3.6 Noise

This section describes the affected environment and regulatory setting for noise. It also describes the noise impacts that would result from implementation of the Commonwealth Corporate Center Project (Project) and provides mitigation measures that would reduce these impacts, where applicable. Technical noise data is provided in Appendix 3.6-1. Cumulative and growth-inducing impacts are discussed at the end of this section.

Issues identified in response to the Notice of Preparation (NOP) (Appendix 1) were considered in preparing this analysis. Applicable issues that were identified pertain to the noise and vibration levels that would be generated by construction activities and the traffic noise from US 101 that the proposed buildings could potentially reflect to the residential neighborhoods south of US 101.

Existing Conditions

Regulatory Setting

City of Menlo Park General Plan. The California Government Code requires that a noise element be included in the general plan of each county and city in the state. The noise element establishes the local government's goals, objectives, and policies relating to noise control. The Noise Element of the City of Menlo Park's (City's) General Plan establishes goals and policies for assuring that existing and proposed land uses are compatible with their noise environments. To this end, the City has adopted quantitative exterior noise compatibility criteria for various land uses. The purpose of these criteria is to reduce the potential adverse noise effects of new developments on people, including sleep disturbance, interference with speech communication, and the general sense of dissatisfaction that is often associated with high noise exposure.

Under the City's Noise Element, noise levels up to 65 A-weighted decibels (dBA) Community Noise Equivalent Level (CNEL) are considered normally acceptable for residential and hotel uses, while noise levels are conditionally acceptable up to 70 dBA CNEL for these uses as long as noise insulation features are included in the design to reduce interior noise levels. For schools, noise levels up to 70 dBA CNEL are normally acceptable and up to 80 dBA are normally unacceptable. For office and industrial uses, noise levels up to 70 dBA CNEL are considered normally acceptable, and levels up to 77.5 dBA CNEL are conditionally acceptable.

The following goal and policies from the Noise Element of the City's General Plan pertain to the Project.

> **Goal NI:** Achieve Acceptable Noise Levels.
>
> *Policy N1.1:* Compliance with Noise Standards. Require new projects to comply with the noise standards of local, regional, and building code regulations.
>
> *Policy N1.2:* Land Use Compatibility Noise Standards. Protect people in new development from excessive noise by applying the City's Land Use Compatibility Noise Standards for New Development to the siting and required mitigation for new uses in existing noise environments.
>
> *Policy N1.4:* Noise Sensitive Uses. Protect existing residential neighborhoods and noise sensitive uses from unacceptable noise levels and vibration impacts.
>
> *Policy N1.7:* Noise and Vibration from New Non-Residential Development. Design non-residential development to minimize noise impacts on nearby uses. Where vibration impacts may occur,

reduce impacts on residences and businesses through the use of setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the Federal Transit Administration (FTA) near rail lines and industrial uses.

Policy N1.8: Potential Annoying or Harmful Noise. Preclude the generation of annoying or harmful noise on stationary noise sources, such as construction and property maintenance activity and mechanical equipment.

City of Menlo Park Municipal Code. In addition to the General Plan, the City's Municipal Code also contains noise regulations. Chapter 8.06 of the Municipal Code contains noise limitations and exclusions for land uses within the City. The Noise Ordinance addresses noise limits that would constitute a noise disturbance, primarily as measured on residential land uses. The following Municipal Code regulations would be applicable to the Project.

8.06.030 Noise Limitations

a. Except as otherwise permitted in this chapter, any source of sound in excess of the sound level limits set forth in Section 8.06.030 shall constitute a noise disturbance. For purposes of determining sound levels from any source of sound, sound level measurements shall be made at a point on the receiving property nearest where the sound source at issue generates the highest sound level.

   1. For all sources of sound measured from any residential property:

      A. "Nighttime" hours (10:00 p.m. to 7:00 a.m.)—50 dBA

      B. "Daytime" hours (7:00 a.m. to 10:00 p.m.)—60 dBA

8.06.040 Exceptions

a. Construction Activities

   1. Construction activities between the hours of 8:00 a.m. and 6:00 p.m. Monday through Friday.

   4. Notwithstanding any other provision set forth above, all powered equipment shall comply with the limits set forth in Section 8.06.040(b).

b. Powered Equipment

   1. Powered equipment used on a temporary, occasional or infrequent basis operated between the hours of 8:00 a.m. and 6:00 p.m. Monday through Friday. No piece of equipment shall generate noise in excess of 85 dBA at 50 feet.

c. Deliveries

   1. Deliveries to food retailers and restaurants.

   2. Deliveries to other commercial and industrial businesses between the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. Saturdays, Sundays and holidays.

8.06.050 Exemptions

a. Sound Generated by Motor Vehicles. Sound generated by motor vehicles, trucks and buses operated on streets and highways, aircraft, trains, and other public transport.

   1. This exemption shall not apply to the operation of any vehicle including any equipment attached to any vehicle (such as attached refrigeration and/or heating units or any attached auxiliary equipment) for a period in excess of 10 minutes in any hour while the vehicle is stationary, for reasons other than traffic congestion.

Environmental Setting

Fundamentals of Environmental Noise and Vibration

Terminology

A brief description of noise and vibration concepts and terminology used in this assessment is provided below.

- **Sound**. A vibratory disturbance transmitted by pressure waves through a medium such as air or water and capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. The dBA scale is the most widely used for environmental noise assessments.
- **Maximum Sound Levels (L_{max}).** The maximum sound level measured during the measurement period.
- **Equivalent Sound Level (L_{eq})**. The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy. The 1-hour A-weighted equivalent sound level (L_{eq} 1h) is the energy average of A-weighted sound levels occurring during a 1-hour period.
- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with a 10-dB penalty added to sound levels between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. L_{dn} and CNEL are typically within one dBA of each other and, for all intents and purposes, are interchangeable.
- **Vibration Velocity Level (or Vibration Decibel Level, VdB).** The root mean square velocity amplitude for measured ground motion expressed in dB.
- **Peak Particle Velocity (PPV).** A measurement of ground vibration defined as the maximum speed at which a particle in the ground is moving, expressed in inches per second (in/sec).

Overview of Noise and Sound

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient (existing) sound level. Although the decibel (dB) scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process referred to as *A-weighted decibels* (dBA). Table 3.6-1 summarizes typical A-weighted sound levels for different noise sources.

Table 3.6-1. Typical A-Weighted Sound Levels

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

Source: California Department of Transportation 2009.

Human sound perception, in general, is such that a change in sound level of 1 dB cannot typically be perceived by the human ear; a change in sound level of 3 dB is just noticeable; a change of 5 dB is clearly noticeable; and a change of 10 dB is perceived as doubling or halving the sound level. A doubling of actual sound energy is required to result in a 3 dB (i.e., barely noticeable) increase in noise; in practice, for example, this means that the volume of traffic on a roadway would typically needs to double to result in a noticeable increase in noise.

