Appendix F

Noise and Vibration Assessment

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1150 WALSH AVENUE DATA CENTER - ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

Santa Clara, California

July 27, 2018

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INTRODUCTION

This report assesses the environmental noise and vibration impacts resulting from the construction and operation of the proposed Data Center project located at 1150 Walsh Avenue in Santa Clara, California.

The report is divided into two sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; and 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to mitigate impacts to a less than significant level.

PROJECT DESCRIPTION

The 3.32-acre project site is located in the City of Santa Clara (Santa Clara), in the Silicon Valley area of the larger San Francisco Bay Area region. The project site is within Santa Clara north of Highway US 101 and east of Mineta San Jose International Airport. Land use designations surrounding the project site consists of light industrial, public/quasi-public, and low intensity office/research and development uses. The project site is zoned Heavy Industrial (MH).

Surrounding development consists of one-to-two-story office and industrial buildings to the north, east, and west. Other nearby land uses include a US Post Office, wholesale retailers, and a rental car agency. Buildings are generally set back from the street by landscaping areas, fencing and surface parking. Street trees occur intermittently throughout the area, often breaking up the views of existing buildings from the street.

Sal's Airport and Limousine service occupies the lot immediately west of the project site while Sunlight Concepts (a solar lighting fixture dealership) and XL Vehicle Graphics and Digital Prints (a custom signage business) occupy the building located immediately to the east of the project site. The US Post Office is located north of the project site, across Walsh Avenue.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn}/CNEL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12 to 17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57 to 62 dBA L_{dn}/CNEL with open windows and 65 to 70 dBA L_{dn}/CNEL if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, and those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} or CNEL as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn}/CNEL. At an L_{dn}/CNEL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn}/CNEL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between an L_{dn}/CNEL of 60 to 70 dBA. Between an L_{dn}/CNEL of 70 to 80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn}/CNEL is 60 dBA, approximately 30 to 35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of 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. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting 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 frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reactions of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background - Noise

The State of California and the City of Santa Clara have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) Exposure of 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;

(b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within 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, if the project would expose people residing or working in the project area to excessive noise levels; or

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn}/CNEL or greater would be considered significant where exterior noise levels would exceed the compatible noise level standard (60 dBA L_{dn}/CNEL for residential land uses and 70 dBA L_{dn}/CNEL for industrial land uses). Where noise levels would remain at or below the compatible noise level standard with the project, noise level increases of 5 dBA L_{dn}/CNEL or greater would be considered significant.

The project is not located within the vicinity of a private airstrip and would not be anticipated to expose people residing or working in the project area to excessive noise levels. Checklist item (f) is not carried further in this analysis.

2016 California Green Building Standards Code (Cal Green Code). The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). Section 5.507 states that either the prescriptive (Section 5.507.4.1) or the performance method (Section 5.507.4.2) shall be used to determine environmental control at indoor areas. The prescriptive method is very conservative and not practical in most cases; however, the performance method can be quantitatively verified using exterior-to-interior calculations. For the purposes of this report, the performance method is utilized to determine consistency with the Cal Green Code. Both of the sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies making up the building envelope that are exposed to the noise source shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, wall and roof-ceiling assemblies making up the building envelope and exposed to the noise source shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan. The Comprehensive Land Use Plan adopted by the Santa Clara County Airport Land Use Commission (ALUC) contains standards for projects within the vicinity of San José International Airport which are relevant to this project:

4.3.2 Noise Compatibility

The objective of noise compatibility criteria is to minimize the number of people exposed to frequent and/or high levels of aircraft noise.

4.3.2.1 Policies

N-1 The Community Noise Equivalent Level (CNEL) method of representing noise levels shall be used to determine if a specific land use is consistent with the CLUP.

N-2 In addition to the other policies herein, the Noise Compatibility Policies presented in Table 4-1 shall be used to determine if a specific land use is consistent with this CLUP.

N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5.

N-4 No residential or transient lodging construction shall be permitted within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of a mixed use residential project or a multi-unit residential project. (Sound wall noise mitigation measures are not effective in reducing noise generated by aircraft flying overhead.)

N-5 All property owners within the Airport Influence Area who rent or lease their property for residential use shall include in their rental/lease agreement with the tenant, a statement advising that they (the tenants) are living within a high noise area and the exterior noise level is predicted to be greater than 65 dB CNEL in a manner that is consistent with current state law including AB2776 (2002).

N-6 Noise level compatibility standards for other types of land uses shall be applied in the same manner as the above residential noise level criteria. Table 4-1 presents acceptable noise levels for other land uses in the vicinity of the Airport.

N-7 Single-event noise levels (SENL) from single aircraft overflights are also to be considered when evaluating the compatibility of highly noise-sensitive land uses such as schools, libraries, outdoor theaters, and mobile homes. Single-event noise levels are especially important in the areas regularly overflown by aircraft, but which may not produce significant CNEL contours, such as the down-wind segment of the traffic pattern, and airport entry and departure flight corridors.

