RGD ACOUSTICS

Acoustical & Audiovisual Consultants

ELEMENTARY SCHOOL AT CHARTER SQUARE

MEASURE X PROGRAM

ENVIRONMENTAL NOISE IMPACT REPORT

FOSTER CITY, CA

RGD Project #: 17-014

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1 Introduction

San Mateo – Foster City School District (SMFCSD or District) is proposing to build a new elementary school at the current Charter Square Shopping Center in Foster City, to be funded by the District's Measure X bond. The new school will relieve overcrowding at existing Foster City elementary schools and provide additional classrooms for future enrollment increases. The conceptual plan includes classrooms, a multi-purpose/stage room, collaboration areas, and outdoor playground and field.

This report analyzes the change in noise levels at nearby residential areas due to the project. The analysis includes acoustical measurements of the existing ambient noise environment at residences surrounding the project site, and acoustic measurements for school activities based on measurements RGD Acoustics made at Brewer Island Elementary School in Foster City, CA.

Project noise sources evaluated in the study include school activities (primarily on the field/playground) and vehicular traffic. The project generated noise levels are assessed with respect to the California Environmental Quality Act (CEQA) and the goals and policies from the Foster City General Plan and Noise Ordinance.

2 Fundamental Concepts of Environmental Noise

Terminology: Noise can be defined as unwanted sound and is commonly measured with an instrument called a sound level meter. The sound level meter "captures" sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels (dB).

To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local agencies as well as other federal and State noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is often used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. Descriptors that are commonly used in environmental studies include L_{max}, L_{eq}, L_{90} and L_{dn} and CNEL.

The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car pass-by or airplane flyover. To express the average noise level, the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 15 minutes to one hour. The background noise level (or

residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time. The Foster City Noise Ordinance uses the L_5 which is the noise level exceeded 5% of the time (three minutes per hour).

Type of Noise or Environment	Decibels
Recording studio	20
Soft whisper; quiet bedroom	30
Busy open-plan office	55
Normal conversation	60–65
Automobile *at 20 mph 25 ft. away*	65
Vacuum cleaner *10 ft. away*	70
Dump truck *at 50 mph 50 ft. away*	90
Gas leaf blower *at 25 ft. away*	100
Helicopter *200 ft. away*	100
Train horn *100 ft. away*	105
Claw hammer; jet takeoff *200 ft. away*	120
Shotgun *at shooter's ear*	140

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (L_{dn} or DNL) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the L_{eq} except they include, by definition, a ten dBA "penalty" for noises that occur during nighttime hours (10 p.m. to 7 a.m.) to account for people's sensitivity to intrusive noise during these hours. The CNEL also includes a five dBA "penalty" during evening hours (7 p.m. to 10 p.m. to account for peoples' increased sensitivity during these hours (American National Standards Institute, *ANSI S1.1-1994, Acoustical Terminology*, 1994).

Community Response to changes in noise levels: The potential for adverse community response tends to increase as an intrusive noise becomes more noticeable above existing background noise levels. For example, if an intrusive noise has an average level that is comparable to existing average ambient noise levels, then the intrusive sound would tend to blend in with the ambient noise. However, if the intrusive sound is significantly greater than the ambient noise then the intrusive sound would be more noticeable and potentially more annoying as it can interfere with rest, working efficiency, social interaction and general tranquility.

In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB clearly noticeable and a change of 10 dB is perceived as a doubling (or halving) of loudness (Cowen, *Handbook of Environmental Acoustics*, 1994).

3 Acoustical Criteria and Thresholds of Significance

The proposed school site is located in the city of Foster City in California. Applicable policies for assessing potential impact of noise from a project can be found in the Foster City General Plan and Foster City Noise Ordinance.

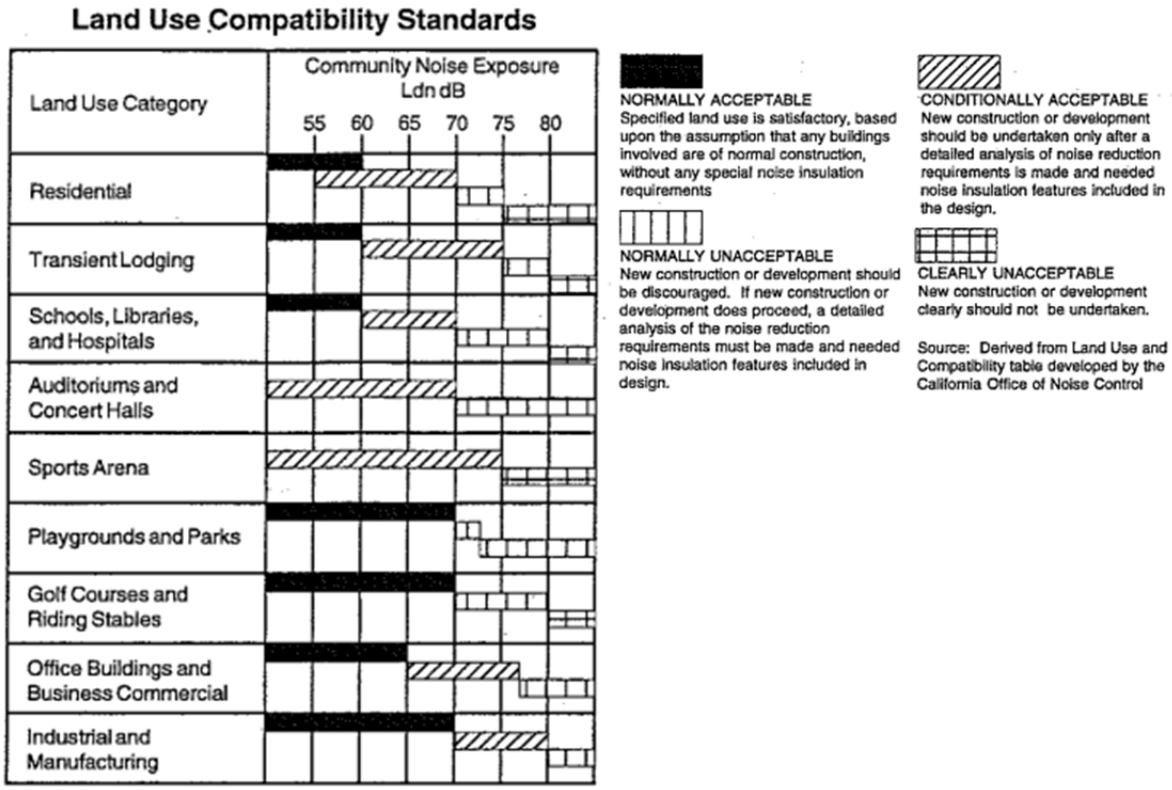
3.1 City of Foster City – General Plan

The Foster City General Plan Noise Element has goals and policies to assure the compatibility of a new development with the noise environment of the City. The applicable goals and policies are shown below:

3.1.1 Goal N-A: Assure the Noise Impacts of New Development or Redevelopment of Property is Done in a Manner that is Compatible with Existing Land Uses

- Policy N-1: New development exposed to transportation noise sources must meet acceptable exterior noise level standards. The “normally acceptable” noise standards for new land uses are established in the Noise and Land Use Compatibility Guidelines [Figure 3.1-1].

