



ACOUSTICAL ENGINEERING CONSULTANTS

## Exterior Noise Narrative for The Proposed San Jose Temple at 771 W Fremont Ave, Sunnyvale, CA 94087

Prepared for

Andrea Jagers  
NORR  
1631 Alhambra Blvd Suite 100  
Sacramento, CA, 95816

Prepared by

A handwritten signature in black ink, appearing to read 'Keenan Hye'.

Keenan Hye  
Consultant

A handwritten signature in black ink, appearing to read 'Brian R. Smith'.

Brian R. Smith, Principal  
INCE Board Certified

January 14, 2025  
23-0122



## Table of Contents

Summary .....	3
Noise Regulations & Standards .....	3
City of Sunnyvale 2011 General Plan, Noise Element .....	3
City of Sunnyvale Municipal Code Noise Ordinance .....	3
2022 California Building Code & California Green Building Standards Code (CALGreen).....	4
2022 Temple Design Guidelines – Acoustical .....	4
Site & Project Description .....	5
Exterior Acoustic Environment .....	6
Existing.....	6
Existing Plus Project .....	6
References .....	7
Appendix A.....	8



## Summary

The Church of Jesus Christ of Latter-day Saints is planning to construct a new San Jose California Temple replacing the existing temple at 771 W Fremont Ave in Sunnyvale, California. The project will include the addition of an outdoor generator, electrical transformers, and an air to water heat pump array. This document serves as an acoustical narrative for exterior noise control for the project; an official noise study including acoustical measurements at the project location is not included in AEC's scope of work for this project. This narrative includes analysis of significant noise sources both added by the project and currently existing in the surrounding area in relation to local regulations and the Church's 2022 Temple Design Guidelines. Limits are given for generator sound pressure levels and time of use to comply with local regulations and the Church's guidelines. A block wall surrounding the generator, transformers, and heat pump array will be sufficient in reducing their sound levels to meet local noise regulations. Exterior noise levels at the project are acceptable as outlined in this narrative.

## Noise Regulations & Standards

Local noise regulations for the City of Sunnyvale, CA are found in both the Noise Element of the city's 2011 General Plan (City of Sunnyvale, 2011) and the Noise Section 19.42.030 of the City of Sunnyvale Municipal Code (City of Sunnyvale, 2023). The Noise Element of the General Plan is used to assess the potential for noise impacts associated with transportation and non-transportation sources prior to a project approval while the Municipal Code is used to address existing noise sources and is applicable to the project once complete. The California Building Code and California Green Building Standards Code also give requirements for noise transmission to habitable and non-residential interior spaces (California Building Standards Commission, 2022). In addition to state and local regulations, the Church's 2022 Temple Design Guidelines contain exterior noise level limits to be considered (The Church of Jesus Christ of Latter-day Saints, 2022).

### *City of Sunnyvale 2011 General Plan, Noise Element*

Acoustic criteria contained in the Noise Element are based on the day-night average sound level ( $L_{dn}$ ) metric. The  $L_{dn}$  noise metric averages measured or predicted sound levels over 24-hours after applying a 10 dB penalty to sounds that occur during the nighttime hours of 10 PM to 7 AM. The penalty is applied because people trying to sleep during these hours are more sensitive to external sounds.

Figure 6-6 in Chapter 6 of the City of Sunnyvale 2011 General Plan contains exterior noise compatibility standards for various land uses in terms of  $L_{dn}$ . "Normally Acceptable" limits of 60 dBA and 70 dBA are given for the respective land uses of detached single-family homes and churches. Noise levels in exceedance of these limits require further review by the city. The land use of "church" is not changing, and future noise contours given in Figure 6-5 of the plan indicate compliance with the compatibility standards (see Figure 2 in Appendix A).

Additionally, Policy SN-9.2 is given as follows: "When new equipment is installed on a property, including new stationary noise sources (e.g., heating, ventilation, and air conditioning systems, generators, heating boilers) that could affect existing sensitive land uses, construction of enclosures or other screening materials should be installed around the stationary noise source such that equipment is in compliance with the city's operational noise code." New noise sources added by the project are required to comply with the municipal noise code limits given in the following section.