The decibel level of a sound decreases (or attenuates) exponentially as the distance from the source of that sound increases. For a point source such as a stationary compressor or construction equipment, sound attenuates at a rate of 6 dB per doubling of distance. For a line source such as free flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance.[1] Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically in the range of 1 to 2 dB per doubling of distance. Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Community noise environments are generally perceived as *quiet* when the 24-hour average noise level is below 45 dBA, *moderate* in the 45 to 60 dBA range, and *loud* above 60 dBA. Very noisy urban residential areas are usually around 70 dBA CNEL. Along major thoroughfares, roadside noise levels are typically between 65 and 75 dBA CNEL. Increments of 3 to 5 dB to existing 1-hour L_{eq}, or to the CNEL, are commonly used as thresholds for an adverse community reaction to a noise increase. However, there is evidence that incremental thresholds in this range may not be sufficiently protective in areas where noise-sensitive uses are located and CNEL is already high (i.e., above 60 dBA). In these areas, limiting noise increases to 3 dB or less is recommended.[2] Noise intrusions that cause short-term interior levels to rise above 45 dBA at night can disrupt sleep. Exposures to noise levels greater than 85 dBA of 8-hours or longer can cause permanent hearing damage.

Overview of Ground-borne Vibration

Ground-borne vibration is an oscillatory motion of the soil with respect to the equilibrium position and can be quantified in terms of velocity or acceleration. Ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, as it can cause buildings to shake and generate rumbling sounds. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, pile driving, and operating heavy earth-moving equipment.

Ground-borne vibration can be quantified by its peak or root-mean-square (RMS) velocity amplitudes. The RMS amplitude is useful for assessing human annoyance; the RMS amplitude is expressed in terms of the velocity level in decibel units (VdB). The peak amplitude is most often used for assessing the potential for damage to building structures; the peak amplitude is typically assessed in terms of peak particle velocity (PPV), measured in inches per second.

In extreme cases, ground-borne vibrations can cause damage to buildings. Building damage is not a factor for normal transportation projects, with the occasional exception of blasting and pile driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance is well below the damage threshold for normal buildings.

Table 3.6-2 summarizes the typical ground-borne vibration velocity levels and average human response to vibration that may be anticipated when a person is at rest in quiet surroundings. If the person is engaged in any type of physical activity, vibration tolerance increases considerably. The duration of the

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1 California Department of Transportation 2009. "Caltrans Technical Noise Supplement." November. Available: <http://www.dot.ca.gov/hq/env/noise/.> Accessed: August 14, 2012.

2 Federal Transit Administration. 2006. "Transit Noise and Vibration Impact Assessment." FTA-VA-90-1003-06. Office of Planning and Environment.

event has an effect on human response, as does its daily frequency of occurrence. Generally, as the duration and frequency of occurrence increase, the potential for adverse human response increases.

Table 3.6-2. Typical Levels of Ground-Borne Vibration

Human or Structural Response	Vibration Velocity Level (VdB)	Typical Sources (50 feet from source)
Threshold for minor cosmetic damage to fragile buildings	100	Blasting from construction project
		Bulldozer or heavy tracked construction equipment
Difficulty in reading computer screen	90	
		Upper range of commuter rail
Threshold for residential annoyance for occasional events (e.g. commuter rail)	80	Upper range of rapid transit
Threshold for residential annoyance for frequent events (e.g. rapid transit)		Typical commuter rail. Bus or truck over bump
	70	Typical rapid transit
Approximate threshold for human perception of vibration Limit for vibration sensitive equipment		Typical bus or truck on public road
	60	
		Typical background vibration
	50	
Source: Federal Transit Administration 2006.		

The background vibration velocity level in residential areas is usually around 50 VdB or lower. The vibration velocity level threshold of perception for humans is approximately 65 VdB. Most perceptible indoor vibration is caused by sources within buildings, such as the operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are heavy construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration from traffic is rarely perceptible.

Ground-borne noise is a secondary phenomenon of ground-borne vibration. When building structure vibrates, noise is radiated into the interior of the building. Typically, this is a low frequency sound that would be perceived as a low rumble. The magnitude of the sound depends on the frequency characteristic of the vibration and the manner in which the room surfaces in the building radiate sound. Ground-borne noise is quantified by the A-weighted sound level inside the building. The sound level accompanying vibration is generally 25 to 40 dBA lower than the vibration velocity level in VdB. Ground-borne vibration levels of 65 VdB can result in ground-borne noise levels up to 40 dBA, which can disturb sleep. Ground-borne vibration levels of 85 VdB can result in ground-borne noise levels up to 60 dBA, which can be annoying to daytime noise-sensitive land uses such as schools.[3]

Existing Noise Levels

The Project site is generally bound to the north and west by commercial buildings, to the southwest by US 101, and to the south by the Dumbarton Rail Corridor. The Dumbarton Rail Corridor is currently not

[3] Federal Transit Administration. 2006. "Transit Noise and Vibration Impact Assessment." FTA-VA-90-1003-06. Office of Planning and Environment.

in use for any railroad operations. Therefore, the rail corridor is not an existing source of noise and vibration in the area.

Noise-sensitive land uses[4] in the Project vicinity include single family residences located south of the Project site across US 101, and Beechwood School, which is located southeast of the Project site across the Dumbarton Rail Corridor. Joseph P. Kelly Park, located directly to the east of the Project site, is primarily used for active recreation, such as soccer and baseball activities; therefore, it is not considered a noise-sensitive land use for this analysis.

The existing ambient noise environment in the Project area is characteristic of an urban environment (e.g., local traffic, aircraft overflights, and commercial and industrial noise sources). To quantify existing ambient noise levels in the Project vicinity, continuous (24-hour) and short-term (15-minute) ambient noise measurements were conducted on April 23, 2013 and April 25, 2013 at various locations around and on the Project site. Noise measurement data is included in Appendix 3.6-1. Figure 3.6-1 shows the long-term and short-term noise measurement locations. Table 3.6-3 summarizes the results of the noise measurements. The ambient noise level measured at the southwest of the Project site facing US 101 was about 75.2 dBA CNEL with the average daytime L_{eq} of 70.5 dBA (7:00 a.m. to 10:00 p.m.) and nighttime L_{eq} of 68.0 dBA (10:00 p.m. to 7:00 a.m.). Vehicular traffic on US 101 is the primary source of noise in the Project vicinity.

Table 3.6-3. Noise Levels Measurements at Selected Locations in/around the Project Site

Site	Site Description	Date and Time	Primary Noise Sources	Measured Noise Level (dBA)		
				CNEL	L_{eq}	L_{max}
LT1	Southwest of the existing building inside of the property, facing US 101	4/23/2013 at 1:00 p.m. to 4/25/2013 at 12:00 p.m.	Traffic on US 101	75.2	Daytime: 70.5; Nighttime: 68.0	--
ST1	Kelly Park parking lot at the end of Terminal Avenue	4/23/2013 at 1:40 p.m.	Traffic on US 101; school soccer activity	--	59.2	66.1
ST2	Sidewalk in front of 259 Hedge Road	4/25/2013 at 12:50 p.m.	Traffic on US 101 and Hedge Road	--	60.3	71.7
ST3	Sidewalk in front of 227 Hedge Road	4/25/2013 at 12:15 p.m.	Traffic on US 101 and Hedge Road	--	58.0	67.2
ST4	Parking lot behind the Exponent building at 149 Commonwealth Drive	4/23/2013 at 1:05 p.m.	Traffic on US 101	--	64.4	68.3

Note: See Appendix 3.6-1 for data sheets.
LT = continuous (24-hour) ambient noise measurement.
ST = short-term (15-minute) ambient noise measurement.