Figure 1: Foster City General Plan – Land Use Compatibility Guidelines



- Policy N-6: The City will protect schools, hospitals, libraries, churches, convalescent homes and other noise sensitive uses from noise levels exceeding those allowed in residential areas. Projects located near noise sensitive uses should be oriented away from noise sources unless mitigation measures are included in development plans and regulation occurs of the activities or uses generating noise that might cause noise disturbances for noise sensitive uses.

3.1.2 Goal N-B: Preserve and Improve the "Quiet Ambiance" Within Existing Neighborhoods

- Policy N-8: Protect the noise environment in existing residential areas. In general, the city will require the evaluation of mitigation measures for projects that would cause the Ldn to increase by 3 dB or more, if the increase would result in an Ldn greater than 60 dB or if the Ldn already exceeds 60 dB. Projects with the potential to generate significant adverse community controversy must also be evaluated. Noise created by commercial or industrial sources associated with new projects, developments or new or existing activities conducted by existing developments or companies shall be controlled so as not to exceed the noise level standards set forth in "Noise and Land Use Compatibility Standards for Industrial and Commercial Noise Sources" table as measured at any affected residential land use.

- Policy N-13: The City will apply the quantitative noise ordinance standards (Chapter 17.68, General Performance Standards) throughout the City.

3.2 Foster City Noise Ordinance

The Foster City Noise Ordinance (Chapter 17.68) was developed by the City to protect the City from unnecessary, excessive, unreasonable and annoying noises. It contains noise performance standards for noise generating facilities that are based on the type of adjacent land uses. The noise performance standards are presented in Table 1.

Table 1: Foster City Noise Ordinance – Noise Limits (Chapter 17.68)

Receiving land use category	Time period	Noise Level (dBA)	
		Any time duration greater than 3 minutes	Time duration less than 3 minutes
One- or two-family residential*	10 p.m.—7:30 a.m.	50	55
	7:30 a.m.—10 p.m.	60	65
Multiple family, public space	10 p.m.—7:30 a.m.	55	60
	7:30 a.m.—10 p.m.	60	65
Commercial, office	10 p.m.—7:30 a.m.	60	65
	7:30 a.m.—10 p.m.	65	70
Light industrial	10 p.m.—7:30 a.m.	65	70
	7:30 a.m.—10 p.m.	70	75

* Air conditioning condenser units placed in side yards in accordance with the provisions of Section 17.54.080 shall not generate noise levels in excess of 82 dBA as measured twelve inches from the source.
Notes:

3.3 CEQA Guidelines

In accordance with Appendix G of the *CEQA Guidelines*, a proposed project could have a significant environmental impact if it would result in:

a. exposure of persons to or generation of noise levels in excess of standards established in any applicable 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 above levels existing without the project;

e. exposure of people residing or working in the project area to excessive noise levels if the project is located within an area covered by an airport land use plan, or where such plan has not been adopted, within two miles of a public airport or public use airport; or

f. exposure of people residing or working in the project area to excessive noise levels if the project is located in the vicinity of a private airstrip.

3.4 Thresholds of Significance

Noise

The CEQA checklist does not specify a quantitative method for determining whether or not a project would cause a significant increase. Therefore, for the purposes of assessing impact due to the proposed project, this report uses thresholds of significance based on the Foster City General Plan and Noise Ordinance.

The project will cause a significant adverse noise impact if:

1) The project noise will raise the L_{dn} by 3 dBA or more if the increase in noise would result in an L_{dn} greater than 60 dBA or if the L_{dn} already exceeds 60 dBA, or
2) The project noise would generate noise levels greater than an L_5 of 60 dBA and a L_{max} of 65 dBA between 7:30 AM and 10:00 PM at the neighboring residences or public space[1], or
3) The project noise would generate noise levels greater than an L_5 of 50 dBA and a L_{max} of 55 dBA between 10:00 PM and 7:30 AM at the neighboring residences or public space

Groundborne Vibration and Groundborne Noise

Neither CEQA nor the State specifies acceptable vibration levels from construction activities. The Foster City Municipal Code 17.68.040 states that “no vibration shall be permitted so as to cause a noticeable tremor, measureable without instruments at the lot line” but also does not specify acceptable vibration levels. For the purposes of this assessment, the methodology described by the Federal Transit Administration (FTA) is used[2]. These FTA criteria are based on the potential for annoyance and interference with vibration sensitive activities which is much more stringent than criteria for structural damage. The FTA specifies vibration impact criteria of 80 VdB[3] for residences. These criteria are for “infrequent” events (i.e. transit train passbys). Although more stringent criteria are recommended for “frequent” or “occasional” events, these are not used since construction activities would generally occur during the daytime and would not be permanent.

[1] The L_5 noise is the noise exceeded for 5% in a given time period, or 3 minutes in an hour (the standard used the Foster City Noise Ordinance).

[2] *Transit Noise and Vibration Impact Assessment*, Federal Transit Administration, May 2006

[3] VdB – The vibration velocity level expressed in decibels re one micro-inch per second.

4 Existing Noise Environment

The project site is located at the northwest corner of Shell Boulevard and Beach Park Boulevard. The project site is currently a 55,000 square feet area with commercial use properties, a daycare center with outdoor play area, and a United States Postal Service center. According to discussions with the Charter Square site manager on 27 April 2017, there are currently 13 existing tenants with trash pickup every other day.

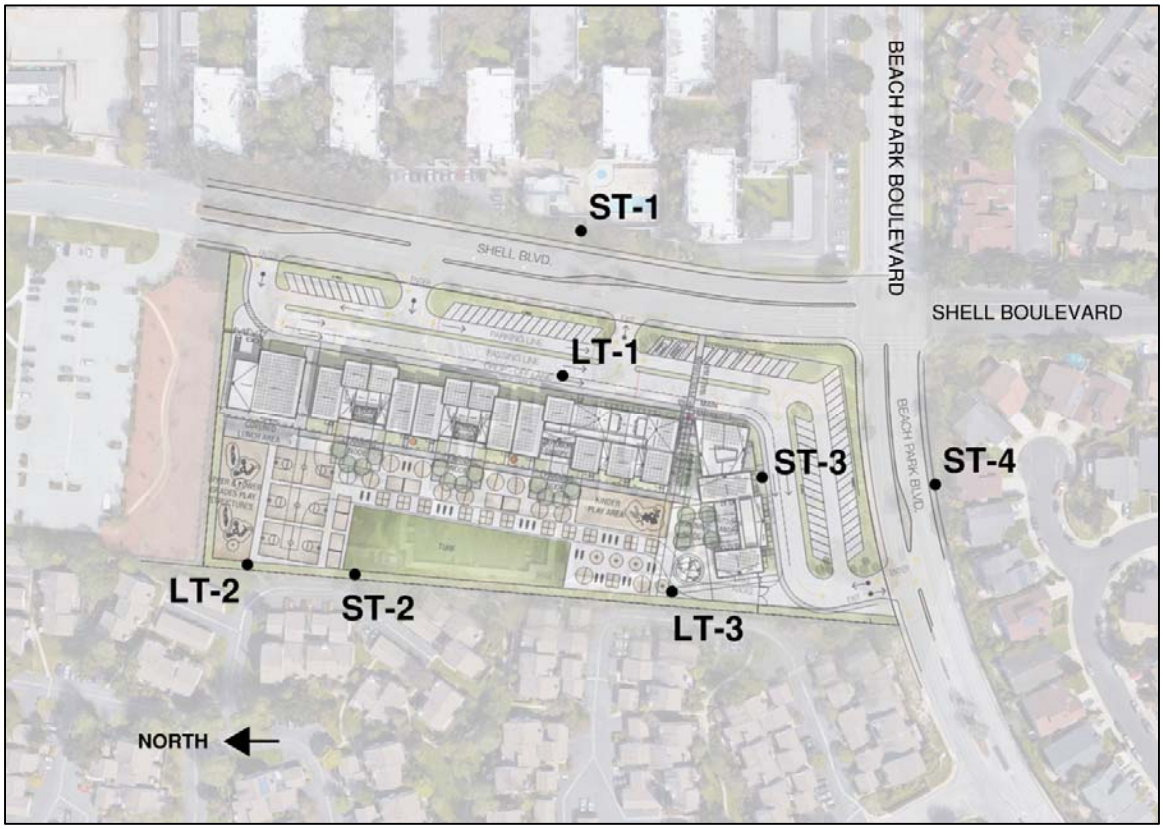
There are residential and public facility uses that are potentially affected by the noise from the project. Potentially affected residential use include the single-family homes to the west, the single-family homes to the south across Beach Park Boulevard, and the multi-family homes to the east across Shell Boulevard. Potentially affected public facilities include The Church of Jesus Christ of Latter-day Saints and Central Peninsula Church to the north.