### *City of Sunnyvale Municipal Code Noise Ordinance*

The City of Sunnyvale's Noise Ordinance as given by section 19.42.030 of its Municipal Code gives the following residential and non-residential limits to adjacent land operational noise during daytime (between 7 AM and 10 PM) and nighttime (between 10 PM and 7 AM):



- Residential:
  - Daytime: 60 dBA
  - Nighttime: 50 dBA
- Non-residential:
  - Daytime: 70 dBA
  - Nighttime: 60 dBA

The limits are not to be exceeded at any time or any point on the property line. “Powered equipment” used on a temporary, occasional, or infrequent basis during daytime hours is exempt from these limits, though it is unclear if this would encompass generator testing or other operational noise. Noise from emergency utility repairs are exempt, but emergency use of a generator is not explicitly exempt.

*2022 California Building Code & California Green Building Standards Code (CALGreen)*

Section 5.507.4 of the California Green Building Standards Code (Cal Green) requires that buildings within transportation noise contours of 65 dBA CNEL or  $L_{dn}$  be required to evaluate the building shell to provide acceptable interior sound levels. The code offers two methods for meeting the interior sound level standard: a prescriptive method that stipulates a minimum building envelope composite STC rating of 50 (OITC 40) with exterior windows meeting a minimum STC rating of 40 (OITC 30), or a performance method where the interior environment must meet an hourly  $L_{eq}$  of 50 dBA in occupied areas during any hour of operation based on acoustical analysis. This project does fall within a 65 dBA  $L_{dn}$  contour per Figure 6-5 of the General Plan (see Figure 2 in Appendix A) and will use the performance method (Section 5.507.4.2) with this narrative serving as documentation of compliance (California Building Standards Commission, 2022).

*2022 Temple Design Guidelines – Acoustical*

The Church’s Temple Design Guidelines state that “identifiable long-term noise of a continuous nature”—explicitly noted to include HVAC equipment and generators—will not exceed 60 dBA at both the property line and the exterior wall of the temple. Additionally, the exterior wall of the temple must have a Sound Transmission Class (STC) rating of no less than STC 35-36. A summary of all applicable regulatory limits and design guidelines is given below in Table 1:

Land type	CA Title 24 Parts 2 (CBC) and 11 (CALgreen)	Sunnyvale Noise Element	Sunnyvale Noise Ordinance		Temple Design Guidelines (Temple sources)
			Daytime (7 AM – 10 PM)	Nighttime (10 PM – 7 AM)	
Residential	N/A*	N/A*	60 dBA $L_{eq-1hr}$ (exterior)	50 dBA $L_{eq-1hr}$ (exterior)	N/A
Non-residential, Temple	50 dBA $L_{eq-1hr}$ any hour of operation (interior)	70 dBA $L_{dn}$ (exterior)	70 dBA $L_{eq-1hr}$ (exterior)	60 dBA $L_{eq-1hr}$ (exterior)	60 dBA (at exterior wall & property line)

\*Applies to new residential projects impacted by transportation noise sources only

Table 1: Regulation Noise Limits & Guideline Exterior Noise Limits for the Project

## Site & Project Description

The new temple will be built on the existing temple lot at 771 W Fremont Ave. Figure 1 shows a map of the area surrounding the project site with relevant locations identified. The closest existing noise sources are W Fremont Ave directly to the south, CA Route 85 to the west and Interstate 280 further south. Residential properties surround the project location, with a school slightly further away to the northeast and another church across W Fremont Ave to the southeast.



Figure 1: Project Location and Relevant Nearby Noise Sources and Receivers



## Exterior Acoustic Environment

### *Existing*

Vehicle noise from W Fremont Ave, Route 85 and Interstate 280 are the primary existing sound sources in the surrounding area. Acoustical measurements were not performed for this narrative, and traffic counts were used to estimate traffic noise at the project location. Traffic volumes for CA-80 and I-280 were taken from CalTrans published data (California Department of Transportation, 2020). Though  $L_{dn}$  contours are available for W Fremont Ave, traffic counts were not available and were estimated based on nearby counts and these contours.

Noise estimates were made using the Federal Highway Administration (FHWA) Highway Noise Prediction Model (Barry & Reagan, 1978). As a conservative estimate, this model assumes freely flowing traffic, which is typical for relevant roadways outside of commuting times. Road visibility and ground conditions were considered in calculations of sound levels. The ground was assumed to be acoustically hard for automobiles, medium trucks, and heavy trucks. Significant reductions in road noise have occurred since development of the Highway Noise Prediction Model due to improved tire tread and road surface designs. Unfortunately, transportation noise model formulas have not been adjusted accordingly. Traffic noise estimation is thus conservative in nature and actual levels are likely lower than predicted. This can only be corroborated via acoustical measurements at the project location.

