, construction equipment vibration velocities would not exceed 0.032 in/sec PPV, which is below the FTA's 0.2 PPV threshold and Caltrans' 0.4 in/sec PPV threshold for human annoyance. It is acknowledged that construction activities would occur throughout the project site and would not be concentrated at the point closest to the nearest off-site structure.

Therefore, vibration impacts associated with the project would be less than significant.

Equipment	Peak Particle Velocity at 25ft (in/sec)	Peak Particle Velocity at 50ft (in/sec)
Large Bulldozer	0.089	0.032
Caisson Drilling	0.089	0.032
Loaded Trucks	0.076	0.027
Jackhammer	0.035	0.012
Small Bulldozer/Tractors	0.003	0.001

[1] Calculated using the following formula: $PPV_{equip}=PPV_{ref}x(25/D)1.5$, where: PPV_{equip}=the peak particle velocity in in/sec of the equipment adjusted for the distance; PPV_{ref} = the reference vibration level in in/sec; D = the distance from the equipment to the receiver.

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018.

7.9 Airport Noise Impact to Project Site

The Ontario International Airport (OIA) is located approximately, 9.7 miles northeast of the project site. The project site is located outside the airport influence Area of the OIA and outside the 60 to 65dBA CNEL Noise Impact Zone of the airport and would be significantly affected by overhead aircraft noise. Additionally, the project site is not located within the vicinity of a private airstrip.

Therefore, the project site will not expose people residing or working in the project area to excessive noise levels and a less than significant impact would occur.

8.0 Conclusions

The project proposed is a house of worship facility consisting of a 32,400 square foot building on 4.83 acres (209,088.2 square feet), and total of 154 parking stalls. This report assumes the project is built out in 1 phase. The project site located at 12594 Roswell Avenue, in the City of Chino, California, as shown in Exhibit A. The general plan will be rezoned to worship/institutional. The surrounding areas are zoned residential (RD-2) to the south and west.

Assessing both traffic and stationary noise to and from the project site, this report compares the results to the applicable city noise limits. The sources of traffic noise propagate from Walnut Avenue, the railroad triangulating the site, and Roswell Avenue. The primary recorded traffic noise during the study, besides the railroad, comes from Walnut Avenue. Construction activities within the project area will consist of on-site grading, building, paving, and architectural coating. With the large machinery being used, during the construction phase; both noise and ground born vibration

The new site plan calls for a 8-foot masonry unit boundary wall on the south and west boundaries of the project location. The construction related noise would be of concern due to their associated high SPL levels, **however with the erection of this CMU boundary wall** (exhibit A drawing b) **prior to the grading phase of construction, the resultant noise level would fall within the City of Chino's noise ordinance levels.**

9.0 References

California Department of Transportation. 2013. Table 20. Transportation and Construction Vibration Guidance Manual.

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Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden. 2015. Noise Navigator Sound Level Database with Over 1700 Measurement Values.