Existing noise at the project site is primarily from vehicular traffic on local roads. Noise from the children and outdoor music at the daycare center's outdoor play area also contributed to the overall noise levels at the site and at adjacent residences. Other ambient noise sources include parking lot traffic and activities, residential activities (home/landscape maintenance and voices). There were also frequent aircraft flyovers which were a mix of commercial jets and general aviation. During our site visit, we observed aircraft passing near the site as often as once every minute.

4.1 Ambient Noise Measurements

In order to quantify existing noise levels, three continuous long-term noise measurements (approximately four days) and four short-term noise measurements (15-minutes) were made on and around the project site. Figure 2 shows the locations of the measurements with the project's 100% Schematic Design Site Plan from HMC Architects.

Figure 2: Noise Measurement and Receiver Locations



Long-term Measurements of Ambient Noise: April 19-22, 2017:

The long-term measurement at location LT-1 was made on a light pole near the setback of the proposed school building, approximately 12 feet above ground. The long-term measurement at location LT-2 was made on a light pole at the west property line, approximately 12 feet above ground. The long-term measurement at location LT-3 was made on a tree at the west property line near the edge of the proposed playground area. The long-term noise measurement results are shown in Figures 3 to 5.

Figure 3: Long-term Hourly Noise Measurement Results at LT-1

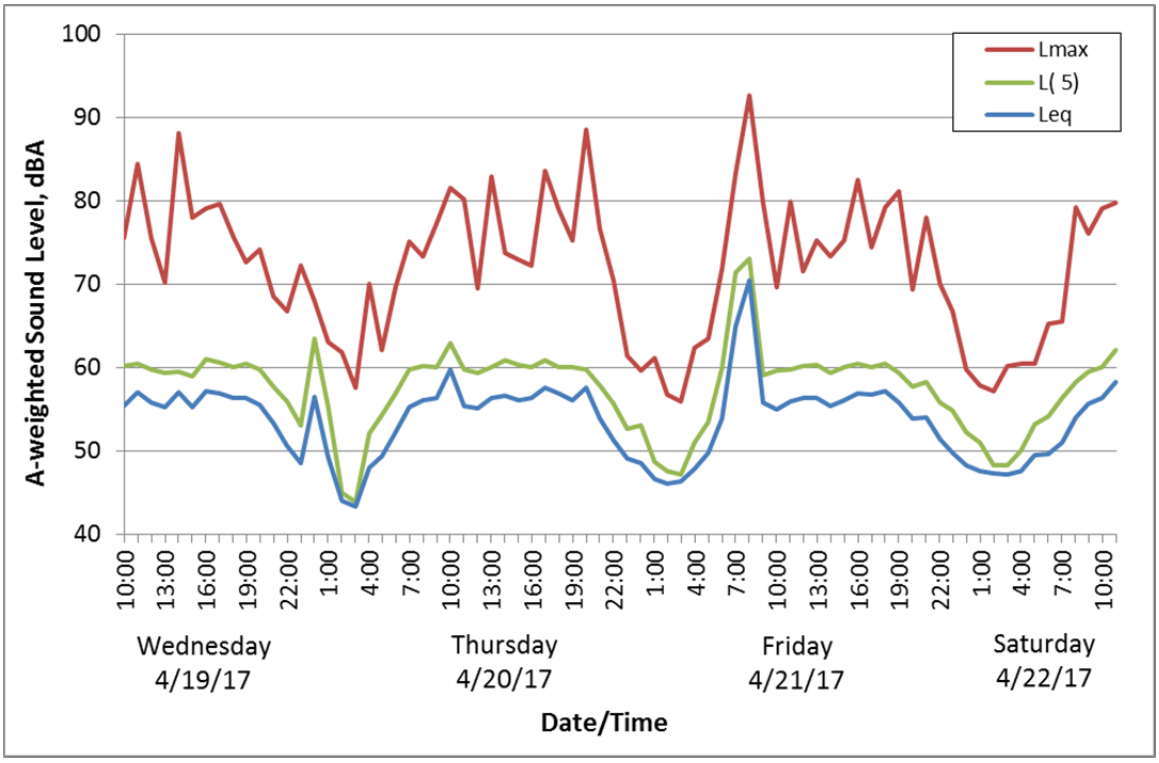


Figure 4: Long-term Hourly Noise Measurement Results at Location LT-2

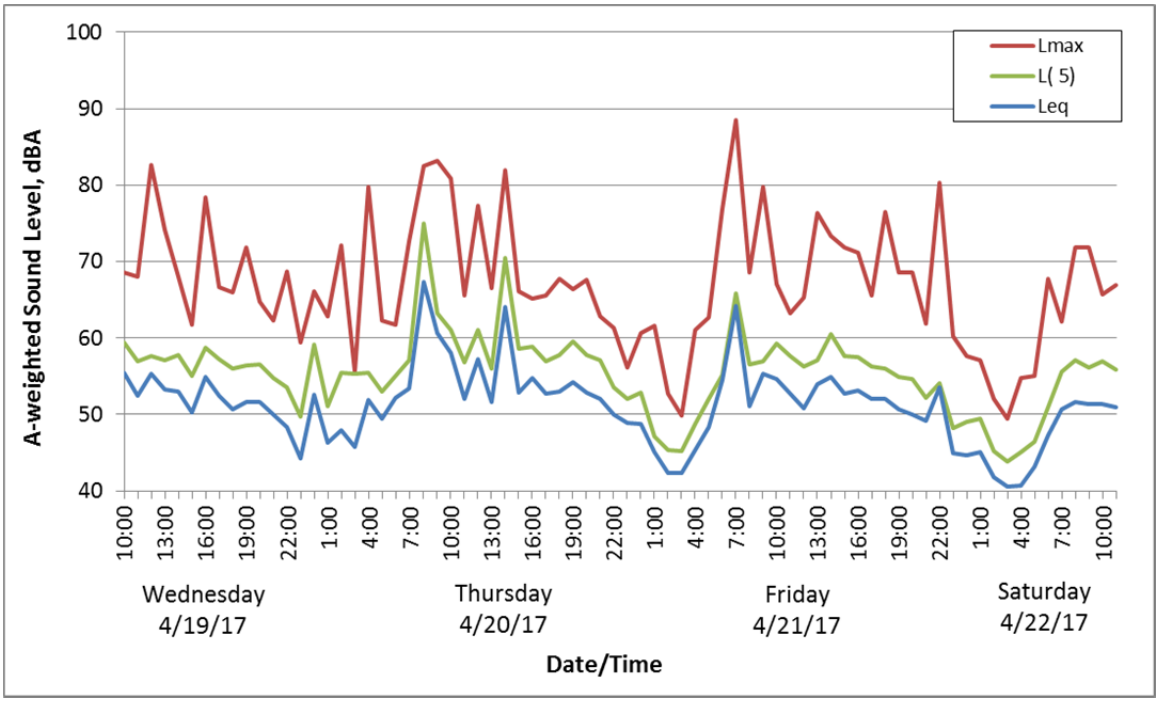
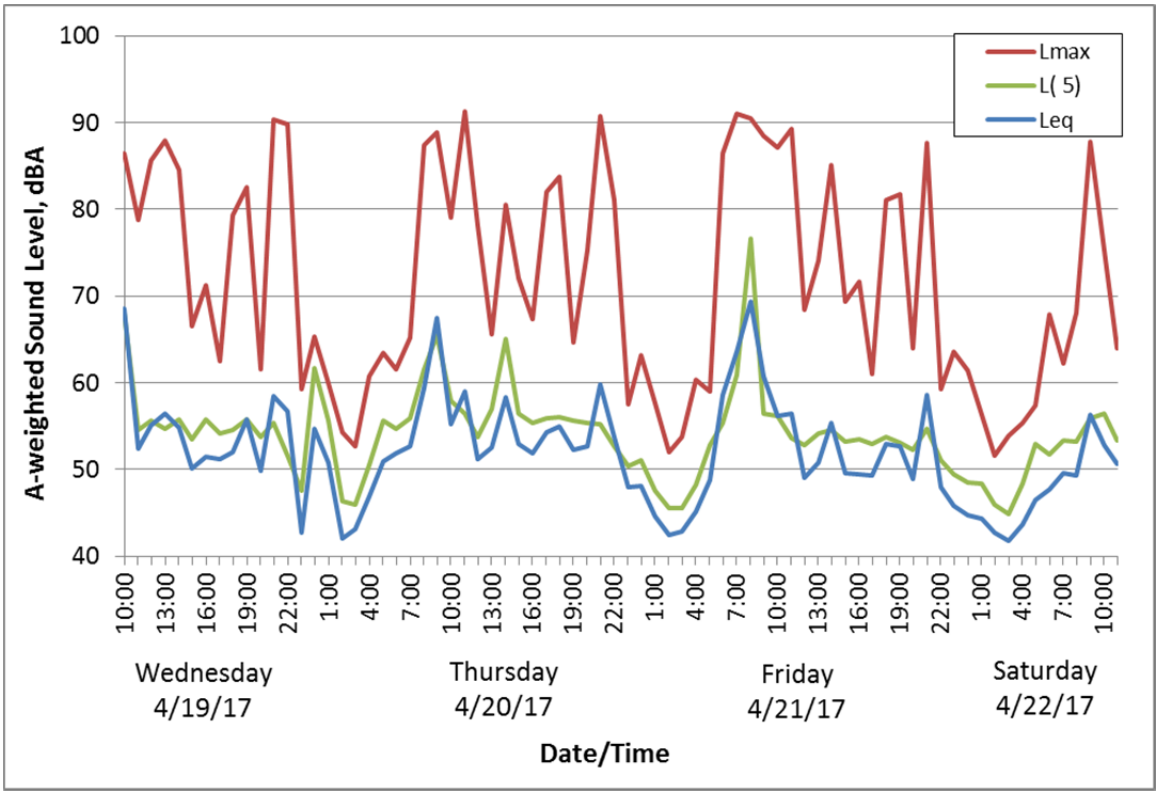


Figure 5: Long-term Hourly Noise Measurement Results at Location LT-3