Traffic from all three sources is estimated to be similar, though traffic from W Fremont Ave is likely the primary noise source due to proximity. Combined traffic noise is estimated to be a  $L_{eq}$  of 70 dBA at the building facade during worst-case hours and will be lower than this in terms of  $L_{dn}$ . Contours given in Figure 6-5 of the plan (reproduced as Figure 2 in Appendix A) show a maximum predicted  $L_{dn}$  of 65 dBA for cumulative (future, 2035) conditions. The project does not change the land use of the site and meets the land use compatibility limits of 70 dBA  $L_{dn}$  given in the noise element.

### *Existing Plus Project*

The project will add a few new noise sources to the area including a generator, transformers, and a heat pump array. The generator is situated on the north side of the project site, about 50 feet away from the nearest property line to the north. The generator has its own sound-rated enclosure and is additionally surrounded by a 11'4" tall solid block wall. This wall exceeds the height of the generator and the diesel particulate filter mounted on top of it by 6" on all sides. The block wall enclosure has a door and acoustical louver for airflow (Kinetics Noise Control KCAL-2) on its south-facing side only. The enclosure will provide additional sound reduction past that provided by the generator enclosure. Routine testing of the generator will be restricted to daytime hours only to keep the property line noise limit at 60 dBA per the local noise regulations.

Generator requirements to achieve both regulations and the Church's design guidelines are as follows:

- Limit generator testing to occur only between the hours of 7 AM and 10 PM (daytime hours)
- Generator specifications must call for the generator and enclosure including exhaust silencer to not exceed 74 dBA as measured at 23 feet in any direction from the enclosure.

Outdoor electrical transformers are placed within two equipment yards on the north side of the project site. Each yard has one 500 kVA transformer with a specified sound pressure level of 56 dB at 1 meter and one 30 kVA transformer with a specified sound pressure level of 39 dB at 1 meter. The closest transformer is about 50 feet away from the nearest property line to the north. Given these sound levels, daytime and nighttime limits will be met with transformers in their current positions.

A pump yard is also located on the north side of the project site and contains an air to water heat pump array with (4) 40-ton modules. The heat pump array is about 7 feet tall and emits noise levels of 83 dBA at 1 meter. Sound is sourced primarily



from evaporator fans at the top of each module with the compressor sound component lower in level. The array is located about 50 feet away from the nearest adjacent residential property line to the north and is also surrounded by an 11'4" tall solid block wall. Levels from the heat pump array are expected to be 45 dBA at the property line including the effect of this wall, meeting daytime and nighttime limits (it is assumed the pumps would need to operate at night). Manufacturer sound attenuation options are available for the array that will reduce levels by 2 dBA but are not required to meet regulatory limits.

Additional mechanical and electrical equipment will be housed inside the building. AEC is not aware of any additional and significant sound sources being added to the exterior of this project other than those outlined above. If any exterior equipment is added or significantly changed to the project, alert AEC for an updated review of exterior noise implications.

Exterior transportation noise sources from the project falling within the 65 dBA  $L_{dn}$  contour transmitting to the interior of the temple will be attenuated by the exterior walls of the building, which consist of 10" thick concrete, an airgap with minimum 3" thick mineral wool insulation, and a stone veneer exterior finish layer. These exterior walls surpass the Church Guidelines' minimum STC rating of 35-36. Exterior glazing is expected have a buildup of two layers of minimum ¼" glass with a minimum of ½" airgap between them. Given this expected exterior construction, exterior levels will be sufficiently attenuated to reach the non-residential interior limits of 50 dBA during any hour of operation given in CalGreen.

## References

- Barry, T., & Reagan, J. (1978). *FHWA Highway Traffic Noise Prediction Model*. Washington, D.C.: Federal Highway Administration Office of Research, Office of Environmental Policy.
- California Building Standards Commission. (2022). 2022 California Building Code. Sacramento, CA.
- California Building Standards Commission. (2022). California Green Building Code. Sacramento, CA.
- California Department of Transportation. (2020). *Traffic Census Program*. Retrieved from Caltrans: <https://dot.ca.gov/programs/traffic-operations/census>
- City of Sunnyvale. (2011). *General Plan - July 2011*. Sunnyvale, CA: City of Sunnyvale.
- City of Sunnyvale. (2023). *City of Sunnyvale, CA Code of Ordinances*. Retrieved from eCode360: <https://ecode360.com/42730950>
- Menge, C., Rossano, C., Anderson, G., & Bajdek, C. (1998). *FHWA Traffic Noise Model Technical Manual*. Waltham, MA: U.S. Department of Transportation, Federal Highway Administration.
- The Church of Jesus Christ of Latter-day Saints. (2022). *2022 Temple Design Guidelines - Acoustical*. Intellectual Reserve, Inc.