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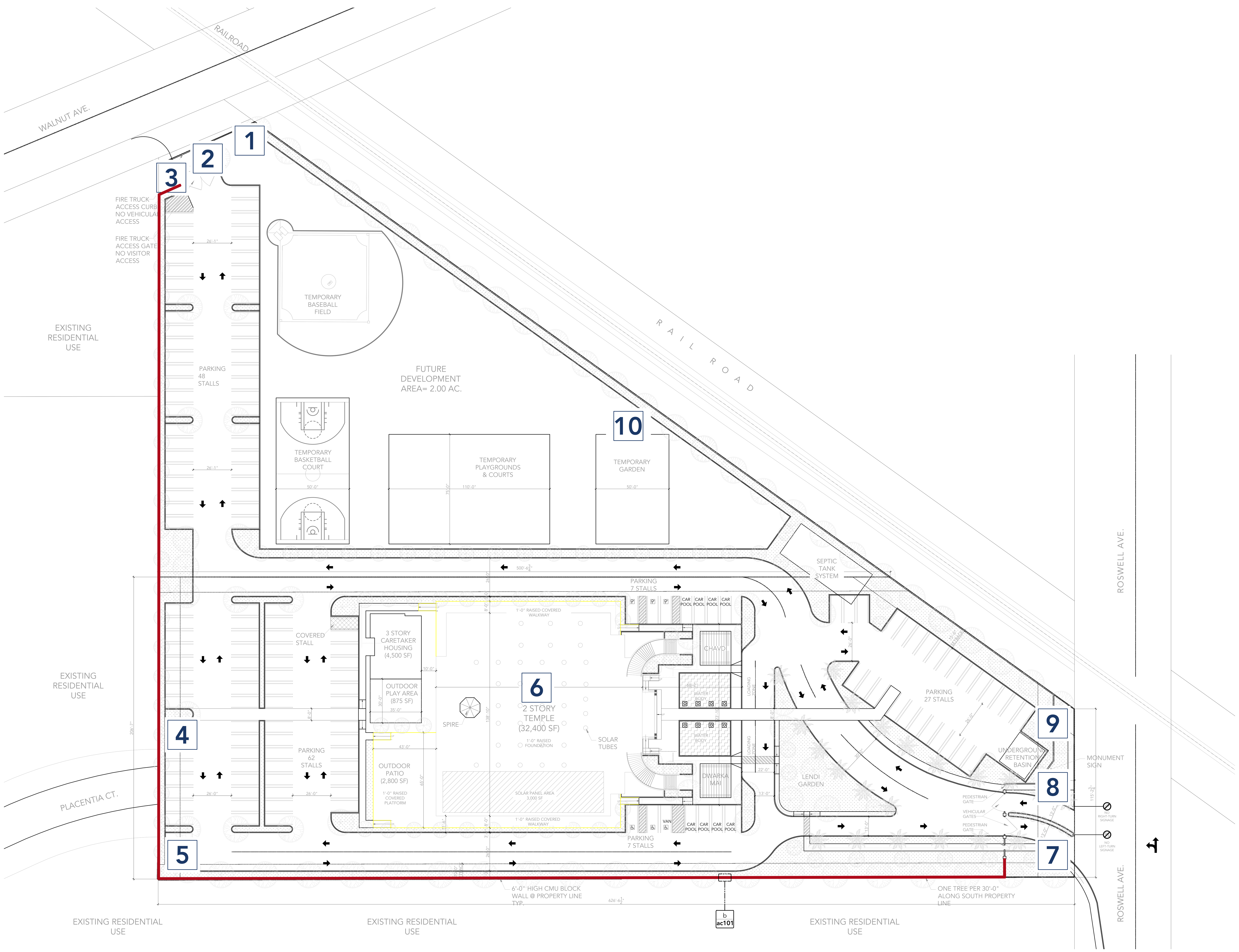
Ontario Airport Planning (2011). Ontario International Airport Land Use Compatibility Plan. Map 2-3 Compatibility Policy Map: Noise Impact Zones. http://www.ontarioplan.org/alucp-for-ontario-international-airport/ (accessed March 2020).

State of California General Plan Guidelines: 1998. Governor's Office of Planning and Research City of Chino: General Plan Noise Element, July 2010

