Appendix B:

Noise Assessment

SUMMIT K2 CHARTER SCHOOL HIGH SCHOOL EXPANSION PROJECT ENVIRONMENTAL NOISE ASSESSMENT EL CERRITO, CALIFORNIA

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INTRODUCTION

This report summarizes the assessment of potential noise impacts resulting from the Summit K2 Charter School High School Expansion Project, proposed at 1800 Elm Street in El Cerrito, California. Summit K2 is seeking to add additional grade levels and additional students to the site. Education Matters, the property owner of the site, has submitted an application to amend the existing use permit to allow grades 7-12 at the site, to increase the maximum number of students to 630, to extend school hours until 3:30 p.m. and to increase maximum summer enrollment to 315 students.

The Setting Section of this report presents the fundamentals of environmental noise, provides a discussion of policies and standards applicable to the project, and presents the results of the ambient noise monitoring survey made to document existing conditions. The Impacts and Mitigation Measures Section of the report summarizes future noise levels resulting from the project and provides an evaluation of the potential significance of project-related noise impacts.

SETTING

Background Information on Noise

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

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

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

events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

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

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

Effects of Noise

Sleep and Speech Interference

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

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

Source: Technical Noise Supplement to the Traffic Noise Analysis Protocol (TeNS), Caltrans, September 2013.

Regulatory Criteria

State CEQA Guidelines. The California Environmental Quality Act (CEQA) includes qualitative guidelines for determining the significance of environmental noise impacts. A project will typically have a significant impact if it would:

(a) Expose people to or generate noise levels in excess of established in the local general plan, noise ordinance, or applicable standards of other agencies.

(b) Expose people to or generate excessive ground-borne vibration or ground-borne noise levels.

(c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

(d) Result in a substantial temporary or periodic increase in the ambient noise levels in the project vicinity above levels existing without the project.

(e) Where projects within an area covered by an airport land use plan or within two miles of a public airport or public use airport when such an airport land use plan has not been adopted, or within the vicinity of a private airstrip, expose people residing or working in the project area to excessive aircraft noise levels.

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

Of these guidelines, items (a) and (c) are applicable to the proposed project.

With regard to the impact assessment of the proposed project, Guidelines (b) and (d) would be applied to temporary noise or vibration resulting from construction. The proposed project would not modify the existing site or facilities at this time, and no changes are proposed to the campus modifications approved under the 2007 master plan, therefore, Guidelines (b) and (d) are not applicable in the assessment. Guidelines (e) and (f) are not applicable because the project is not located within an airport land use plan, within 2 miles of an airport, or in the vicinity of a private airstrip and would not expose persons in the project area to excessive airport-related noise. CEQA checklist items (b), (d), (e) and (f) are not carried forward for further analysis.

City of El Cerrito General Plan. The Resources and Hazards Element of the City of El Cerrito General Plan identifies noise and land use compatibility standards for various land uses. These standards are intended to provide for compatible noise environments for land uses throughout the community. Residential land uses are considered "normally acceptable" in exterior noise environments of 60 dBA L_{dn} or less. The General Plan also identifies goals and policies designed to limit noise exposure at noise sensitive land uses. Goal H3 states the following: "New development complies with the noise standards established in the General Plan, all new noise sources are within acceptable standards, and existing objectionable noise sources are reduced or eliminated." General Plan policies applicable to the evaluation of noise are listed below.

H3.2: Outdoor Noise Levels. "The goal for maximum outdoor noise levels in residential areas is an L_{dn} of 60 dB. This level is a requirement to guide the design and location of future development and is a goal for the reduction of noise in existing development. However, 60 L_{dn} is a goal that cannot necessarily be reached in all residential areas within the realm of economic or aesthetic feasibility. This goal will be applied where outdoor use is a major consideration (e.g., backyards in single-family housing developments and recreation areas in multi-family housing projects). The outdoor standard will not normally be applied to the small decks associated with apartments and condominiums but theses will be evaluated on a case-by-case basis. Where the city determines that providing an L_{dn} of 60 dB or lower outdoors is not feasible, the outdoor goal may be increased to an L_{dn} of 65 dB at the discretion of the Planning Commission."

H3.7: Areas Below Desired Noise Standards. "These guidelines are not intended to be applied reciprocally. In other words, if an area currently is below the desired noise standards, an increase in noise up to the maximum should not necessarily be allowed. The impact of a proposed project on an existing land use should be evaluated in terms of the increase in existing noise levels and potential for adverse community impact, regardless…[sic]"

H3.8: Non-Transportation Related Noise Sources. "For non-transportation related noise sources, noise levels outdoors should not exceed the limits in the table above (e.g., 60 dBA L_{dn} for residential land uses). Interior noise levels shall be 15 decibels lower than those shown in the table."