[4] Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Noise-sensitive land uses typically include single and multi-family residential areas, health care facilities, lodging facilities, and schools. Recreational areas where quiet is an important part of the environment can also be considered sensitive to noise. Some commercial areas may be considered noise sensitive as well, such as the outdoor restaurant seating areas.

Existing Ground-borne Vibration Levels

The most common sources of ground-borne vibration in the Project area and the City are construction activities and roadway truck traffic. Heavy trucks currently transport goods and materials along US 101 surrounding the Project site. Large delivery trucks typically generate ground-borne vibration velocity levels around 63 VdB at 50 feet from the source.[5] As described above, the vibration velocity level threshold of perception for humans is approximately 65 VdB. Therefore, existing traffic vibration is neither distinctly nor generally perceptible. Additionally, vibration velocity levels around 63 VdB would generally not produce ground-borne noise that would disturb sleep.

Environmental Impacts

This section describes the impact analysis relating to noise for the Project. It describes the methods used to determine the impacts of the Project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany each impact discussion.

Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies.
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels.
- Result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project.
- Be located within an airport land use plan area or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, and expose people residing or working in the Project area to excessive noise levels.
- Be located in the vicinity of a private airstrip and expose people residing or working in the Project area to excessive noise levels.

This analysis uses the General Plan's land use compatibility guidelines and the City's Noise Ordinance to assess the noise exposure of land uses in the Project vicinity. The General Plan sets the outdoor noise threshold of 70 dBA CNEL for new office buildings. The Noise Ordinance establishes a daytime noise level limit of 60 dBA L_{eq} for noise increases from all sources (except construction sources) at existing residential land uses and a noise level limit of 85 dBA L_{max} at 50 feet for operation of construction equipment. The Noise Ordinance does not provide a daytime noise limit for existing school uses; therefore, this analysis uses a noise limit of 70 dBA L_{eq} for noise increases at existing schools. This is consistent with the noise limit established in the General Plan's land use compatibility guidelines.

[5] Federal Transit Administration. 2006. "Transit Noise and Vibration Impact Assessment." FTA-VA-90-1003-06. Office of Planning and Environment.

Neither the General Plan nor the Noise Ordinance establishes thresholds for ground-borne vibration or noise. The Federal Transit Administration (FTA) vibration and noise impact thresholds for infrequent events are used to assess ground-borne vibration and noise. Infrequent events are defined as fewer than 30 vibration events of the same kind per day. The thresholds for residences and buildings where people normally sleep are 80 VdB for ground-borne vibration and 43 dBA for ground-borne noise, which are the thresholds for residential annoyance for occasional events. The ground-borne vibration threshold for buildings where vibration would interfere with interior equipment operations is 65 VdB. Vibration-sensitive equipment is generally not sensitive to ground-borne noise; therefore, no corresponding ground-borne noise threshold is established.

Neither the General Plan nor the Noise Ordinance establishes thresholds for increased traffic noise as a result of a project. For this analysis, a significant traffic noise impact would occur if the Project would result in an increase in Project traffic noise of greater than 3 dB above the traffic noise levels without the Project at the neighborhoods along major Project traffic access roadways. The 3 dB is generally considered to be the threshold of a perceptible change.

In accordance with the California Environmental Quality Act (CEQA), City regulations, and professional standards, the Project's noise impact would be considered significant if the Project would result in any of the following.

- Generate construction equipment noise in excess of 85 dBA L_{max} at 50 feet from the construction site.
- Expose the onsite outdoor common areas to noise greater than 70 dBA CNEL.
- Result in Project operation noise of greater than 60 dBA L_{eq}.at nearby residences and 70 dBA L_{eq} at the Beechwood School.
- Result in an increase in Project traffic noise of greater than 3 dB above the traffic noise levels without the Project at the neighborhoods along major Project traffic access roadways.
- Generate ground-borne vibration and noise at nearby office buildings in excess of 65 VdB and at nearby residences in excess vibration level of 80 VdB and noise level of 43 dBA.

Methods for Analysis

This noise impact analysis evaluates the temporary noise increase associated with Project construction activities, operational noise generated by sound-generating equipment and onsite activities, traffic noise associated with Project-related changes in traffic patterns, and the exposure of Project site to traffic noise.

Noise impacts associated with onsite demolition and construction activities were evaluated using the noise calculation method and construction equipment noise data in the Federal Highway Administration (FHWA) roadway construction noise model (RCNM). The noise data include the A-weighted L_{max}, measured at a distance of 50 feet from the construction equipment and the utilization factors for the equipment. The utilization factor is the percentage of time each piece of construction equipment is typically operated at full power over the specified time period and is used to estimate L_{eq} values from L_{max} values. For example, the L_{eq} value for a piece of equipment that operates at full power over 50 percent of the time is 3 dB less than the L_{max} value.[6]

[6] Federal Highway Administration. 2006. "FHWA Roadway Construction Noise Model User's Guide." FHWA-HEP-05-054. January.

Noise impacts associated with increased traffic volumes generated by the Project were evaluated for the existing condition, existing plus Project condition, cumulative no Project condition, and cumulative plus Project condition, using a spreadsheet based on the FHWA traffic noise model (TNM). This spreadsheet calculates the traffic noise level at a fixed distance from the centerline of a roadway based on the traffic volume, roadway speed, and vehicle mix that is predicted to occur under each condition. Peak hour intersection traffic volumes and average daily traffic volumes shown in Section 3.3 *Transportation and Traffic* were utilized to determine the traffic noise impact along the major project traffic access routes. The vehicle mix (i.e., the proportion of automobiles, trucks, buses, and other vehicles) for future and Project-related traffic was adjusted consistent with the existing conditions vehicle mix. Traffic noise was evaluated in terms of how Project-related traffic noise increases could affect existing noise-sensitive land uses along the major Project traffic access roadways (Willow Road and Marsh Road) and how the Project uses could be affected by noise from traffic on US 101.

Operational noise impacts associated with the proposed onsite activities and stationary sources were evaluated based on the proposed layout and the types of noise generating equipment and noise generating activities provided by the Sobrato Organization (Project Sponsor).

Noise generated by point sources (e.g., construction equipment and stationary operational equipment) was estimated to include point-source attenuation of 6 dB per doubling of distance. Noise generated by line sources (e.g., vehicles traveling on streets) was estimated to include line-source attenuation of 3 dB per doubling of distance from the noise source.

Impacts Not Evaluated In Detail

Adjacency to Airports. The closest airport to the Project site is the Palo Alto Airport Terminal, located approximately 3.4 miles to the southeast. This general aviation airport does not serve commercial aviation and has one runway; the majority of the aircraft operations are small, single engine planes.[7] This airport does not have an adopted Airport Land Use Compatibility Plan, and the Project site is more than 2 miles from the airport. Additionally, this airport has noise abatement policies and procedures in place to limit aircraft noise during departures and landings.[8] Therefore, the Project would not be exposed to excessive noise from this airport. The closest airport with an adopted airport land use plan is the San Carlos Airport, located about 4.8 miles to the northwest. This airport is included in the San Mateo County Comprehensive Airport Land Use Plan, adopted in December 1996. The Project site is not located within the 55 dBA noise contour of this airport.[9] There would be ***no impacts*** related to operations from public or private airports and, therefore, these impacts are not evaluated further.