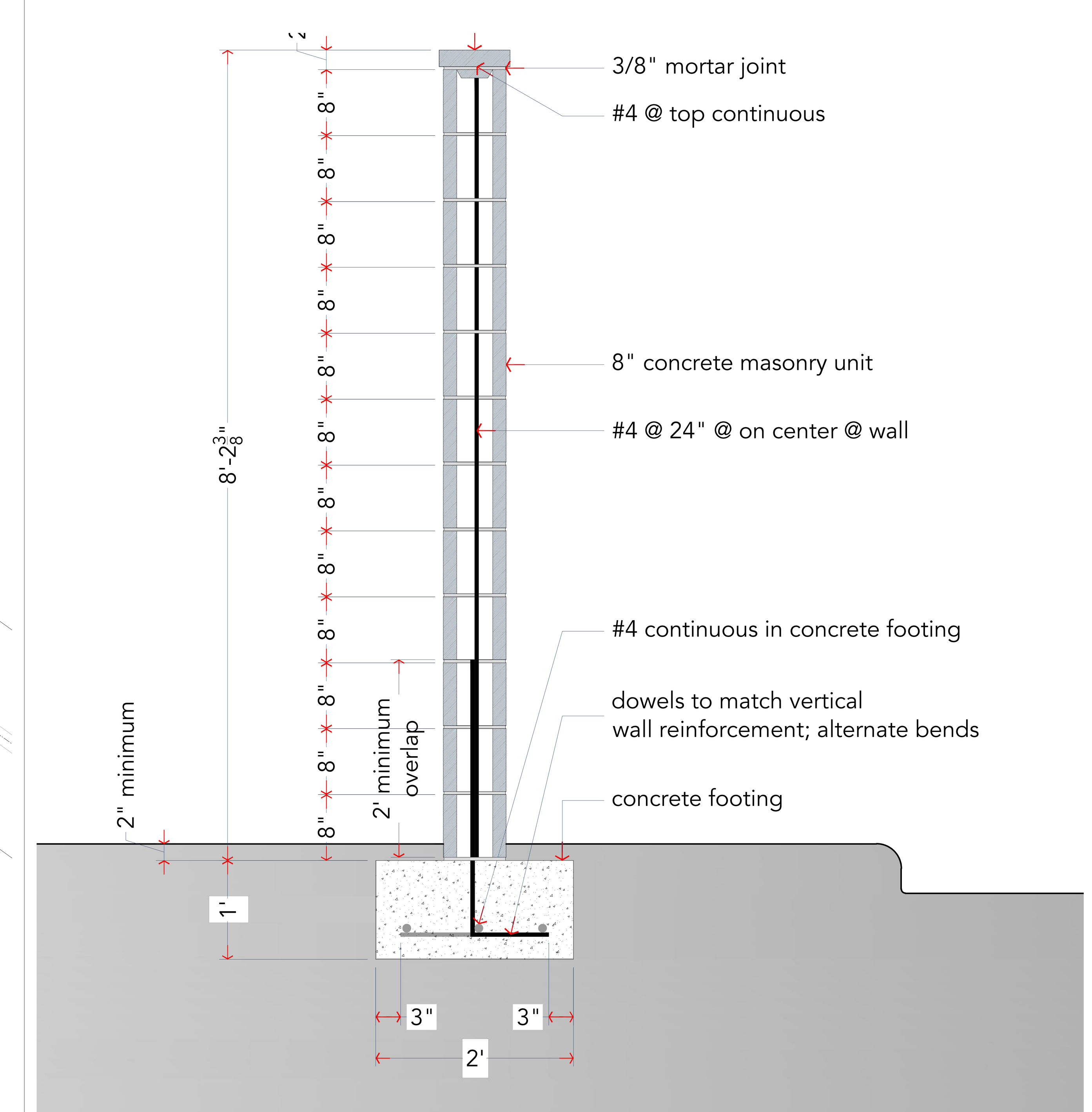
exhibit a



a site plan

SCALE: 1/32" = 1'-0"

0' 16' 64'



b boundary cmu wall section detail

SCALE: 1" = 1'-0"

0' 6" 2'

a2v consulting group
simplified by design

proprietary notice

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revision information

MARK	DATE	DESCRIPTION
01	04032020	site plan acoustic noise study rev1

drawing data

project no.	0013972
issue date:	04/13/2020
drawn by:	yogesh kanjee
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sheet notes

field measurement data
1. 67dBA
2. 64dBA
3. 69dBA
4. 58dBA
5. 57dBA
6. 69dBA
7. 52dBA
8. 56dBA
9. 54dBA
10. 59dBA

sheet title

site plan

sheet number

ac 101