The day-night average sound level (L_{dn}) at each long-term monitor location is shown in Table 2. The L_{dn} was calculated using measured weekday hourly noise levels. Adjustments were made to account for a leaf blower that was being used in close proximity to the long term noise monitors. Table 2 also shows the average hourly noise level during daytime and nighttime hours.

Table 2: Weekday Ambient Noise Levels at Receiver Areas

Receiver	L_{dn}, dBA	Average Hourly Noise Level, dBA		
		Time of Day	L_{eq}	L_5
LT-1	58	7:00 – 22:00	56	60
		22:00 – 7:00	49	54
LT-2	57	7:00 – 22:00	54	63
		22:00 – 7:00	50	54
LT-3	58	7:00 – 22:00	56	57
		22:00 – 7:00	50	53

Short-term Measurements of Ambient Noise: April 19, 2017:

Short-term noise measurements were made on April 19, 2017 to allow for direct observation of the existing ambient noise and to help determine noise levels at other locations in the community. These short-term measurements were also used to quantify noise from the existing daycare center. The short term noise measurements were made at a height of five feet above ground and the results are shown in Table 3.

Table 3: Short-Term Noise Measurement Results (April 19, 2017)

Site	Location	Time	L_{eq}	L_5	L_{dn}*	L_{max}
ST-1	Multi-family Residences on Shell Boulevard	11:46 AM – 12:01 PM	61	66	62	Cars: 64 – 69 typ., 82 Bus: 72 Aircraft: 53 typ.
ST-2	Project site parking lot along west property line behind existing daycare's outdoor play area	10:49 AM – 11:16 AM	58	63	60	Children at daycare: 53 – 58 Children at daycare yelling: 64 - 73 Music at daycare: 56 Aircraft: 56 – 64 Leaf blower: 53
ST-3	Project site parking lot near the setback of proposed classrooms facing Beach Park Boulevard	10:26 AM – 10:41 AM	52	56	61	Cars: 51 – 56 Trucks: 51, 62 Bus: 45 Aircraft: 46 – 55 Parking Lot: 54 – 62 Birds: 47 - 52
ST-4	Two-story single-family housing on Beach Park Boulevard	11:27 AM – 11:42 AM	68	73	70	Cars: 64 – 74 typ., 81 Truck: 64 Motorcycle: 70, 87 Aircraft: 46 – 53 Birds: 52, 56

*L_{dn} calculated based on correlation between simultaneous short-term and long-term measurements