7 AirNav.com. 2013. "KPAO—Palo Alto Airport of Santa Clara County." Available: <http://www.airnav.com/airport/KPAO.> Accessed: October 21, 2013.

8 County of Santa Clara Airports Department. 2013. "Noise Abatement Policy/Recommended Procedures." Available: <http://www.countyairports.org/pao-noise.html.> Accessed October 21, 2013.

9 County of San Mateo. 2002. San Carlos Airport Master Plan Update Airport Modernization Project Draft Environmental Impact Report.

Impacts and Mitigation Measures

Impact NOI-1: Substantial Temporary or Periodic Increase in Noise Levels. The Project could generate construction equipment noise in excess of 85 dBA L_{max} at 50 feet from the construction equipment. (PS)

Project construction is proposed to begin in April 2014, with a total duration of approximately 15 months. However, the highest anticipated noise levels are expected to occur at the beginning of Project construction during the demolition and grading phases. The construction activities would be limited to the hours between 8:00 a.m. and 6:00 p.m. from Monday to Friday in compliance with the Menlo Park Municipal Code.

Project construction would require the use of heavy equipment that would temporarily increase noise levels near the work sites. Construction activities are expected to include building demolition, excavation/grading, building construction, and landscaping/paving activities. Table 3.6-4 presents the typical L_{max} of the construction equipment that would be used for the Project's construction work and the corresponding average total L_{eq} levels for each construction activity. The A-weighted L_{max} levels area measured at a distance of 50 feet from the construction equipment, and the utilization factors for the equipment are defined as the fraction of time that the equipment typically runs at maximum capacity. The utilization factor is used to estimate L_{eq} values from L_{max} values. The average total L_{eq} for each construction activity is determined by combining the L_{eq} for all equipment to be used for the construction activity.

Note that the noise levels in Table 3.6-4 are typical values based on the typical construction equipment that is likely to be used for Project construction; thus, there could be wide fluctuations in the noise levels, depending on actual site-specific conditions and the type and mix of equipment used at the construction site. Regardless, the expected construction noise levels at nearby noise sensitive land uses, discussed below, have been calculated using the shortest distance between the construction activities and the land uses, and thus present the worst-case scenario. In general, construction equipment would operate throughout the Project site on a daily and monthly basis and would only occasionally be operating on the edges of the construction site closest to the adjacent uses. Therefore, exposures to substantially high noise levels during construction are expected to be intermittent and short term.

As shown in Table 3.6-4, the construction equipment used for the Project would generate L_{max} and L_{eq} noise level in excess of the Noise Ordinance limit of 85 dBA at a distance of 50 feet during the building demolition, excavation, and grading activities. When the construction activities occur in the northern portions of the Project site, the operation of heavy construction equipment could potentially result in a substantial temporary increase in ambient noise at the adjacent commercial and office uses adjacent to the Project site. The adjacent buildings are between 50 and 150 feet from the existing buildings on the Project site. The construction activities could generate the loudest L_{eq} noise levels of 86 dBA at 50 feet and 76 dBA at 150 feet during the building demolition phase,[10] which exceed the Noise Ordinance exterior noise limit of 85 dBA at a distance of 50 feet and are substantially higher than the measured ambient level of 64.4 dBA L_{eq} in the area (site ST4). Therefore, impacts related to construction noise on adjacent commercial and office uses are considered ***potentially significant***.

[10] Based on the formula dBA at D feet = dBA at 50 feet – 20 x log (D/50), the noise levels at 150 feet from the source (86 dBA at 50 feet) is 76 dBA.

Normal construction materials and techniques typically provide 25 to 35 dB of noise reduction with closed windows.[11] Conservatively assuming noise reduction of 25 dB, the interior noise levels at the adjacent office buildings are expected to be about 61 dBA at 50 feet and 51 dBA at 150 feet during the building demolition phase. The City does not have an interior noise standard for office or school uses. However, these noise levels are consistent with typical office and speech noise levels indicated in Table 3.6-1. The Beechwood School is approximately 350 feet from the Project boundary. During the excavation/grading phase in the southeastern portions of the Project site, the construction activities could generate the loudest L_{eq} noise level of approximately 69 dBA at the school building. Although the noise level is higher than the measured ambient level of 59 dBA L_{eq} in the area (site ST1), it is lower than the General Plan exterior noise limit of 70 dBA for school uses. Furthermore, when construction occurs in the southeastern portions of the Project site, the interior noise levels experienced at the classrooms are expected to be about 44 dBA L_{eq}, While the City does not have an noise standard for school uses, Caltrans indicates that an interior noise level of 52 dBA L_{eq} is acceptable for school uses.[12] Therefore, using Caltrans standards, impacts on Beechwood School that are related to construction noise are considered ***less than significant***.

The nearest residences are located south of the Project site, separated by US 101, approximately 350 feet from the existing buildings on the Commonwealth Site. There are noise walls behind these first-row residences to reduce traffic noise from US 101 that would also provide noise abatement of about 8 to 10 dBA[13] for construction noise generated at the Project site. The construction activities could generate the loudest L_{eq} noise level of 59–61 dBA at 350 feet during the building demolition phase, which are similar to the measured ambient levels of 58 to 60 dBA L_{eq} in this residential area (sites ST2 and ST3). Therefore, impacts on the residential area that are related to construction noise are considered ***less than significant***.

Table 3.6-4. Typical Noise Levels for Construction Equipment and Activity

Equipment	Typical L_{max} at 50 feet from Source (dBA)	Acoustical Utilization Factor (%)	Average L_{eq} at 50 feet from Source (dBA)
Demolition	-	-	86[a]
Concrete/Industrial Saw	90	20	83
Dozer	82	40	78
Excavator	81	40	77
Tractor/Loader/Backhoe	84	40	80
Excavation/Grading	-	-	86[a]
Dozer	82	40	78
Excavator	81	40	77
Grader	85	40	81
Scraper	84	40	80
Tractor/Loader/Backhoe	84	40	80

[11] FHWA 2011. Highway traffic noise: analysis and abatement guidance. Washington, D.C.

[12] Caltrans 2011. Caltrans traffic noise analysis protocol. Sacramento, CA.

[13] Federal Highway Administration. 2006. "FHWA Roadway Construction Noise Model User's Guide." FHWA-HEP-05-054. January.

Table 3.6-4. Typical Noise Levels for Construction Equipment and Activity

Equipment	Typical L_{max} at 50 feet from Source (dBA)	Acoustical Utilization Factor (%)	Average L_{eq} at 50 feet from Source (dBA)
Building Construction	-	-	84 [a]
Concrete Mixer Truck	79	40	75
Crane	81	16	73
Generator	81	50	78
Man Lift	75	20	68
Tractor/Loader/Backhoe	84	40	80
Landscaping/Paving	-	-	82 [a]
Compressor	78	40	74
Concrete Mixer Truck	79	40	75
Paver	77	50	74
Roller	80	20	73
Welder	74	40	70

Note:
[a] Total noise level for each phase was calculated by combining the noise levels of all equipment to be used for the activity.
Source: Federal Highway Administration 2006.