# Appendix A

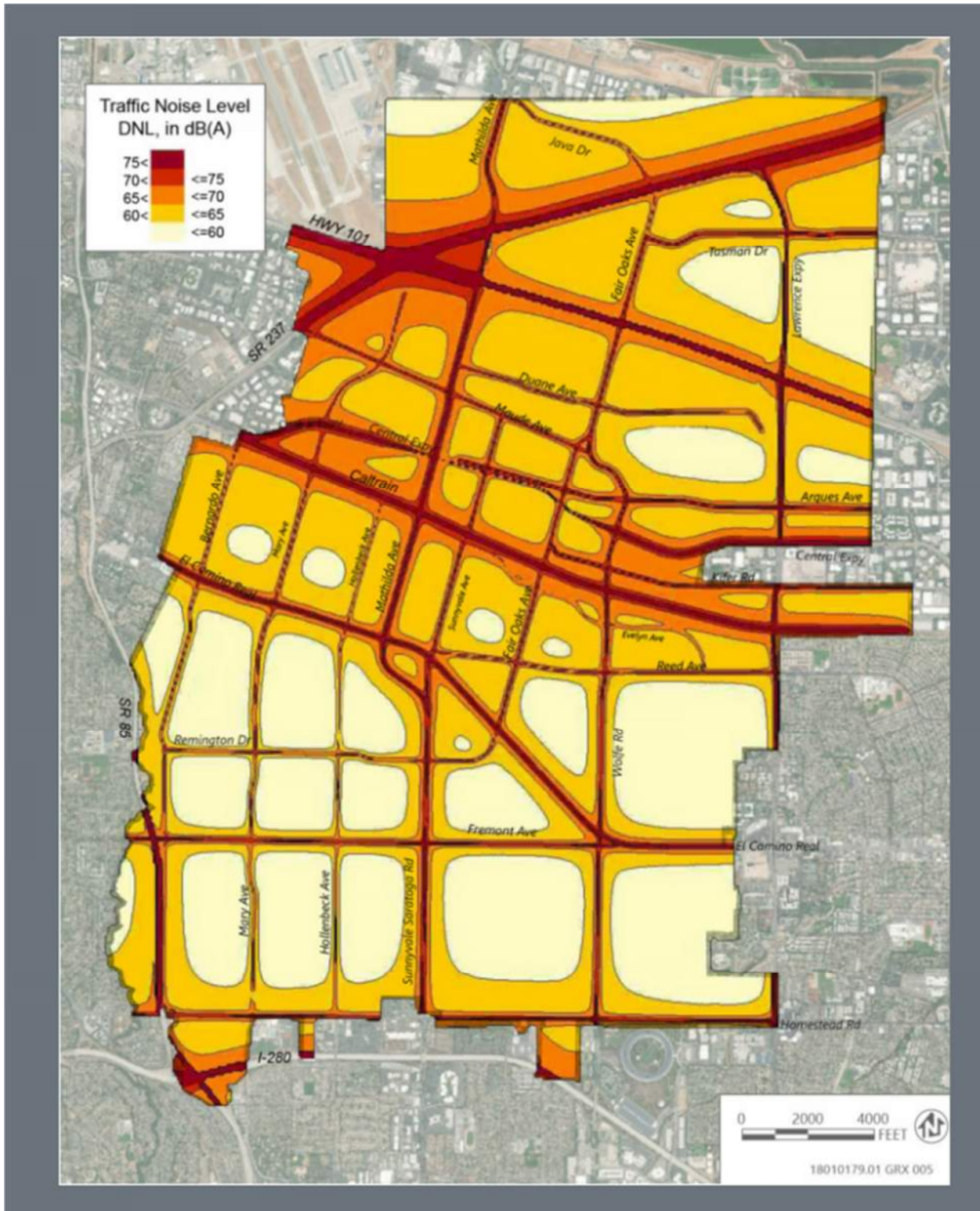


Figure 2: Future (2035) Noise Contours as Given in Figure 6-5 of the Sunnyvale General Plan