H3.9: Noise Environment in Existing Residential Areas. "Protect the noise environment in existing residential areas. In general, the City will require the evaluation of mitigation measures for projects under the following circumstances:

1. The project would cause the L_{dn} to increase 3 dB(A) or more.
2. Any increase would result in an L_{dn} greater than 60 dB(A).
3. The L_{dn} already exceeds 60 dB(A).
4. The project has the potential to generate significant adverse community response."

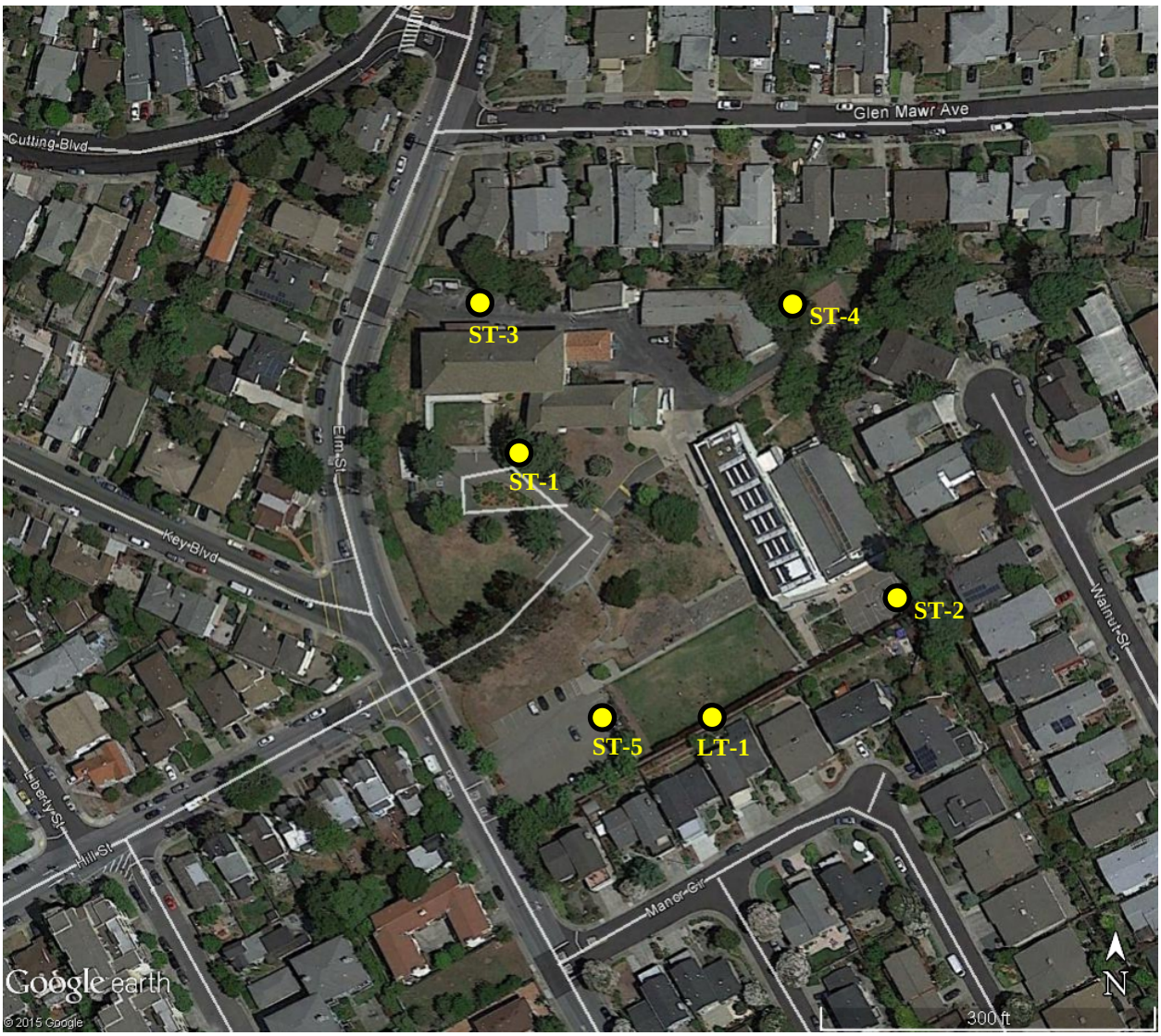
H3.10: Mitigating the Effects of Noise on Adjacent Properties. "Require proposals to reduce noise impacts on adjacent properties by incorporating appropriate measures into the project."