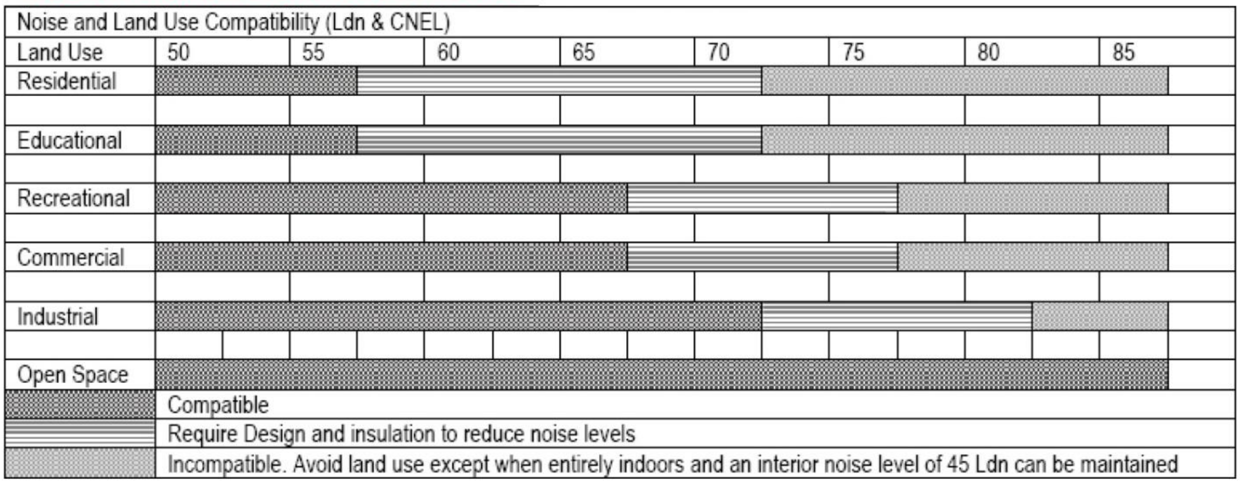
Table 4 - 1 NOISE COMPATIBILITY POLICIES

LAND USE CATEGORY	CNEL					
	55-60	60-65	65-70	70-75	75-80	80-85
Residential – low density Single-family, duplex, mobile homes	*	**	***	****	****	****
Residential – multi-family, condominiums, townhouses	*	**	***	****	****	****
Transient lodging - motels, hotels	*	*	**	****	****	****
Schools, libraries, indoor religious assemblies, hospitals, nursing homes	*	***	****	****	****	****
Auditoriums, concert halls, amphitheaters	*	***	***	****	****	****
Sports arena, outdoor spectator sports, parking	*	*	*	**	***	****
Playgrounds, neighborhood parks	*	*	***	****	****	****
Golf courses, riding stables, water recreation, cemeteries	*	*	*	**	***	****
Office buildings, business commercial and professional, retail	*	*	**	***	****	****
Industrial, manufacturing, utilities, agriculture	*	*	*	***	***	****
* Generally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. Mobile homes may not be acceptable in these areas. Some outdoor activities might be adversely affected.					
** Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Outdoor activities may be adversely affected. Residential: Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.					
*** Generally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor activities are likely to be adversely affected.					
**** Unacceptable	New construction or development shall not be undertaken.					

Source: Based on General Plan Guidelines, Appendix C (2003), Figure 2 and Santa Clara County ALUC 1992 Land Use Plan, Table 1.

City of Santa Clara General Plan. The City of Santa Clara's General Plan identifies noise and land use compatibility standards for various land uses and establishes policies to control noise within the community. Table 5.10-2 from the General Plan shows acceptable noise levels for various land uses. Industrial land uses are considered compatible in noise environments of 70 dBA L_{dn}/CNEL or less. The guidelines state that where the exterior noise levels are greater than 70 dBA L_{dn}/CNEL and less than 80 dBA L_{dn}/CNEL, the design of the project should include measures to reduce interior noise to acceptable levels. Exterior noise levels exceeding 80 dBA L_{dn}/CNEL at industrial land uses are considered incompatible. Industrial land uses proposed in noise environments exceeding 80 dBA L_{dn}/CNEL should generally be avoided, except when the use is entirely indoors and where interior noise levels can be maintained at 45 dBA L_{dn}/CNEL or less.

TABLE 5.10-2: GENERAL PLAN NOISE STANDARDS



Applicable goals and policies presented in the General Plan are as follows:

5.10.6-G1 Noise sources restricted to minimize impacts in the community.

5.10.6-G2 Sensitive uses protected from noise intrusion.

5.10.6-G3 Land use, development and design approvals that take noise levels into consideration.

5.10.6-P1 Review all land use and development proposals for consistency with the General Plan compatibility standards and acceptable noise exposure levels defined on Table 5.10-1.

5.10.6-P2 Incorporate noise attenuation measures for all projects that have noise exposure levels greater than General Plan "normally acceptable" levels, as defined on Table 5.10-1.

5.10.6-P3 New development should include noise control techniques to reduce noise to acceptable levels, including site layout (setbacks, separation and shielding), building treatments (mechanical ventilation system, sound-rated windows, solid core doors and baffling) and structural measures (earthen berms and sound walls).

5.10.6-P4 Encourage the control of noise at the source through site design, building design, landscaping, hours of operation and other techniques.

5.10.6-P5 Require noise-generating uses near residential neighborhoods to include solid walls and heavy landscaping along common property lines, and to place compressors and mechanical equipment in sound-proof enclosures.

5.10.6-P6 Discourage noise sensitive uses, such as residences, hospitals, schools, libraries, and rest homes, from areas with high noise levels, and discourage high noise generating uses from areas adjacent to sensitive uses.

5.10.6-P7 Implement measures to reduce interior noise levels and restrict outdoor activities in areas subject to aircraft noise in order to make Office/Research and Development uses compatible with the Norman Y. Mineta International Airport land use restrictions.

City of Santa Clara Municipal Code. The City's Municipal Code establishes noise level performance standards for fixed sources of noise. Section 9.10.40 of the Municipal Code limits noise levels at multi-family residences to 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA at night (10:00 p.m. to 7:00 a.m.). Noise levels at light industrial land uses are limited to 70 dBA. If the measured ambient noise level at any given location differs from those levels set forth above, the allowable noise exposure standard shall be adjusted in five dBA increments in each category as appropriate to encompass or reflect the ambient noise level.

The noise limits are not applicable to the performance of emergency work, including the operation of emergency generators and pumps or other equipment necessary to provide services during an emergency, licensed outdoor events, City-owned electric, water, and sewer utility system facilities, construction activities occurring within allowable hours, permitted fireworks displays, or permitted heliports.