4.2 Elementary School Noise Levels

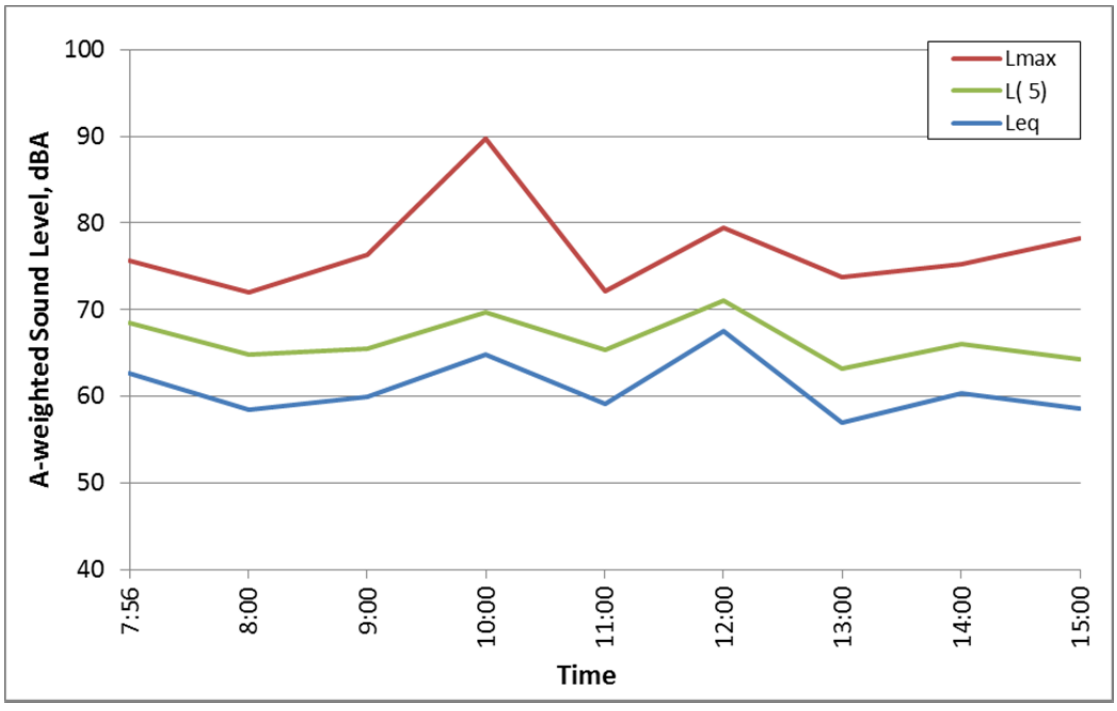
To quantify noise from the proposed school, Brewer Island Elementary School was chosen because it is in the same school district as the project and has student enrollment that would be comparable to the project under full capacity.

Brewer Island Elementary School currently has 685 students. This is two to three times the number of students that the project will have initially and about 85 more than the project at full capacity[4].

One long-term measurement and one short-term measurement were made on 2 May 2017 near the northwest entrance to the school with direct line-of-sight to the school's field and playground area. The long-term measurement was made for one full school day on a chain link fence approximately 10 feet above ground. The short-term measurement was made during recess approximately 10 feet from the chain link fence at a height of 5 feet above ground.

Measurements included noise associated with students playing on the fields, parents dropping off/picking up students, vehicular traffic, and frequent aircraft flyovers. The major noise sources from the school are children playing outdoors (laughing, cheering, balls bouncing, talking, and occasional yelling). During recess, a maximum noise level of 90 dBA was measured at the long-term monitor. Based on the audio recordings, this single event was due to a child yelling in close proximity to the noise monitor. However, the typical yelling noise had a maximum instantaneous noise level (L_{max}) of 72 to 79 dBA at the monitor. Figure 6 shows the long-term measurement results and Table 4 shows the short-term measurement results.

Figure 6: Long-term Measurement Result at Brewer Island Elementary School – 2 May 2017



[4] *Email from Tish Busselle dated 17 April 2017.*

Table 4: Short-Term Noise Measurement Results at Brewer Island Elementary School 2 May 2017

Location	Time	L_{eq}*	L_5*	L_{max}
10 feet from school entrance fence on Ranger Circle at 5 feet above ground	10:03 – 10:30 AM	64	68	Kids yelling: 66 – 68 Balls bouncing nearby: 62 Bell: 62 – 72 (with kids yelling) Jets: 64 – 67 HVAC: 46 - 47

*measurements adjusted to exclude six airplane flyovers

Based on conversation with Brewer Island Elementary School staff on 2 May 2017, children are allowed to play outdoors during recess, lunch, and physical education class. Physical education classes occur throughout the school day with fewer students on the field and therefore, noise levels are generally lower than during recess and lunch time. Table 5 shows Brewer Island Elementary School's 2016-2017 bell schedule.

Table 5: Brewer Island Elementary School 2016-2017 Bell Schedule

Grade	Start	Recess	Lunch	Regular Day Dismissal	Minimum Day Dismissal
Transitional Kindergarten	8:10	10:00 – 10:20	--	12:10	12:10
Kindergarten	8:10	10:00 – 10:20	--	12:10	12:10
1st Grade	8:20	9:50 – 10:10	12:00 – 1:00	2:40	12:35
2nd Grade	8:20	9:50 – 10:10	12:00 – 1:00	2:40	12:35
3rd Grade	8:20	9:50 – 10:10	12:00 – 1:00	2:40	12:35
4th Grade	8:00	10:15 – 10:35	12:00 – 1:00	2:40	12:28
5th Grade	8:00	10:15 – 10:35	12:00 – 1:00	2:40	12:28

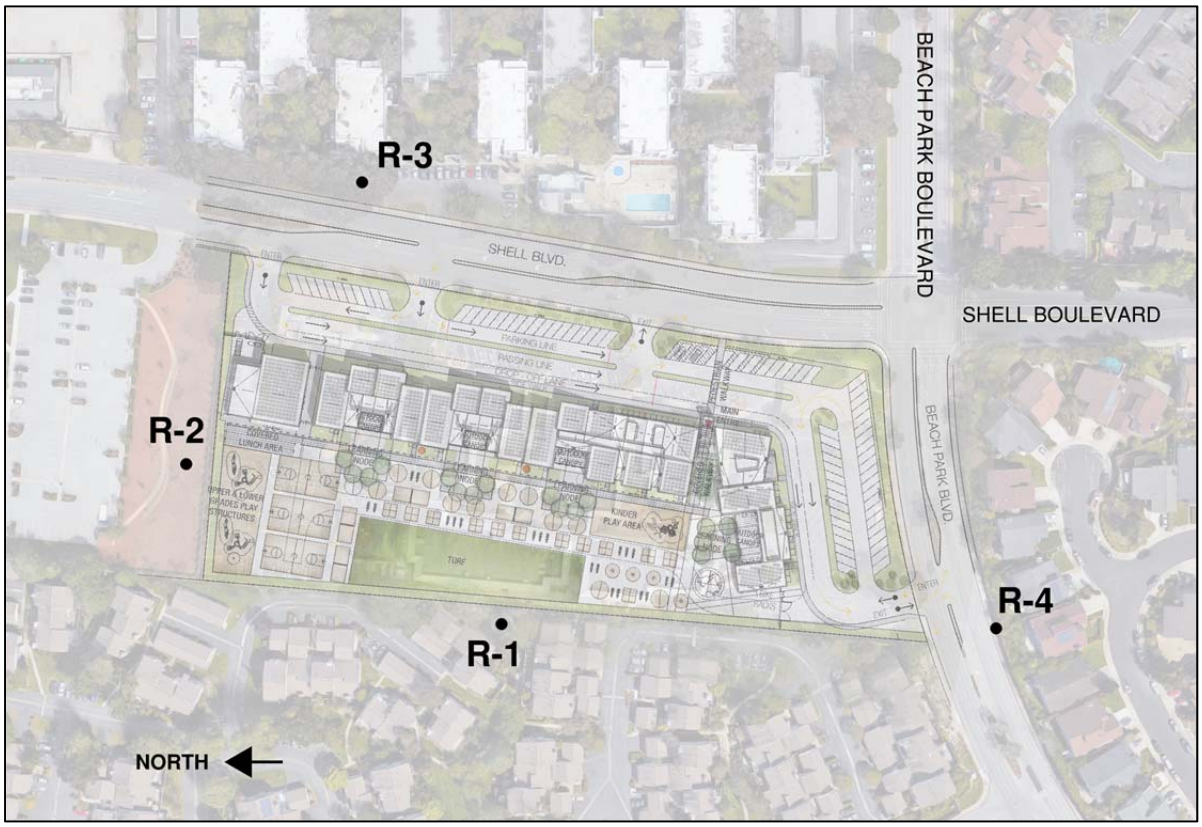
5 Project Generated Noise Levels

Establishment of the school will allow school staff and up to 600 students and their parents to use the site. In order to evaluate the noise levels from the project site with and without the project, assumptions were made regarding the timing when the project would generate noise.