MITIGATION MEASURES. Implementation of Mitigation Measure NOI-1.1 would reduce construction-related impacts to a less-than-significant level.

NOI-1.1: Implement Noise Control Measures to Reduce Construction Noise during Project Construction. The Project Sponsor shall implement the following measures during demolition and construction of the Project.

- To the extent feasible, the noisiest construction activities, such as demolition and grading activities, shall be scheduled during times that would have the least impact on nearby office uses. This could include restricting construction activities in the areas of potential impact to the early and late hours of the work day, such as from 8:00 a.m. to 10:00 a.m. or 4:00 p.m. to 6:00 p.m., Monday through Friday.
- Equipment and trucks used for Project construction shall use the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds) wherever feasible.
- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for Project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

- Construction contractors, to the maximum extent feasible, shall be required to use "quiet" gasoline-powered compressors or other electric-powered compressors, and use electric rather than gasoline or diesel powered forklifts for small lifting.
- Stationary noise sources, such as temporary generators, shall be located as far from nearby receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.
- Install temporary noise barriers eight feet in height around the construction site to minimize construction noise to 90 dBA as measured at the applicable property lines of the adjacent uses, unless an acoustical engineer submits documentation that confirms that the barriers are not necessary to achieve the attenuation levels.
- Trucks shall be prohibited from idling along streets serving the construction site.

Impact NOI-2: Expose Onsite Users to Excessive Noise Levels. The Project would not expose the onsite outdoor common areas to noise greater than 70 dBA CNEL. (LTS)

Vehicular traffic on US 101 is the primary source of noise on the Project site. The ambient noise level measured at Project site approximately 130 feet to the center of US 101 was 75.2 dBA CNEL (site LT1). The proposed outdoor common areas would be located between the two new buildings, approximately 340 feet from the center of US 101 and behind the Building 1 approximately 420 feet from the center of US 101.

Due to acoustical shielding from the four-story buildings[14] and additional setback[15] of the outdoor areas, traffic noise transmitted to the outdoor areas between two new buildings would be about 9 dB quieter than under existing conditions. Therefore, traffic noise levels at the outdoor areas would be approximately 66 dBA CNEL, which is less than the exterior noise standard of 70 dBA CNEL required by the General Plan for new office developments. Therefore, the exterior noise impact on the Project site is ***less than significant***.

Impact NOI-3: Expose Sensitive Receptors to Excessive Noise Levels. The Project would not expose the nearby residences or Beechwood School to Project operation noise of greater than 60 dBA L_{eq} at nearby residences and 70 dBA L_{eq}.at Beechwood School. (LTS)

Operation of the Project would consist of typical office activities. Noise sources associated with the Project include stationary mechanical equipment (e.g. HVAC units, emergency generators), parking lot activities, and truck loading activities. Existing noise-sensitive land uses that could be affected by operational noise from the Project include single-family residences located south of the Project site across US 101 and the Beechwood School located southeast of the Project site. Table 3.6-3 shows that daytime ambient noise levels measured at the residential area (sites ST2 and ST3) are between 58.0 and 60.3 dBA L_{eq} and at the Beechwood School (site ST1) is 59.2 dBA L_{eq}. According to the City's Noise Ordinance, the daytime noise limit is 60 dBA L_{eq} for noise increases from all sources (except construction sources) at existing residential land uses. The Noise Ordinance does not provide a daytime noise limit for existing school uses; therefore, for this analysis, the noise limit of 70 dBA L_{eq} is used,

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[14] The noise reduction provided by the barriers with some gaps between the noise source and receptor is about 5 dB.

[15] The noise measurement setback was 130 feet from the US 101 centerline, and the proposed outdoor area would be set back approximately 340 feet from the US 101 centerline, which would result in a 4.3 dB noise reduction from the measure noise level.

which is consistent with the noise limit established in the General Plan's land use compatibility guidelines. The potential for Project operation noise sources to exceed the noise limits is discussed below.

Stationary Mechanical Equipment. The Project would include installation of noise-generating equipment including HVAC units and emergency generators. All HVAC equipment would be located on the roof of two new buildings behind an acoustic wall/parapet. The emergency generators would be installed at the south corner of the Project site within an enclosed structure.

Mechanical HVAC equipment located on rooftops of new buildings have the potential to generate an average hourly noise level of between 50 and 65 dBA L_{eq} at 50 feet from the equipment or an average daily noise level of between 57 and 72 dBA CNEL at a distance of 50 feet when equipment is operating continuously for 24 hours. The screen installed around these mechanical systems and the roof parapet would typically reduce noise levels by approximately 15 dBA, which would reduce HVAC equipment noise to approximately 50 dBA L_{eq} at 50 feet from the equipment, which would be approximately 57 dBA CNEL at 50 feet.[16] The proposed buildings would be located approximately 400 feet from the nearest residence and approximately 1,000 feet from Beechwood School. At these distances, noise from the HVAC systems would be well below the noise limits of 60 dBA L_{eq} for residences and 70 dBA L_{eq} for schools and the ambient noise levels at the residential area and school.

Emergency generators create temporary and periodic noise during periods of testing, which occur weekly for approximately 30 minutes. The generators are proposed to be located adjacent to US 101 and the northwestern property line and would be installed within enclosures that would be built with concrete masonry units (CMU). Based on specifications, and when inside the enclosure, it is anticipated that each generator and would generate sound levels of approximately 68 dBA L_{eq} at 23 feet when it operates continuously for 1 hour. The proposed generator would only operate 30 minutes during each routine test, resulting in an average hourly noise level of 65 dBA L_{eq} at 23 feet. The Project would have two generators; assuming both generators would run the routine test separately but within the same hour, the combined average noise level generated by both generators would be about 68 dBA L_{eq} at 23 feet during the hour of the testing. The distance between the nearest residence and the generator unit is approximately 280 feet. With a noise attenuation rate of 6 dB per doubling of distance for point sources, emergency generator testing would result in noise levels of 46 dBA L_{eq} at 280 feet, which is well below the Noise Ordinance limit of 60 dBA L_{eq} and the ambient noise levels at the residential area. Since Beechwood School is further than the nearest residence, noise from emergency generators would also be below 60 dBA L_{eq}. Therefore, impacts from stationary mechanical sources are ***less than significant***.

Parking Lot Activities. Noise sources from parking lots would include human speech, vehicle door slams, car starts, tire squeals, accidental car alarms, and other automotive noise. Quantification of parking lot noise is difficult to predict due to many variables. Variation in sound levels depends on such factors as parking lot design and the number of vehicles moving through at any given time. However, noise from parking lots is characterized as temporary and periodic noise. These temporary and periodic noise sources within the Project parking lots would be different from each other in kind, time, duration, and location, so that the overall effects would be separate and, in most cases, would not affect the same receptors at the same time. Therefore, this type of noise associated with parking lots is considered a nuisance noise effect that would result in a ***less-than-significant*** impact.