Construction activities are not permitted within 300 feet of residentially zoned property except within the hours of 7:00 a.m. and 6:00 p.m. on weekdays and 9:00 a.m. and 6:00 p.m. on Saturdays. No construction is permitted on Sundays or holidays.

The City Code does not define the acoustical time descriptor such as L_{eq} (the average noise level) or L_{max} (the maximum instantaneous noise level) that is associated with the above limits. A reasonable interpretation of the City Code would identify the ambient base noise level criteria as an average or median noise level (L_{eq}/L_{50}).

Existing Noise Environment

The project site is located at south of highway US-101 on Walsh Avenue between Lafayette Street and Scott Boulevard. As shown in Figure 1, the area surrounding the project site is industrial. The closest residential area is 0.4 miles from the project boundary. The Norman Y. Mineta San José International Airport is located to the east of the project site.

In order to quantify and characterize ambient noise levels at the site, a noise monitoring survey was performed in the project vicinity between Wednesday, April 11, 2018 and Friday, April 13, 2018. The survey included two long-term measurements (LT-1 and LT-2) and three short-term measurements (ST-1, ST-2, and ST-3), as shown in Figure 1. The predominant sources of noise in the project vicinity included traffic on Walsh Avenue and intermittent noise from aircraft associated with San Jose International Airport. The daily trends in noise levels at LT-1 and LT-2 are shown in Figure 2 and 3. The results for short-term measurements are summarized in Table 4.

FIGURE 1 Noise Measurement Locations

Long-term measurement LT-1 was made at 1150 Walsh Avenue, approximately 30 feet from centerline of Walsh Avenue. Hourly average noise levels at this location typically ranged from 62 to 72 dBA L_{eq} during day, and 56 to 69 dBA L_{eq} during night. The community noise equivalent level on Thursday, April 12, 2018 was 71 dBA CNEL.

Long-term measurement location LT-2 was made at the south of the site, approximately 520 feet from Walsh Avenue. Hourly average noise levels at this location typically ranged from 59 to 67 dBA L_{eq} during the day, and 52 to 62 dBA L_{eq} at night. The community noise equivalent level on Thursday, April 12, 2018 was 64 dBA CNEL.

TABLE 4 Summary of Short-Term Noise Measurements (dBA)

ID	Location (Date, Start Time)	Measured Noise Levels, dBA				Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	345 feet south of Walsh Avenue, 15 feet from east project boundary (4/11/18, 12:40 p.m.)	64	57	54	60	Traffic on Walsh Avenue, intermittent noise from propeller and jet planes, mechanical equipment (53 dBA)
ST-2	390 feet from Walsh Avenue, 180 feet from west project boundary (4/11/18, 01:00 p.m.)	53	45	46	51	Traffic on Walsh Avenue, pick-up trucks nearby, mechanical equipment (45 dBA)
ST-3	West side of site, 130 feet south of Walsh Avenue (4/13/18, 11:40 p.m.)	64	57	53	61	Intermittent noise from propeller and jet planes, mechanical equipment (51 dBA)