City of El Cerrito Municipal Code. Section 19.21.050 of the City of El Cerrito Municipal Code reiterates the guidelines and performance-based standards stated in the Noise section of the Resources and Hazards Element of the General Plan. For brevity, the Municipal Code language has not been repeated in this discussion of applicable regulatory criteria.

Existing Noise Environment

An ambient noise monitoring survey was conducted between Wednesday, September 30th and Friday, October 2nd, 2015 to document ambient noise levels at the site and in the project vicinity. The noise survey included one long-term noise measurement at the south property line of the school at the midpoint of the playfield (the source of the highest noise levels generated on-site) and five short-term (10-minute) noise measurements. The primary noise sources in the area include outdoor activities at the school, local traffic, and BART trains. Measurement locations are shown in Figure 1. The results of the long-term measurement are shown in Figures 2 through 4. A summary of the long-term and short-term measurement results are shown in Table 3.

FIGURE 1 Noise Measurement Locations



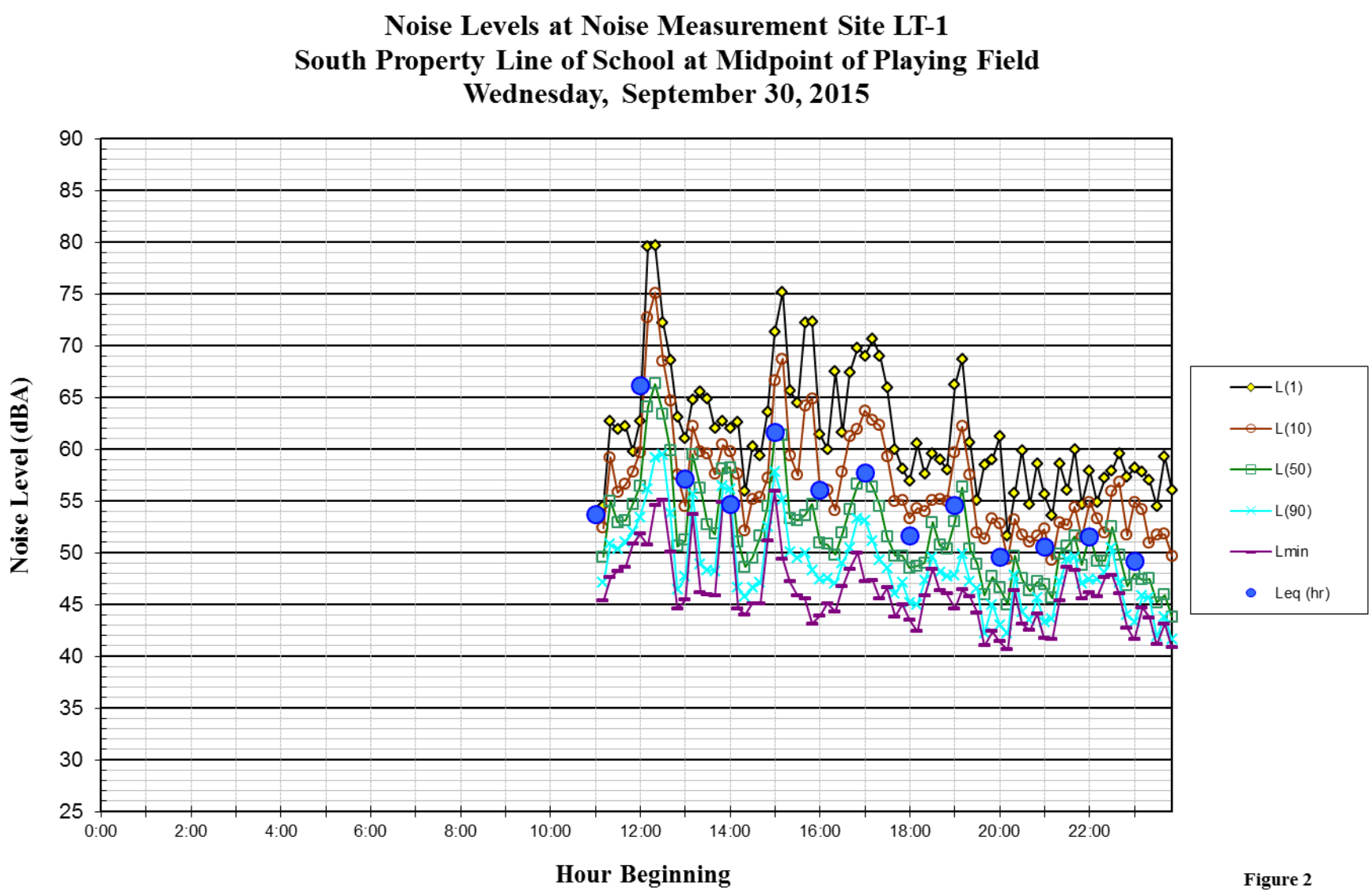

Noise Levels at Noise Measurement Site LT-1
South Property Line of School at Midpoint of Playing Field
Wednesday, September 30, 2015
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 2