This report assumes the proposed project would use a bell schedule similar to that of Brewer Island Elementary School, and that the majority of traffic noise associated with the project occurs an hour before school starts, during lunch time, and an hour after school ends. The noise impact assessment locations are shown in Figure 7. These locations were chosen

based on the proposed school site plan, the location of project generated noise sources and the location of noise sensitive receptors.

Figure 7: Noise Impact Assessment Locations



5.1 Methodology for Determining Future Noise Levels

Student Activities

This analysis uses SoundPlan (ver 7.4) noise modeling software to calculate noise from student activities. The noise model was calibrated using measured noise levels at Brewer Island Elementary School with adjustments to account for the enrollment differences at the new school. Specifically, Brewer Island Elementary School currently has 685 students and the project's maximum capacity is 600 students. The modeling also took into account the sound attenuation provided by the proposed school buildings. Separate model runs were done for class time, recess, and lunch time.

School Bells and Public Address (PA) System

The sound of announcements and class/recess bells will be audible at the project site and vicinity. At this time the specifics of the system are not known. Noise levels used for this analysis are based on the measurements conducted at the Brewer Island Elementary School.

The class/recess bells were generated electronically by the PA system loudspeakers (rather than by physical bells). Much of the PA system consists of speakers inside classroom buildings however some loudspeakers are located outdoors to cover the halls and playground. The class/recess bells generated a maximum noise level of 72 dBA at the property line (see Table 4). It is assumed that the property line noise levels from bells and announcements will be similar at the Charter Square School.

Project Generated Traffic and Parking Lot Noise

Noise from project-generated traffic is based on the traffic volumes provided in the project's traffic impact study[5]. According to that study, the project would introduce new traffic associated with the school and remove existing traffic associated with the Charter Square Shopping Center. The result is a net total increase of 273 vehicle trips during the morning peak hour and a decrease of 15 and 186 vehicle trips during the midday and evening peak hours, respectively. To be conservative, the project generated traffic noise was calculated only for the additional traffic associated with the project using the Federal Highway Administration's Traffic Noise Model (TNM 2.5).

Based on the site plan dated June 8, 2017, there will be a total of 75 on-site parking spaces. Additionally, the traffic study indicates that the project would install drop-down barrier gates to control the flow of vehicles entering on-site. This information was used as inputs to the SoundPlan model to calculate the noise from the use of drop-off/pick-up lanes and the use of the on-site parking lot.

Traffic Noise Levels

The main ambient noise sources in the future are expected to be vehicular traffic and aircraft flyovers. Based on the site noise measurements and increased traffic from the traffic study, the calculated ambient noise level at the setback of the classrooms is an L_{dn} of 58 dBA.

To calculate the increase in traffic noise levels due to the project, the Federal Highway Administration's Traffic Noise Model (TNM 2.5) was used. The traffic volumes were based on the project's traffic impact study and were assumed to occur during daytime hours. A heavy truck mix of 1% and medium truck mix of 3% was used to account for typical truck activity and the presence of school buses. Table 6 shows the increase in vehicular traffic (L_{dn}) due to cumulative growth in the area.

[5] Hexagon Transportation Consultants. *New Elementary School in Foster City Traffic Impact Analysis.*

Table 6: Cumulative Traffic Noise Level Increase

Receiver	L_{dn} (dBA)				
	Existing	Cumulative Without Project*	Cumulative Plus Project	Cumulative Increase	Cumulative Increase due to Project
R-1	48.7	48.8	48.9	0.2	0.1
R-2	46.7	46.7	47.1	0.4	0.4
R-3	55.6	55.6	56.0	0.4	0.4
R-4	60.0	60.2	60.3	0.3	0.1

*Cumulative without Project conditions calculated by summing the Existing conditions with the difference between Cumulative plus Project conditions and Existing plus Project conditions.

Aircraft Noise Levels

The project site is located approximately 6.5 miles southeast of the San Francisco International Airport and 2.3 miles northwest of San Carlos Airport. According to the Comprehensive Airport Land Use Compatibility Plan (ALUC) for the Environs of San Francisco International Airport, the project site is located outside the lowest available aircraft noise contour for CNEL 65 dBA. According to the ALUC for the Environs of San Carlos Airport, the project site is outside the lowest available aircraft noise contour for CNEL 60 dBA.

During the four 15-minute measurements, we observed that the majority of planes flying near the project site were commercial aircrafts. Commercial aircrafts generated noise maximum instantaneous noise levels (L_{max}) of 55 to 64 dBA. General aviation aircrafts were generally quieter and generated lower instantaneous noise levels (L_{max}) of 46 to 53 dBA.

5.2 Noise Modeling Results

Table 7 presents the noise levels generated by the project during class time, recess, and lunch time in terms of the L_5 and maximum noise level (L_{max}). Table 8 shows existing noise levels, future noise levels on a school day (students and associated traffic and parking lot noise) and the change in noise level due to the project in terms of the L_{dn}.

Table 7: Typical Noise Levels from Outdoor Student Activities

Receiver	Lunchtime		Recess		Class	
	L_5	L_{max}	L_5	L_{max}	L_5	L_{max}
R-1	74	82	71	79	65	73
R-2	71	80	68	76	62	70
R-3	58	66	55	63	48	57
R-4	59	67	55	64	49	57

Table 8: Change in L_{dn} due to Project

Receiver	Noise Source	Typical School Day (L_{dn})		
		Existing	Existing + Project	Increase
R-1	Ambient	57.3	57.3	--
	Noise from the School	--	59.5	--
	Noise from Project Traffic and Parking Lot	--	33.8	--
	Total	57.3	61.6	4.3
R-2	Ambient	56.8	56.8	--
	Noise from the School	--	56.9	--
	Noise from Project Traffic and Parking Lot	--	31.5	--
	Total	56.8	59.9	3.1
R-3	Ambient	62.2	62.2	--
	Noise from the School	--	43.6	--
	Noise from Project Traffic and Parking Lot	--	39.5	--
	Total	62.2	62.3	0.1
R-4	Ambient	70.0	70.0	--
	Noise from the School	--	44.2	--
	Noise from Project Traffic and Parking Lot	--	44.3	--
	Total	70.0	70.0	< 0.1

6 Impact Analysis

a) Would the project result in 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?

Significant and Unavoidable Impact.

Land Use Compatibility

The measured noise level and calculated future ambient levels at the setback of the classrooms is an L_{dn} of 59 dBA. The Foster City General Plan considers schools with normal construction exposed to an L_{dn} below 60 dBA to be “normally acceptable”. Therefore, this potential impact is considered *less than significant.*

Noise from Student Activities Affecting Existing Residences

The primary noise from the school would be students playing outdoors. The project will include new hard courts, turf, and play areas. Noise during lunch time is expected to

generate the most noise during a school day. Table 7 shows the predicted noise levels from student activities outdoors (lunchtime, recess and class time).