FIGURE 2 Daily Trend in Noise Levels at LT-1

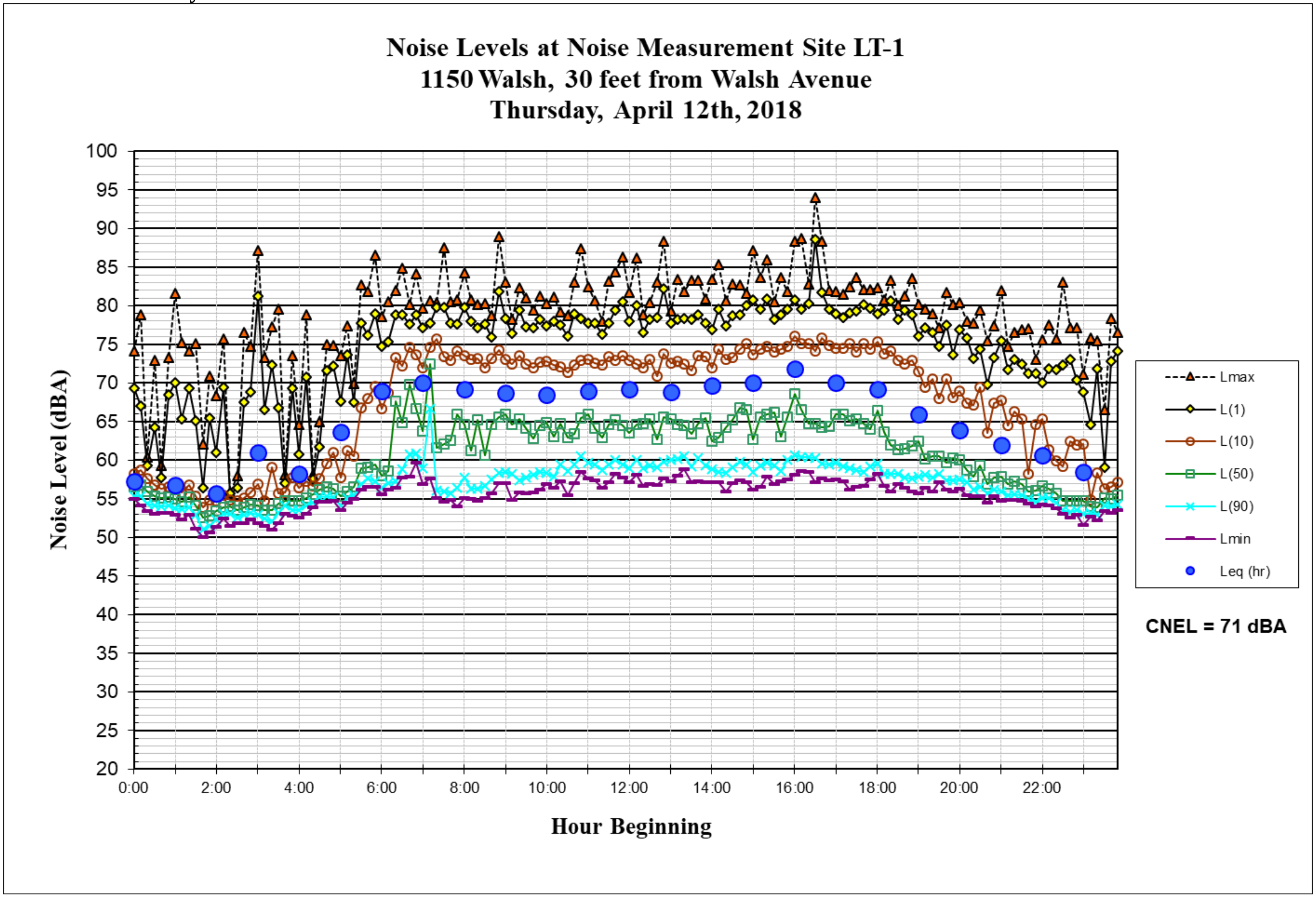
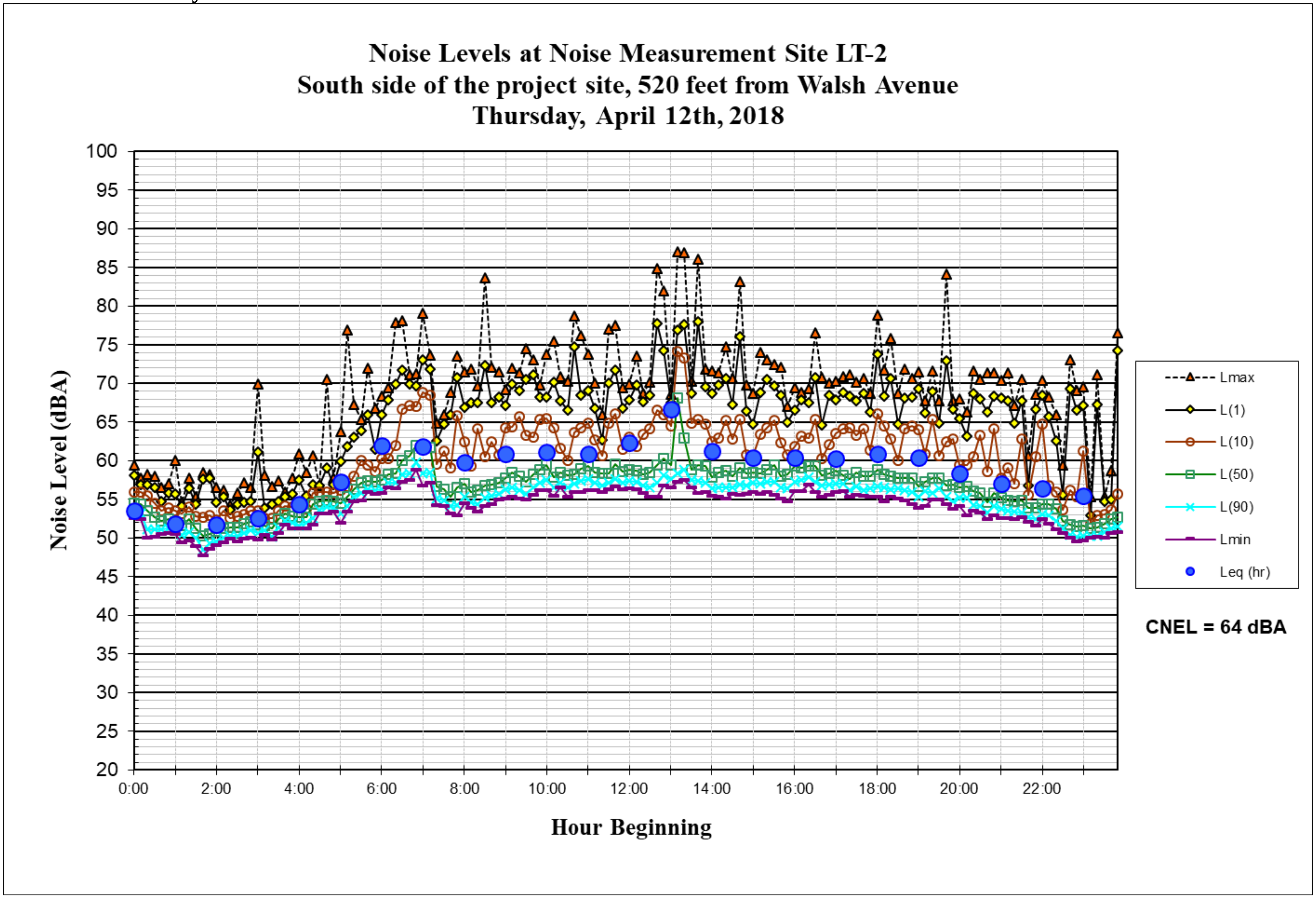


FIGURE 3 Daily Trend in Noise Levels at LT-2



NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Noise and Land Use Compatibility:** A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.
    - For non-residential land uses, the Cal Green Code[1] requires interior noise levels to be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation in noise sensitive spaces such as offices.
    - The Santa Clara Municipal Code[2] requires that exterior noise levels at light-industrial land uses are maintained at or below 70 dBA, and at residential uses at or below 55 dBA during the daytime and 50 dBA during the nighttime.
- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Ground-borne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings (see Table 3).
- **Permanent Noise Increases:** A significant impact would be identified if traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater where the future noise level is compatible in terms of noise and land use compatibility, or b) the noise level increase is 3 dBA CNEL or greater where the future noise level exceeds the compatibility threshold.
- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. At commercial uses, hourly average noise levels exceeding 70 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase. If approved residential uses in the project vicinity are occupied during project construction, hourly average noise levels exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase. Industrial land uses are not considered noise-sensitive and would not be subject to temporary construction noise regulations.