[16] City of Santa Ana. 2010. City of Santa Ana Transit Zoning Code (SD 84A and SD 84B) Final Environmental Impact Report. May.

Truck Loading Activities. Trucks used for pick-up and deliveries of supplies would result in intermittent noise, such as engines idling and beeping from backing warning signals. However, operation of the Project would not involve large-scale commercial services, manufacturing, or similar work that would require regular, frequent truck deliveries and pick-ups. Truck deliveries to the Project would be deliveries of supplies to the offices, pop-up retail, and food service amenities. Simultaneous truck deliveries to the same structure are not anticipated, and simultaneous deliveries to the both buildings would be expected to occur only occasionally, due to varying delivery schedules. Trucks are exempted from the City's short-term noise level limit of 60 dBA at residential land uses, provided the trucks do not idle for more than 10 minutes. Additionally, given the short duration and relative infrequency of truck trips to the Project site, truck deliveries would not be a source of excessive ambient noise. Therefore, impacts related to truck deliveries would be ***less than significant***.

US 101 Traffic Noise Reflected by New Buildings. US 101 separates the Project site and the Suburban Park–Lorelei Manor–Flood Park Triangle neighborhood to the south of US 101. There are existing sound walls separating the residential properties from US 101 in order to reduce traffic noise from the highway. US 101 is depressed in the Project vicinity by approximately 11 to 14 feet below the elevation of the Project site and the nearest residences, respectively. The Project would increase building height at the Project site from approximately 27 feet to 61 feet.

Concern has been expressed that the proposed increase in building height on the Project site could increase the reflection of highway noise into the neighborhood. Under maximum noise reflection conditions, a high, infinitely long reflecting surface on one side of a highway could reflect 100 percent of the sound energy to the opposite side of the highway. This could potentially double the sound energy on the opposite side of the highway. A doubling of sound energy corresponds to a 3 dB increase in sound levels. As discussed above, a 3dB increase in noise would be just noticeable. Because the existing buildings span a small portion of the area on the opposite side of US 101 from the neighborhoods, they currently reflect far less than 100 percent of the sound energy. As such, the potential increase in noise associated with building reflections under the Project would be well below 3 dB and would not be distinctly noticeable. Increasing the height of onsite buildings would only slightly increase the amount of reflected sound energy and would not be expected to result in any meaningful or noticeable increase in noise on the opposite of the US 101. Consequently, the impact would be ***less than significant***.

Traffic Noise Increase. The Project-generated traffic would mostly travel on Willow Road, Marsh Road, and Bayfront Expressway to the Project site. In the Project vicinity, residences along Willow Road and Marsh Road could be affected by the increase in traffic noise caused by the Project. Land uses along Bayfront Expressway consist primarily of office and light industrial, which are not expected to be affected by the increase of Project traffic noise because the land uses are not considered as noise-sensitive receptors related to Project operation. Therefore, traffic noise impact is evaluated for Willow Road and Marsh Road in the Project vicinity.

Table 3.6-5 summarizes the increase in traffic noise levels (CNEL) along Willow Road and Marsh Road as a result of Project-generated traffic. Traffic noise levels for Marsh Road were estimated based on the daily traffic volumes that are predicted to occur in 2015 and 2030. For Willow Road, where daily traffic volumes are not available, traffic noise levels are estimated using the predicted PM peak hour traffic volumes.[17] The calculation of traffic noise levels is included in Appendix 3.6-1.

[17] The PM peak hour volumes at intersections along the analysis segment are used to derive the daily traffic volumes. Daily traffic volumes are estimated by multiplying the PM peak hour volume by a factor of 1.1.

As shown in Table 3.6-5, the Project would result in traffic noise increases of less than 1 dB on Marsh Road and Willow Road. The traffic noise increase over the baseline conditions (2015 near-term and 2030 long-term, as defined in the Section 3.3, *Transportation and Traffic*) would be less than 3 dB, which is considered to be below the threshold of a perceptible change. Therefore, the traffic noise impact is considered ***less than significant*** at neighborhoods along the Project access roads in the Project vicinity.

Impact NOI-4: Substantial Temporary or Periodic Increase in Vibration Levels. The Project would generate ground-borne vibration levels in excess of 65 VdB at nearby office buildings but would not exceed vibration levels in excess of 80 VdB and noise levels in excess of 43 dBA at nearby residences. (PS)

The thresholds for residences and buildings where people normally sleep are 80 VdB for ground-borne vibration and 43 dBA for ground-borne noise, which are the thresholds for residential annoyance for occasional events. Buildings where vibration would interfere with sensitive interior equipment operations would have a lower threshold of 65 VdB, which is just above the perception level for humans.

Typical outdoor sources of perceptible ground-borne vibration and noise are construction equipment, steel-wheeled trains, and heavy vehicles on uneven surfaces. If the roadway is smooth, the ground-borne vibration and noise from traffic is rarely perceptible. Operation of the Project would consist of typical office operations and would not involve vibratory or impact equipment that would generate ground-borne vibration and noise. Therefore, there would be no ground-borne vibration and noise impact associated with Project operation. The discussion therefore focuses on the ground-borne vibration and noise impact associated with construction equipment during Project construction.

The operation of heavy construction equipment can generate localized ground-borne vibration and noise at buildings adjacent to the construction site. The ground-borne vibration rarely causes damage to normal buildings, with the occasional exception of blasting and pile driving during construction. Because the Project construction would not involve pile driving activities, damage to surrounding office buildings is not expected. Therefore, the annoyance thresholds for vibration velocity levels are used to determine the ground-borne vibration and noise impacts at surrounding buildings. A vibration level that causes annoyance is well below the damage threshold for typical buildings. Table 3.6-6 summarizes typical vibration velocity levels for various types of construction equipment that would be used for the Project.[18]

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18 Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Office of Planning and Environment.

Table 3.6-5. Project Traffic Noise Increase at Representative Locations in the Project Vicinity

Roadway	Segment	Distance to Center of the Road (feet)[b]	Traffic Noise Level CNEL without Project (dBA)	Traffic Noise Level CNEL with Project (dBA)	Increase in Noise Level as a Result of Project (dB)	Significant Impact?[d]
2015 Near-Term Condition[a]						
Marsh Road	US 101—Bay Road	120	67	67	0	No
Marsh Road	Bay Road—Middlefield Road	100	65	65	0	No
Willow Road	Bayfront Expressway—US 101[c]	120	61	61	0	No
Willow Road	US 101—Middlefield Road	110	61	62	1	No
2030 Long-Term Condition[a]						
Marsh Road	US 101—Bay Road	120	67	67	0	No
Marsh Road	Bay Road—Middlefield Road	100	66	66	0	No
Willow Road	Bayfront Expressway—US 101[c]	120	62	62	0	No
Willow Road	US 101—Middlefield Road	110	62	62	0	No

Notes:

a. Refer to Section 3.3, *Transportation and Traffic*, for a description of the traffic scenarios.

b. The average distance for each segment is measured from the center of the road to the back yard of the first row residences.

c. Noise barriers are presented to shield the first row residences along the segments.

d. A significant impact is determined by the traffic noise increase of 3 dB, which is generally considered to be the threshold of a perceptible change.