For the nearest sensitive noise receptors, the calculated lunch time noise levels are an L_5 of 74 dBA and a L_{max} of 82 dBA at the residences to the west (Location R-1), and an L_5 of 71 dBA and a L_{max} of 80 dBA at the neighboring church (Location R-2). For residences across the street, the calculated lunch time noise levels are an L_5 of 58 dBA and a L_{max} of 66 dBA at the residences along Shell Boulevard (Location R-3), and an L_5 of 59 dBA and a L_{max} of 67 dBA at the residences along Beach Park Boulevard (Location R-4).

At Locations R-1 and R-2, the L_5 noise levels from lunch time activities are 8 to 11 decibels above the daytime ambient L_5 noise level. This is clearly noticeable and has the potential to cause annoyance at the nearest residences. At Locations R-3 and R-4, noise from lunch time activities would be 8 decibels below the ambient. At these locations, the dominant noise source would continue to be vehicular traffic.

The thresholds of significance are a daytime noise limit of L_5 of 60 dBA and a L_{max} of 65 dBA. Therefore, the noise levels from lunch time activities would exceed the L_{max} thresholds at all assessment locations and exceed the L_5 threshold at Locations R-1 and R-2. The L_5 noise levels from lunch time activities would not exceed the threshold of significance at Locations R-3 and R-4. This is a *significant impact.*

Mitigation Measure NO-1

In order to reduce noise to the City's noise ordinance limits a noise barrier in excess of 20 feet would be required. Therefore, it is recommended that a barrier of practical height (i.e. 8-foot tall) be constructed along the property line between the outdoor use areas and the neighboring residences and church. Figure 8 shows the location for the barrier.

The 8-foot tall barrier would reduce noise from the crowd and field activities by 8 dBA at first floor (ground level) elevation. This would be a noticeable reduction in noise associated with students on the field but would still exceed an L_5 of 60 dBA and an L_{max} of 65 dBA at the nearest residences. Table 9 shows the change in noise levels with and without the wall at the representative receivers for first floor residences shown in Figure 8. This impact remains *significant after mitigation.*

Figure 8: Proposed Location for an 8-ft Wall

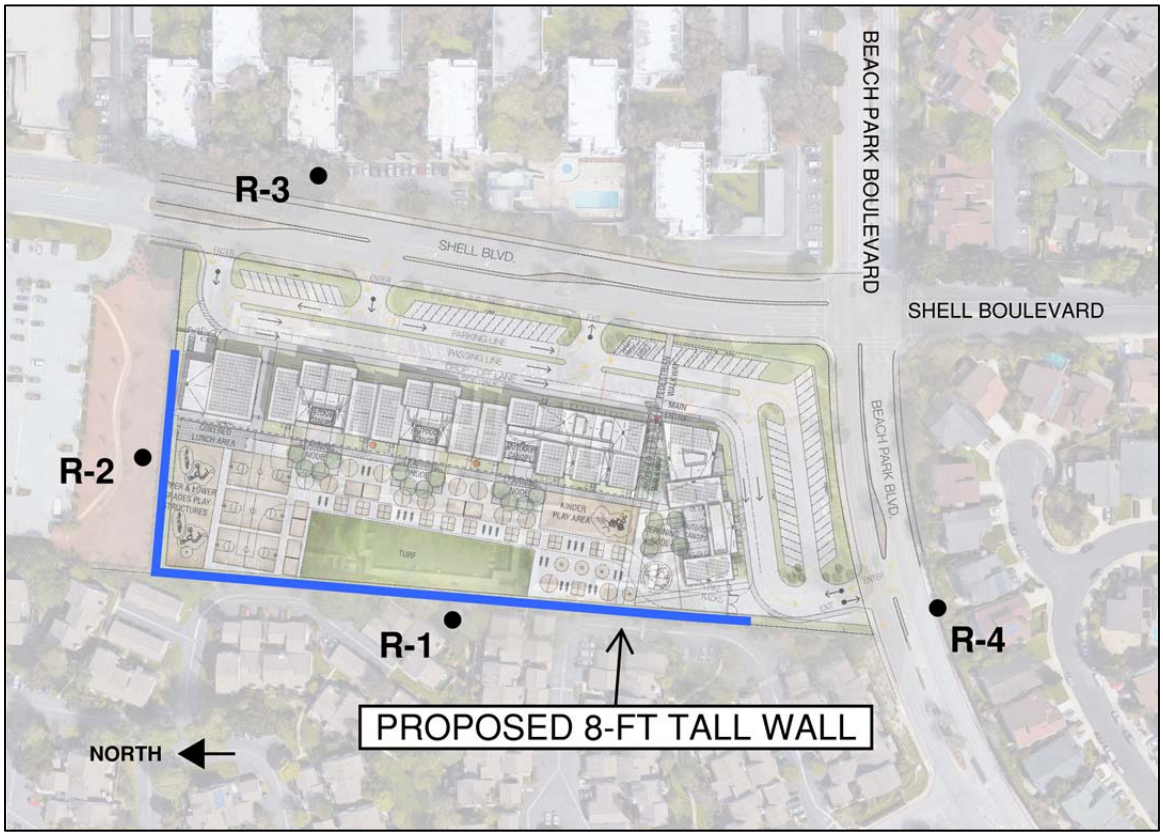


Table 9: Change in Noise Level During Lunchtime with an 8-ft Wall

Receiver	Noise Level During Lunchtime				
	Without wall		With 8-ft wall		Change (dBA)
	L_5 (dBA)	L_{max} (dBA)	L_5 (dBA)	L_{max} (dBA)	
R-1	74	82	66	74	-8
R-2	71	80	63	71	-8
R-3	58	66	58	66	0
R-4	59	67	59	67	0

Noise from Class/Recess Bells and PA

Bells and PA announcements are expected to generate maximum noise levels of 72 dBA at the nearest property lines (Locations R-1 and R-2). The noise from bells and PA will not contribute significantly to the 24-hour average noise level (L_{dn}) because

they are short duration. It is expected that the PA system speakers would be oriented toward the project site and, therefore, generate significantly lower noise levels at the residences across Shell and Beach Park Boulevards.

The thresholds of significance are a daytime noise limit of L_{max} of 65 dBA. Therefore, the noise levels from bells and PA system announcements would exceed the L_{max} thresholds at Locations R-1 and R-2. This is a *significant impact.*

Mitigation Measure NO-2

The 8-foot tall barrier recommended in Mitigation Measure NO-1 will reduce bell and PA noise by about 5 dBA for first floor recievers. This would be a noticeable reduction in noise would still exceed an L_{max} of 65 dBA at the nearest residences. In addition to the barrier the PA system should be designed with consideration of speaker orientation and electronic limiting to minimize the spill to the neighbors. Also the bell system should be programmed so that bells are sounded outdoors only when necessary. This impact remains *significant after mitigation.*

School Building Operational Noise Affecting Existing Residences

The new school buildings will have associated mechanical equipment with the potential to generate noise. According to the MEP/FA/FS Narrative from the 100% Schematic Designs, mechanical systems serving the proposed buildings are packaged gas/electric units located on the roof and are typically 3-5 tons for classrooms. Detailed noise predictions are not possible since the exact equipment is not known. The noise impact from the building mechanical equipment is *potentially significant* because it could exceed the City's noise ordinance limits. *Mitigation Measure NO-3*

Prior to approval of building permit, require applicant to demonstrate that project mechanical equipment has been designed to meet the City's noise ordinance limits. For example, at the adjacent residences, the noise ordinance limit for continuously operation equipment is 60 dBA during the daytime and 50 dBA at night. Noise reduction features could include local noise barriers and locating the equipment farther from property lines. This impact is *less than significant with mitigation*.

b) Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Significant and Unavoidable Impact.