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[1] 5.507.4.2 *Performance Method*, Section 5.507 *Environmental Comfort*; 2016 California Green Buildings Standards Code; CBSC, July 2016.
[2] 9.10.040 *Noise or Sound Regulation*, Chapter 9.10 *Regulation of Noise and Vibration*, Santa Clara City Code, October 2015.

Impact 1: **Noise and Land Use Compatibility.** Noise levels experienced at the data center would be considered compatible with the City of Santa Clara General Plan. Standard office construction methods will adequately reduce noise levels indoors to meet the CALGreen Building Code. **This is a less-than-significant impact.**

The proposed land use is categorized as heavy industrial and is not considered sensitive to noise. There are no noise sensitive exterior areas on the project site. Noise levels at the exterior façades of the data center building would be 64 to 70 dBA CNEL, with the highest noise levels occurring at the northern façade facing Walsh Avenue. Therefore, the exterior environment would be considered compatible with City's 70 dBA CNEL compatibility threshold for industrial land uses.

Some interior areas on level one in the northwestern part of the proposed data center building are proposed as conference and open office space use. The CalGreen Building Code requires interior noise levels to be maintained at 50 dBA $L_{eq(1-hr)}$ or less during hours of operation in rooms sensitive to noise. A review of hourly average exterior noise levels measured at the site indicates that exterior levels typically range from 66 to 70 dBA dBA $L_{eq(1-hr)}$ and occasionally reach 72 dBA $L_{eq(1-hr)}$. The building will be provided with forced-air mechanical ventilation, allowing occupants the option of closing windows to control noise. Standard industrial building construction with windows closed provides approximately 25 dBA of noise reduction in interior spaces. As a result, interior hourly average noise levels from exterior environmental noise sources would typically be 41 to 45 dBA $L_{eq(1-hr)}$, with levels occasionally reaching 47 dBA $L_{eq(1-hr)}$. Noise levels are compatible with the proposed use, and this would be a **less-than-significant impact**.

Mitigation Measures: **None Required.**

Impact 2: **Exposure to Excessive Ground-borne Vibration due to Construction.** Existing structures in the vicinity of the project could be exposed to excessive vibration from project construction. **This is a potentially significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include demolition, site preparation, grading and excavation, trenching, building (exterior), interior/ architectural coating and paving. Pile driving is anticipated for construction of the building foundation.

To avoid structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings that are structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. This analysis assumes that buildings adjoining the site were constructed prior to the 1990s and are structurally sound.

Therefore, ground-borne vibration levels exceeding the conservative 0.3 in/sec PPV limit would have the potential to result in a significant vibration impact.

Table 5 presents typical vibration levels that could be expected from construction equipment at distances of 25 feet and 20 feet. The use of pile drivers, and to a lesser extent other construction equipment, would require some attention to ensure that nearby structures are sufficiently protected. Impact pile driving, if used, has the potential of generating the highest ground vibration levels and is of primary concern to structural damage, particularly when it occurs within 100 feet of structures. Vibratory pile driving is of concern when it would occur within 60 feet of structures. Vibration levels generated by pile driving activities would vary depending on project conditions such as soil conditions, construction methods, and equipment used.

Other project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may also potentially generate substantial vibration in the immediate vicinity. Erection of the building structure is not anticipated to be a source of substantial vibration with the exception of sporadic events such as dropping of heavy objects, which should be avoided to the extent possible. Jackhammers typically generate vibration levels of 0.035 inches/sec PPV and drilling typically generates vibration levels of 0.09 inches/sec PPV at a distance of 25 feet.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)	Calculated PPVat 20 ft. (VdB)[1]
Pile Driver (Impact)	upper range	1.158	112	1.618
	typical	0.644	104	0.900
Pile Driver (Sonic)	upper range	0.734	105	1.026
	typical	0.17	93	0.238
Clam shovel drop		0.202	94	0.077
Hydromill (slurry wall)	in soil	0.008	66	0.011
	in rock	0.017	75	0.024
Vibratory Roller		0.210	94	0.080
Hoe Ram		0.089	87	0.034
Large bulldozer		0.089	87	0.034
Caisson drilling		0.089	87	0.034
Loaded trucks		0.076	86	0.029
Jackhammer		0.035	79	0.013
Small bulldozer		0.003	58	0.001

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

[1]These levels calculated assuming normal propagation conditions, using a standard equations of *PPVeqmt-PPVref * (25/D) 1.5*, from FTA, May 2006.

Construction activities are anticipated to last 25-months. Construction of the substation would take up to 10 months. However, construction vibration would only be substantial at adjacent land uses during pile driving activities or when heavy construction is located adjacent to structures. The nearest buildings to the proposed data center building are 1180 Walsh Avenue building located about 20 feet to the northwest of the proposed data center building and industrial and office use building located 20 feet to the east of the project site. At these distances, construction related vibration levels from all sources except pile driving are calculated to be below 0.3 in/sec PPV impact threshold (see Table 5). Vibration levels at these buildings to the east and northwest of the site at a distance of 20 feet could reach 1.618 in/sec PPV from impact pile driving and 1.026 in/sec PPV from vibratory pile driving, with typical levels in the range of about 0.9 in/sec PPV for impact pile driving and 0.238 in/sec for vibratory pile driving. Vibration levels at distances greater than 100 feet from impact pile driving or 60 feet from vibratory pile driving would be anticipated to be below the 0.3 in/sec PPV threshold under upper range and typical conditions. Vibratory rollers if used in the paving phase would generate vibration levels of 0.4 in/sec PPV at 1180 Walsh Avenue building, 15 feet northwest of the project site. Vibration levels would be lower at structures located further from construction.

Vibration levels at the 1519 Walsh Avenue building, located 220 feet northwest of the proposed building, would be below 0.3 in/sec PPV from all construction activity, including potential pile driving. However, vibration levels from impact pile driving activities at the adjacent building to the northwest and to the east would have the potential to cause architectural and structural damage. This would be a **potentially significant impact**.