Table 3.6-6. Typical Vibration Levels for Construction Equipment

Equipment	Vibration Velocity Level (VdB) 25 Feet from Source	50 Feet from Source[a]	100 Feet from Source[a]	150 Feet from Source[a]
Vibratory Roller	94	85	76	71
Large Dozer	87	78	69	64
Loaded Truck	86	77	68	63
Jack Hammer	79	70	61	56
Small Dozer	58	49	40	35

Source: Federal Transit Administration 2006.
Note:
[a] Based on the formula VdB at D feet = VdB at 25 feet – 30 x log (D/25).

Existing residences are located south of the Project site across US 101, about 300 feet from the Project site. Based on the information in Table 3.6-6, vibration levels from construction activities would be 62 VdB or lower at the nearest residences. The sound level accompanying vibration is generally 25 to 40 dBA lower than the vibration velocity level in VdB. Therefore, the ground-borne noise levels from construction activities would be no more than 37 dBA at the nearest residences. These ground-borne vibration and noise levels are well below the FTA-recommended thresholds of 80 VdB and 43 dBA for residences and buildings where people normally sleep. Therefore, the ground-borne vibration and noise impact on residences and buildings (other than office buildings described below) in the Project vicinity would be ***less than significant***.

Existing occupied office buildings are directly to the northwest and northeast of the Project site, about 150 and 100 feet to the existing building on the Project site, respectively. Office uses are generally not considered sensitive receptors; however, because of the nature of some of the businesses that are present in the vicinity, these uses may include vibration-sensitive equipment. Therefore, the adjacent office buildings are assumed to include vibration-sensitive uses. Based on the information in Table 3.6-6, vibration levels from excavation and grading activities that would likely use vibratory rollers could reach up to 71 VdB at 150 feet from the construction equipment. Vibration levels from typical construction activities that would likely use large dozers and large dump trucks could reach up to 69 VdB at 100 feet from the construction equipment. These vibration levels would be above the FTA-recommended threshold of 65 VdB for vibration-sensitive equipment. Based on the information in Table 3.6-6, vibration levels from the operation of a vibratory roller could exceed 65 VdB up to 225 feet away. Therefore, when the construction activities occur in the northwestern and northeastern portions of the Project site, the ground-borne vibration levels from operation of heavy construction equipment (such as vibratory rollers, larger dozers, or large trucks) could exceed 65 VdB at nearby office buildings, resulting in a ***potentially significant*** impact.

MITIGATION MEASURES. Construction of the Project would have the potential to result in significant ground-borne vibration that would disturb vibration-sensitive land uses. Mitigation Measure NOI-4.1 would require the notification of nearby businesses of potential impacts to vibration-sensitive equipment in order to identify any vibration-sensitive equipment in the Project vicinity and implementation of best management practices, as described in Mitigation Measure NOI-4.2, to help reduce impacts on buildings with vibration-sensitive equipment. However, although implementation of these measures would reduce ground-borne vibration impacts during construction, vibration-sensitive equipment at adjacent office buildings could still be exposed to excessive construction-generated vibration levels. In general, construction equipment would operate throughout the Project site on a daily and monthly basis and would only occasionally be operating on the edges of the construction site closest to the adjacent uses. Therefore, the vibration disturbance during construction is expected to be intermittent and short term. Regardless, this impact is considered to be ***significant and unavoidable***.

NOI-4.1: Notify Nearby Businesses of Project Construction Activities that Could Affect Vibration-Sensitive Equipment. The Project Sponsor shall provide notification to property owners and occupants of vibration-sensitive buildings within 225 feet[19] of construction activities 10 days prior to the start of Project construction, informing them of the estimated start date and duration of vibration-generating construction activities, such as would occur during site preparation, demolition, excavation, and grading. This notification shall include information warning about potential for impacts related to vibration-sensitive equipment. The Project Sponsor shall provide a phone number for the property owners and occupants to call if they have vibration-sensitive equipment on their sites. A copy of the notification and any responses shall be provided to the Planning Division prior to building permit issuance.

NOI-4.2: Implement Construction Best Management Practices to Reduce Construction Vibration. If vibration-sensitive equipment is identified within 225 feet of construction sites, the Project Sponsor shall implement the following measures during construction.

- To the extent feasible, construction activities that could generate high vibration levels at identified vibration-sensitive locations shall be scheduled during times that would have the least impact on nearby office uses. This could include restricting construction activities in the areas of potential impact to the early and late hours of the work day, such as from 8:00 am to 10:00 a.m. or 4:00 p.m. to 6:00 p.m. Monday through Friday.
- Stationary sources, such as construction staging areas and temporary generators, shall be located as far from nearby vibration-sensitive receptors as possible.
- Trucks shall be prohibited from idling along streets serving the construction site where vibration-sensitive equipment is located.

Cumulative Impacts

The geographic context for the cumulative noise analysis from localized construction and stationary source noise includes areas immediately surrounding the Project site, as noise diminishes rapidly with distance (6 dBA per doubling of distance for point and stationary sources). For cumulative vehicular noise impacts, the cumulative context is based on the cumulative context for the traffic analysis, which includes existing and future developments, including other current projects, probable future projects, and projected future growth within the City through the year 2030.

[19] Based on the formula shown in Table 3.6-6, the vibration level from operation of a vibratory roller would exceed 65 VdB within 225 feet of the equipment.

Impact C-NOI-1: Cumulative Temporary or Periodic Increase in Noise Levels. Construction activities associated with Project-related development and other future development in the City would not expose sensitive receptors to a substantial temporary or periodic increase in ambient noise level. (LTS)

Tier 1 and Tier 2

Cumulative development in the City would not result in the exposure of people to a substantial temporary increase in ambient noise level during construction due to the localized nature of construction noise impacts and the fact that construction throughout the City would not occur at the same time. The construction activity with the potential to generate the highest noise levels from pile driving would not exceed the construction noise threshold of 85 dBA more than 300 feet from the source.[20] None of the cumulative projects, with the exception of the Dumbarton Rail Corridor Project, are located within 300 feet of the Project site. The Dumbarton Rail Corridor Project is in the preliminary stages of planning and would not be constructed at the same time as the Project. Therefore, construction noise from the cumulative projects would not combine to exceed the City's Noise Ordinance standards for construction. Therefore, the Project would have a ***less-than-significant*** cumulative impact due to the temporary nature of the ambient noise level increases.

Impact C-NOI-2: Cumulative Exposure of Onsite Users to Excessive Noise Levels. The Project, in combination with other development within the City, would not expose the onsite outdoor common areas to noise in excess of the standards established in the General Plan. (LTS)

Tier 1 and Tier 2

As noted above under Impact NOI-2, vehicular traffic on US 101 is the primary source of noise on the Project site, and the noise levels at the proposed outdoor areas would be about 66 dBA CNEL or lower, which is less than the exterior noise standard of 70 dBA CNEL required by the General Plan for new office developments. The cumulative traffic noise increase as a result of Tier 1 and Tier 2 projects would not cause the ambient noise level at the proposed outdoor areas to be in excess of 70 dBA CNEL because, based on the General Plan, a 1-dB traffic noise increase is predicted for US 101 between existing year and 2035. The General Plan accounts for the traffic increase from long-term land use developments in the City, which include both Tier 1 and Tier 2 projects. Therefore, the cumulative projects, with the exception of the Dumbarton Rail Corridor Project, would have a ***less-than-significant*** cumulative impact on the increase in ambient noise level at the Project site.