The operation of the project is not expected to include groundborne vibration sources, however, construction activities will generate groundborne vibration. Construction of

the project would include the demolition of existing buildings, grading and foundation work, and construction of the buildings and outdoor fields, tables, and hard courts. Construction of the school is expected to last 13 months from June 2018 to July 2019. Table 10 presents typical vibration levels from the construction equipment likely to be used at the project.

Existing buildings requiring demolition are located between 20 to 260 feet from the nearest project property line to the west. The proposed school buildings are generally located at distances of 170 feet from the nearest residential property line but there are some classrooms located closer and are as close as 40 feet from the nearest residential property line. During the project demolition phase, the use of heavy construction equipment such as a vibratory roller, a hoe ram or a large bulldozer would generate groundborne vibration levels between 56 to 97 VdB at the nearest residential property line. A jackhammer would generate vibration levels between 48 to 82 VdB. During the construction of the school buildings, heavy construction equipment would generate groundborne vibration levels between 62 to 88 VdB. Other construction tools would generate vibration levels of 54 to 73 VdB. Since construction activities are calculated to exceed the 80 VdB, groundborne vibration is a *significant impact.*

Mitigation Measure NO-3

Locate machinery and tools such as a hoe ram and large bulldozers away from the sensitive receptors as practically as possible. At distances of 50 feet or more, the groundborne vibration due to the operation of a single hoe ram or a large bulldozer would be below the threshold of significance. Alternatively, if feasible, minimize the use of hoe rams by using smaller jackhammers to minimize the groundborne vibration transfer to adjacent properties. Though the aforementioned measures would provide measurable vibration reductions at the property line, construction activities would still exceed 80 VdB. *This impact remains significant after mitigation.*

Table 10: Vibration Levels for Construction Equipment at Various Distances

Equipment	Vibration Velocity Level, VdB			
	25 Feet	50 Feet	75 Feet	100 Feet
Vibratory Roller	94	85	80	76
Hoe Ram	87	78	73	69
Large Bulldozer	87	78	73	69
Caisson Drilling	87	78	73	69
Loaded Trucks	86	77	72	68
Jackhammer	79	70	65	61
Small Bulldozer	58	49	44	40

Note: VdB = RMS Vibration Velocity Level expressed in decibels re 1 micro-inch per second.
Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, Final Report, 2006

c) Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Significant Impact with Mitigation.

The proposed school generates noise associated with outdoor activities, bells and project generated traffic. Table 8 shows that the change in L_{dn} due to the project would exceed the threshold of significance at Locations R-1 and R-2. However, with Mitigation Measure NO-1, an 8 foot tall noise barrier, the L_{dn} would increase by 1 dBA or less and therefore, the increase in noise is less than significant for first floor receivers (see Table 11). Second floor receivers would not benefit from the noise barrier and the noise increase would be a *significant impact with mitigation*.

Table 11: Change in L_{dn} with the Project with an 8-ft Wall (Mitigation Measure NO-1)

Receiver Area	Noise Source	Typical School Day (L_{dn})		
		Existing	Proposed	Increase
R-1	Ambient	57.3	57.3	
	Noise from the School	--	51.5	
	Project-Generated Traffic	--	33.6	
	Total	57.3	58.3	1.0
R-2	Ambient	56.8	56.8	
	Noise from the School	--	48.5	
	Project-Generated Traffic	--	30.6	
	Total	56.8	57.4	0.6
R-3	Ambient	62.2	62.2	
	Noise from the School	--	43.5	
	Project-Generated Traffic	--	39.6	
	Total	62.2	62.3	0.1
R-4	Ambient	70.0	70.0	
	Noise from the School	--	44.3	
	Project-Generated Traffic	--	44.3	
	Total	70.0	70.0	< 0.1

d) Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than Significant Impact with Mitigation.

Construction of the project would last 13 months and include the demolition of existing buildings, grading and foundation work, and construction of the buildings and outdoor fields, tables, and hard courts. Table 12 presents typical construction equipment noise levels at a reference distance of 50 feet. The noisier activities tend to occur during the demolition and grading/foundation phases of construction. The later construction phases of the school buildings generate lower noise levels when the construction activities occur indoors.

Table 12: Typical Construction Equipment Noise Levels

Equipment	L_{max} (dBA) at 50 feet
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76
Scraper	89
Truck	88

Source: Federal Transit Administration Manual, Construction Equipment Noise Emission Levels, 2006

Based on a typical construction equipment noise source level of 85 dBA at 50 feet, the noise levels during the construction of the school buildings would be 75 dBA for homes to the west, 72 dBA for homes across Shell Boulevard, and 64 to 72 dBA for homes across Beach Park Boulevard. During the construction of the playground areas, the noise levels could reach up to 93 dBA for homes to the west due to their close proximity to the proposed playground areas. These noise levels will be clearly noticeable and at times, interfere with normal daily activities.

The Foster City Municipal Code exempts the construction operations between the hours of 7:30 AM and 8:00 PM on weekdays and between 9:00 AM and 8:00 PM on weekends and legal holidays in a residential district if construction noise levels do not exceed 100 dBA at the project's property plane. The existing building and proposed building closest to the project's property line are approximately 20 feet from the property line and 14 feet from the property line, respectively. This corresponds to a typical construction equipment noise of 96 dBA or less. Although noise levels will not

likely exceed 100 dBA at the property plane, construction will temporarily increase noise levels at adjacent residences. *This impact is less than significant with mitigation.*

Mitigation Measure NO-4

In order to minimize disruption and potential annoyance during construction, the following is recommended:

- All construction equipment shall be equipped with mufflers and sound control devices (e.g., intake silencers and noise shrouds) that are in good condition and appropriate for the equipment.
- Maintain all construction equipment to minimize noise emissions.
- Stationary equipment shall be located on the site so as to maintain the greatest possible distance to the sensitive receptors.
- Unnecessary idling of internal combustion engines should be strictly prohibited.
- Neighbors located adjacent to the construction site shall be notified of the construction schedule in writing.
- The construction contractor shall provide the name and telephone number an on-site construction liaison. In the event that construction noise is intrusive to the community, the construction liaison shall investigate the source of the noise and require that reasonable measures be implemented to correct the problem

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, would the project expose people residing or working in the project area to excessive noise levels?

Less than Significant Impact.

San Francisco International Airport

The project is located within the airport influence area of the San Francisco International Airport's 2012 Land Use Compatibility Plan (ALUCP). However, the project site is located outside the ALUCP's CNEL 65 dBA noise contour and the ALUCP considers it to be acceptable for public schools exposed to CNEL from aircraft noise of less than 65 dBA. Therefore, this impact is *less than significant*.

San Carlos Airport

According to the Airport Land Use Compatibility Plan for the Environs of San Carlos Airport (ALUCP), the project is not located in the "proposed CCAQ/ALUC review area" but within the "proposed revised airport influence area". This means the City/County Association of Governments of San Mateo "shall exercise its statutory duties to review

proposed land use policy actions" and that the "Notice of Airport in Vicinity" disclosure must be included in the notice of intention to offer the property for sale.

However, the project site is located outside the ALUCP's CNEL 60 dBA noise contour and the ALUCP considers children's schools (K-12) and child care facilities exposed to a CNEL from aircraft noise of less than 60 dBA to be acceptable. Therefore, this impact is *less than significant*.

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

No Impact.

The project is not located within the vicinity of a private airstrip.