Mitigation Measures:

The following measures, in addition to the best construction practices specified in Impact 5, are recommended to reduce vibration impacts from construction activities:

- Avoid impact pile driving where possible. Drilled piers or rammed aggregate piers cause lower vibration levels where geological conditions permit their use.

- A list of all heavy construction equipment to be used for this project and the anticipated time duration of using the equipment that is known to produce high vibration levels (clam shovel drops, vibratory rollers, hoe rams, large bulldozers, caisson drillings, loaded trucks, jackhammers, etc.) shall be submitted by the contractor. This list shall be used to identify equipment and activities that would potentially generate substantial vibration and to define the level of effort required for continuous vibration monitoring. Use of heavy vibration-generating construction equipment within 25 feet of any adjacent building should be avoided, where possible.

- A construction vibration monitoring plan shall be implemented to document conditions prior to, during, and after vibration generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry-accepted standard methods. The construction vibration monitoring plan should be implemented to include the following tasks:

    - Identification of the sensitivity of nearby structures to groundborne vibration. Vibration limits should be applied to all vibration-sensitive structures located within 100 feet of any pile driving activities and 25 feet of other construction activities identified as sources of high vibration levels.

- Performance of a photo survey, elevation survey, and crack monitoring survey for each structure of normal construction within 100 feet of pile driving activities and/or within 25 feet of other construction activities identified as sources of high vibration levels. Surveys shall be performed prior to any construction activity, in regular interval during construction, and after project completion, and shall include internal and external crack monitoring in structures, settlement, and distress, and shall document the condition of foundations, walls and other structural elements in the interior and exterior of said structures.

- Development of a vibration monitoring and construction contingency plan to identify structures where monitoring would be conducted, set up a vibration monitoring schedule, define structure-specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies would be identified for when vibration levels approached the limits.

- At a minimum, vibration monitoring should be conducted during pavement demolition, excavation, and pile driving activities. Monitoring results may indicate the need for more or less intensive measurements.

- If vibration levels approach limits, suspend construction and implement contingencies to either lower vibration levels or secure the affected structures.

- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

- Conduct post-survey on structures where either monitoring has indicated high levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of construction activities.

- The results of all vibration monitoring shall be summarized and submitted in a report shortly after substantial completion of each phase identified in the project schedule. The report will include a description of measurement methods, equipment used, calibration certificates, and graphics as required to clearly identify vibration-monitoring locations. An explanation of all events that exceeded vibration limits will be included together with proper documentation supporting any such claims.

The implementation of these mitigation measures would reduce the impact to a **less-than-significant** level.

Impact 3: **Project-Generated Traffic Noise.** The proposed project would not result in a permanent traffic noise level increase at noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant impact would occur if the permanent noise level increase due to project-generated traffic was 3 dBA CNEL or greater at noise-sensitive receptors for existing levels exceeding 55 dBA CNEL or was 5 dBA CNEL or greater for existing levels at or below 55 dBA CNEL. For reference, a 3 dBA CNEL noise increase would be expected if the project would double existing traffic volumes along a roadway and a 5 dBA CNEL noise increase would be expected if the project would triple existing traffic volumes along a roadway.

Residential land uses, located 0.5 miles to the south of the project site would be considered the nearest noise-sensitive receptors to the project site. With the exception of a few employees, the data center would not generate traffic, and therefore, there would be no measurable increase in the CNEL along local roadways in the vicinity of the project. This is a **less-than-significant** impact.

Mitigation Measures: None required.

Impact 4: **Mechanical Equipment Noise.** The proposed project would not generate noise levels in excess of the City's standards for fixed sources of noise. **This is a less-than-significant impact.**

The proposed project would include rooftop mechanical equipment and emergency generators. The predominant source of rooftop mechanical equipment would be 18 cold water chillers, which would operate continuously. All rooftop equipment would be shielded by a parapet wall and screen wall, which result in a total height of 14 feet above the top of the roof slab. Eleven backup diesel generators would provide emergency power to the data center in case of power outages and would comprise of ten 3.25 MW and one 1 MW standby emergency generator. The generators would be located on the ground floor at the southeast side of the building. Each generator would be enclosed and the generator area would be surrounded by a 30 foot high acoustical barrier. Substation transformers would be located to the west of the main building. Other mechanical and electrical equipment located inside the building would not be anticipated to emit audible noise outside. Under the City of Santa Clara Municipal Code, noise generated by non-emergency fixed sources of noise would be restricted to 70 dBA at nearby industrial land uses. The noise limits at residences would be 55 dBA during the daytime and 50 dBA at night.

Noise from the rooftop equipment and emergency generators was analyzed using SoundPLAN, version 8.0. Data provided by the project applicant included project plans showing equipment locations and heights, mechanical equipment screen heights, and building geometry. Rooftop equipment was assumed to generate noise levels of 85 dBA at 20 feet based on similar data center facilities in Santa Clara. Noise data for the 3.25 MW Cummins C3250 D6e and 1 MW Cummins generator was used for the analysis. Based on manufacturer's data, an unhoused or unenclosed Cummins generator would produce 99 dBA L_{eq} at 23 feet. Based on the project plans, dated July 6, 2018, generators would be housed in individual acoustic enclosures. According to the data provided by enclosure manufacturer, a generator housed inside an acoustic enclosure would generate a noise level of 70 dBA L_{eq} at 23 feet.[3] Generator testing will be biweekly under no load conditions and monthly under full load for 30 minutes at a time. An integrated systems test would include running at least five generators under full load and two generators under partial load. An integrated systems test would take place over one day. This testing schedule complies with the guideline to operate each generator for up to 50 hours per year, as suggested by the Bay Area Air Quality Management District (BAMD). Mechanical

[3] 23 feet or 7 meters is a standard distance at which manufacturers usually provide sound pressure levels.

equipment noise levels were calculated for the worst-case condition at the property lines of the nearest existing industrial and commercial uses to the east and north of the proposed site, and at residential uses located about ½ mile south of the site.