The Dumbarton Rail Corridor Project, a Tier 2 project, would have the potential to result in a cumulatively considerable increase in ambient noise level on the Project site. The Dumbarton Rail Corridor Project would be subject to CEQA and would be required to mitigate impacts to the extent feasible.

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[20] The typical noise levels generated from a pile driver (either impact or vibratory) are about 101 dBA L_{max} and 94 dBA L_{eq} at 50 feet from the equipment. Based on the formula dBA at D feet = dBA at 50 feet – 20 x log (D/50), the noise levels at 300 feet from the source are 85 dBA L_{max} and 78 dBA L_{eq}.

Impact C-NOI-3: Cumulative Expose Sensitive Receptors to Excessive Noise. The Project, in combination with other development within the City, would not expose the nearby residences or Beechwood School to noise in excess of standards established in the General Plan or Municipal Code. (LTS)

Tier 1 and Tier 2

Onsite Operation Noise. Similar to the Project, operation of the cumulative projects would have the potential to generate noise from onsite equipment and activities and to cumulatively increase ambient noise levels at the noise-sensitive land uses in immediate vicinity of the Project site. This potential impact is limited to cumulative projects in the immediate vicinity of the Project site due to distance and intervening buildings that provide noise attenuation.

As noted above under Impact NOI-3, existing noise-sensitive land uses that could be affected by the Project operation noise include single-family residences located south of the Project site across US 101 and the Beechwood School located southeast of the Project site. The operation of the Project would not generate excessive noise from mechanical equipment and parking and truck activities and would not contribute to an ambient noise increase at the noise-sensitive land uses in excess of the Noise Ordinance limit of 60 dBA L_{eq}. As shown in Figure 3.0-1, there are no Tier 1 and Tier 2 projects, with the exception of the Dumbarton Rail Corridor Project, located in the vicinity of the noise-sensitive land uses; therefore, the cumulative operation impacts at the noise-sensitive land uses in vicinity of the Project would be less than significant.

The Dumbarton Rail Corridor Project, a Tier 2 project, would have the potential to result in a cumulatively considerable increase in ambient noise level in the project vicinity. The Dumbarton Rail Corridor Project would be subject to CEQA and would be required to mitigate impacts to the extent feasible. However, the Project itself would not generate noise levels that would result in an increase in ambient noise levels at existing noise-sensitive land uses. Therefore, because the Project's contribution is not considerable, the cumulative impact with respect to Project noise sources is ***less than significant.***

Traffic Noise. Cumulative growth in the City could lead to increased noise levels from vehicular traffic, although there is the possibility that future traffic noise could be decreased through implementation of Transportation Demand Management (TDM) measures and a focus on transit-oriented development that would reduce vehicle trips. The traffic model used to predict future traffic levels assumed approved development and City growth through the year 2030.

As noted above under Impact NOI-4, the Project-generated traffic would mostly travel on Willow Road, Marsh Road, and Bayfront Expressway to the Project site, of which residences along Willow Road and Marsh Road would be affected by the increase in traffic noise caused by the Project because there are no noise-sensitive land uses along Bayfront Expressway in the Project vicinity. As shown in Table 3.6-7, under the cumulative condition, the traffic noise increase over the existing condition (1-2 dB) would be less than 3 dB, and the Project would only contribute to less than 1 dB of the cumulative traffic noise increase. Therefore, the cumulative traffic noise impact is considered ***less than significant*** at neighborhoods along the Project access roads in the vicinity of the Project.

Impact C-NOI-4: Cumulative Exposure to Ground-borne Vibration. Construction activities associated with Project-related development and other future development in the City would not expose sensitive receptors to excessive ground-borne vibration. (LTS)

Tier 1 and Tier 2

The most common sources of ground-borne vibration and noise in the Project area and the City are construction activities and roadway truck traffic. Heavy trucks currently transport goods and materials along the streets surrounding the Project area (i.e., US 101, Bayfront Expressway, and Willow Road). Large delivery trucks typically generate ground-borne vibration velocity levels around 63 VdB at 50 feet from the source, and these levels could reach 72 VdB where trucks pass over an uneven road surface. The vibration velocity level threshold of perception for humans is approximately 65 VdB. Therefore, existing traffic vibration is neither distinctly nor generally perceptible. Additionally, vibration velocity levels around 63 VdB would generally not produce ground-borne noise that would disturb sleep.

Cumulative development in the City would not result in the exposure of people to or the generation of excessive ground-borne vibration and noise due to the localized nature of vibration impacts and the fact that construction throughout the City would not occur at the same time. High ground-borne vibration at each of the construction sites would continue to be isolated and only affect receptors within close proximity to the individual pieces of construction equipment. Therefore, cumulative development would not result in a significant cumulative vibration impact.

Project construction activities would have the potential to generate localized ground-borne vibration and noise at buildings adjacent to the construction site. The nearest residential uses are located south of the Project site across US 101, about 300 feet from the Project site. Based on the information presented in Table 3.6-6, vibration levels from construction activities would be 62 VdB or lower at the nearest residences. The sound level accompanying vibration is generally 25 to 40 dBA lower than the vibration velocity level in VdB. Therefore, the ground-borne noise levels from construction activities would no more than 37 dBA at the nearest residences. These ground-borne vibration and noise are well below the FTA-recommended thresholds of 80 VdB and 43 dBA for residences and buildings where people normally sleep. Therefore, exposure of residential areas to excessive ground-borne vibration and noise during construction would be less than significant. As such, the vibration impact of the Project, in conjunction with ground-borne vibration and noise from other cumulative development, would result in a ***less-than-significant*** cumulative impact.

Table 3.6-7. Cumulative Traffic Noise Increase at Representative Locations in the Project Vicinity

Roadway	Segment	Distance to Center of the Road (feet)[a]	Existing CNEL (dBA)	2030 Long-term Baseline CNEL (dBA)	2030 Long-term with Project CNEL (dBA)	Cumulative Increase in Noise Level (dB)[c]	Significant Cumulative Impact?	Increase in Noise Level as a Result of Project (dB)	Cumulatively Considerable Contribution?[d]
Marsh Road	US 101—Bay Road	120	66	67	67	1	No	0	No
Marsh Road	Bay Road—Middlefield Road	100	64	66	66	2	No	0	No
Willow Road	Bayfront Expressway—US 101[b]	120	60	62	62	2	No	0	No
Willow Road	US 101—Middlefield Road	110	61	62	62	1	No	0	No

Notes:
a. The average distance for each segment is measured from the center of the road to the back yard of the first row residences.
b. Noise barriers are presented to shield the first row residences along the segments.
c. Noise increase between the existing condition and the cumulative with Project condition.
d. Significant impact is determined by the traffic noise increase of 3 dB, which is generally considered to be the threshold of a perceptible change.