The exterior noise levels resulting from simultaneous operation of 18 rooftop chillers (located on the main data center building) at the industrial buildings (1519 Walsh Avenue and USPS building) to the north of proposed data center would be 50 dBA L_{eq}. The garage area of the industrial building to the east (1130 Walsh Avenue) would be exposed to 55 dBA L_{eq} and the residences to the southwest would be exposed to 42 dBA L_{eq}. The setback of rooftop equipment and the shielding provided by the rooftop parapet wall and mechanical equipment screens would result in noise levels below the noise level limits provided that the selected equipment, locations, and barriers are carried through the design process. These levels are below the City's "compatible" noise level threshold for industrial and residential use areas.

The municipal code states that noise limits set forth in the code are not applicable to the performance of emergency work, including the operation of emergency generators and pumps or other equipment necessary to provide services during an emergency. However, the City has applied the noise limits to testing of the standby generators for previous data center buildings in the City. Under the assumption that generator enclosures would provide enough acoustical shielding to produce 70 dBA L_{eq} noise level at 23 feet, one or two generators being tested simultaneously would not result in any increase in the ambient noise levels resulting from operation of rooftop chillers. In a worst-case scenario of integrated systems testing or when all eleven generators would be operational, the noise level at the garage area of 1130 Walsh Avenue would be exposed to 57 dBA L_{eq} at approximately 75 feet from the generators.

The noise exposure levels are below the City's allowable exterior levels of 70 dBA L_{eq} at industrial uses, and 55 dBA daytime L_{eq} at residences. This is a **less-than-significant** impact.

Mitigation Measures: **None required.**

Impact 5: **Substantial Temporary Noise Increase due to Construction.** Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less than significant impact**.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time. Project construction is anticipated to occur over an approximate period of 25 months. However, noise would be generated during only a portion of this period, as interior construction activities would not be anticipated to generate substantial noise.

As discussed in the Fundamentals section of this report, thresholds for speech interference indoors is 45 dBA. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year. Industrial land uses, such as the buildings adjacent to the site on the south, east and west of proposed data center are not considered noise-sensitive and would not be subject to temporary construction noise regulations.

Construction activities for individual projects are typically carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 7 and 8. Table 7 shows the average noise level ranges, by construction phase, and Table 8 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls within the range of 80 to 90 dBA at a distance of 50 feet from the site.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

- Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 8 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)1,2	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

1 Measured at 50 feet from the construction equipment, with a “slow” (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

Construction activities would include demolition, site preparation, grading and excavation, trenching, building (exterior), interior/ architectural coating and paving. Pile driving, which has the highest potential of generating noise impacts, is anticipated for construction of the building foundation.

Hourly average noise levels due to construction activities during busy construction periods outdoors would typically range from about 75 to 87 dBA L_{eq} at a distance of 50 feet. Impact pile driving would generate maximum noise levels of up to about 101 dBA L_{max} at a distance of 50 feet, with an hourly average noise level of 95 dBA L_{eq}. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor.

The closest residences are located about ½ mile to the southwest of the site, with significant shielding from intervening structures. Noise levels are these residences are not anticipated to be distinguishable from other ambient noise sources. Commercial office uses include the 1180 Walsh Avenue, US Post Office and offices located on the far side of the adjacent building to the east. Sal's Limo Service (1180 Walsh Avenue) is located 15 feet northwest of the proposed building. The US Post Office building is located 300 feet to the north of the proposed site across Walsh Avenue. The industrial building 1180 Walsh Avenue is located 20 feet northwest from the closest potential pile driving location, and approximately 200 feet from the center of the project site. At this distance, hourly average noise levels during busy construction periods would range from 67 to 79 dBA L_{eq} when construction is located near the northern property line, 63 to 75 dBA L_{eq} when construction is located near the center of the site, and 87 dBA L_{eq} during pile driving activity. Maximum instantaneous noise levels during pile driving could occasionally reach 93 dBA L_{max} at the eastern façade of 1180 Walsh Avenue building. Ambient daytime noise levels at this location, represented by LT-1 and ST-3, ranged from 61 to 63 dBA L_{eq}. Construction noise at 1180 Walsh Avenue and 1130 Walsh Avenue would exceed 70 dBA L_{eq} and the ambient noise environment by at least 5 dBA L_{eq} occasionally during periods of heavy construction and during pile driving activity. Offices located on the far side of the 1130 Walsh Avenue building to the east are provided substantial shielding from the building itself and would not be anticipated to experience construction noise levels exceeding 70 dBA L_{eq} at the eastern building façade except during periods of pile driving. The period over which construction noise would exceed applicable thresholds would not be expected to exceed one year at any adjacent noise sensitive location.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. The following construction best management practices would reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- A temporary noise control blanket barrier could be erected, if necessary, along building facades facing construction sites. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling. Noise control blanket barriers can be rented and quickly erected.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers’ radios to a point where they are not audible at existing residences bordering the project site.

- Evaluate alternatives to driven piles for the foundation, such as drilled piers (caissons) with mat slabs over top or rammed aggregate piers.

- If pile driving is necessary, pre-drill foundation pile holes to minimize the number of impacts required to seat the pile.

- If pile driving is necessary, consider the use of “acoustical blankets” for receptors located within 100 feet of the site.

- If pile driving is necessary, consider the use of a noise attenuating shroud on the pile driving hammer.

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

Implementation of the above best management practices would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures and recognizing that noise generated by construction activities would occur over a temporary period, the impact would be **less-than-significant**.

Mitigation Measures: **None Required.**

Impact 6: **Noise and Land Use Compatibility (Aircraft).** The proposed project would be located in a compatible noise environment with respect to noise generated by Norman Y. Mineta International Airport. **This is a less-than-significant impact**.

Norman Y. Mineta International Airport is a public-use airport located approximately 1 mile east of the project site. Although aircraft-related noise is occasionally audible at the project site, noise from aircraft would not substantially increase ambient noise levels. The project site lies outside the 65 dBA CNEL 2017 and 2027 noise contours shown in the Norman Y. Mineta International Airport Master Plan Update Project report published in February 2010 as an addendum to the Environmental Impact Report. Exterior and interior noise levels resulting from aircraft would be compatible with the proposed project. This is a **less-than-significant impact**.

Mitigation Measures: **None Required.**

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August 24, 2018

Andrew Metzger
Associate Planner, Circlepoint
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VIA E-Mail: a.metzger@circlepoint.com

SUBJECT: 1150 Walsh Avenue Data Center, Santa Clara, CA
Noise Analysis of Updated Project Information

Dear Andrew:

This letter presents the results of our analysis assessing operational noise impacts at sensitive receptors near the project site located at 1150 Walsh Data Center in Santa Clara, CA. The Environmental Noise and Vibration Assessment, dated July 27th, 2018, assesses the impacts resulting from the testing of ten Cummins C3250 D6e backup generators and one smaller Cummins generator. Kohler KD3250 and MTU DS3250 generators have now been proposed as alternatives to the Cummins 3.25 MW generator and MTU DS1000 1 MW generator has been proposed as an alternative to Cummins 1 MW generator. This letter assesses potential noise impacts due to the testing of the Kohler generator alternatives.

Backup Generator Noise Levels

The project would include rooftop mechanical equipment and emergency generators. Rooftop equipment, which would operate continuously, was assessed previously in the July 27th, 2018 Environmental Noise and Vibration Analysis. Eleven backup generators, comprising of ten 3.25 MW generators and one 1 MW generator would be installed on the ground floor at the southeast side of the building. Each generator would be enclosed and the generator area would be surrounded by a 30 foot high acoustical barrier. Each generator would be tested biweekly under no load conditions and monthly under full load for 30 minutes at a time. At most, two generators would be tested in a single day. This testing schedule complies with the guideline to operate each generator for up to 50 hours per year, as suggested by the Bay Area Air Quality Management District (BAMD).

Noise data for the 3.25 MW Cummins C3250 D6e and 1 MW Cummins generator was used for the July 27th, 2018 analysis. Based on manufacturer's data, an unhoused or unenclosed Cummins generator would produce 99 dBA L_{eq} at 23 feet. Based on the project plans, dated March 7, 2018, generators would be housed in individual acoustic enclosures resulting in a noise level of 70 dBA L_{eq} at 23 feet. Kohler KD3250 and MTU DS3250 generators are being considered as alternatives to the 3.25 MW Cummins C3250 and the MTU DS1000 is being considered as an alternative to the 1 MW Cummins generator. Based on manufacturer's data, an isolated exhaust unhoused Kohler 3.25 MW generator (KD3250) would produce 99 dBA L_{eq} at 23 feet. Unhoused MTU 3.25 MW (DS3250) and 1 MW (DS1000) generators would produce 95 dBA L_{eq} at 23 feet. Based on the project specifications provided on August 23rd 2018, the 3.25 MW and 1 MW generators manufactured by MTU would be housed in individual enclosures and would produce 70 dBA L_{eq} and 69 dBA L_{eq}, respectively. An enclosed Kohler 3.25 MW generator would produce 73 dBA L_{eq} at 23 feet, assuming the enclosure would provide equal reduction as the enclosure specified for the MTU generators.

Adjacent land uses include industrial buildings located to the north at 1519 Walsh Avenue and the adjacent USPS building, industrial building located to the east at 1130 Walsh Avenue, and the nearest residences, located about ½ mile to the southeast. The noise level exposure at each of these land uses under each generator alternative is summarized in Table 1, below. Calculations assume continuously running rooftop equipment with up to two generators operational for testing.

TABLE 1 Noise Level Exposures for Generator Alternatives

Building Façade	Calculated Future Noise Level (dBA L_{eq})		
	Cummins 3.25 MW (C3250) or Cummins 1 MW	Kohler 3.25 MW (KD3250)	MTU 3.25 MW (DS3250) or MTU 1 MW (DS1000)
South façade of 1519 Walsh Ave & USPS building	50	50	50
West façade of 1130 Walsh Avenue	55	55	55
Residences to the southwest	42	42	42

Noise Impact Analysis

The Santa Clara Municipal Code requires that noise levels at light-industrial land uses are maintained at or below 70 dBA, and at residential uses at or below 55 dBA during the daytime and 50 dBA during the nighttime. The municipal code states that noise limits set forth in the code are not applicable to the performance of emergency work, including the operation of emergency generators and pumps or other equipment necessary to provide services during an emergency. However, the City has applied the noise limits to testing of the standby generators for previous data center buildings in the City.

As indicated in Table 1, one or two generators being tested simultaneously would not result in noise levels exceeding the City's allowable exterior levels of 70 dBA L_{eq} at industrial uses or 55 dBA daytime L_{eq} at residences. In a worst-case scenario with all eleven generators operating simultaneously, the noise level at the garage area of the industrial use at 1130 Walsh Avenue would be exposed to 57 dBA L_{eq}. This is a **less-than-significant** impact.

♦ ♦ ♦

In conclusion, under the assumptions stated above, Kohler and MTU generators would be anticipated to result in similar noise levels to those produced by the Cummins generators at nearby receptors. Generator testing would not result in noise levels exceeding the City's allowable exterior levels of 70 dBA L_{eq} at industrial uses or 55 dBA daytime L_{eq} at residences.

This concludes our review of the generator alternatives proposed for the 1150 Walsh Avenue Data Center. If you have any questions or comments regarding this analysis, please do not hesitate to call.

Sincerely yours,

Manasi Biwalkar
Staff Consultant
ILLINGWORTH & RODKIN, INC.
(18-075)