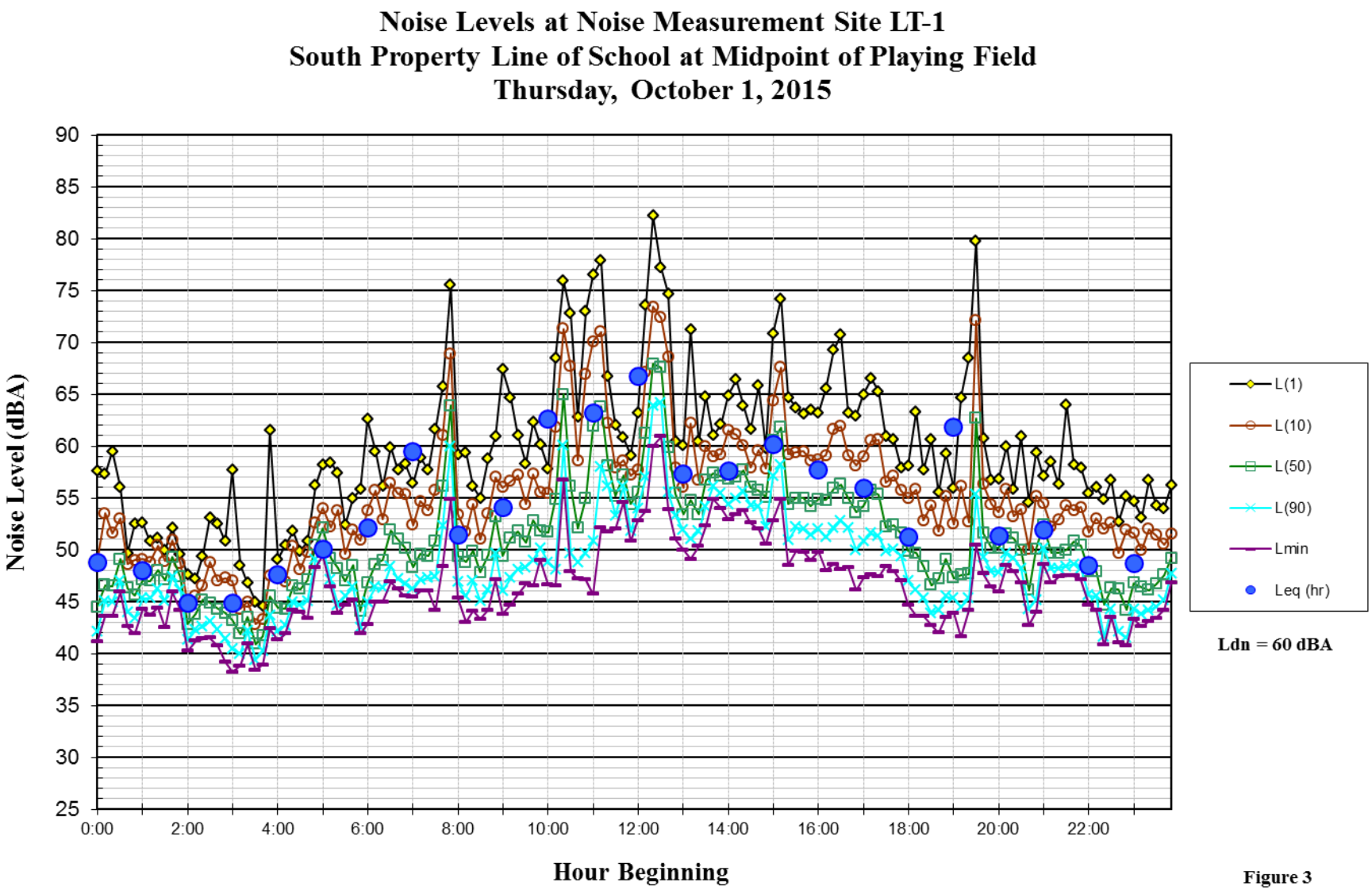

Noise Levels at Noise Measurement Site LT-1
South Property Line of School at Midpoint of Playing Field
Thursday, October 1, 2015
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 60 dBA

Figure 3

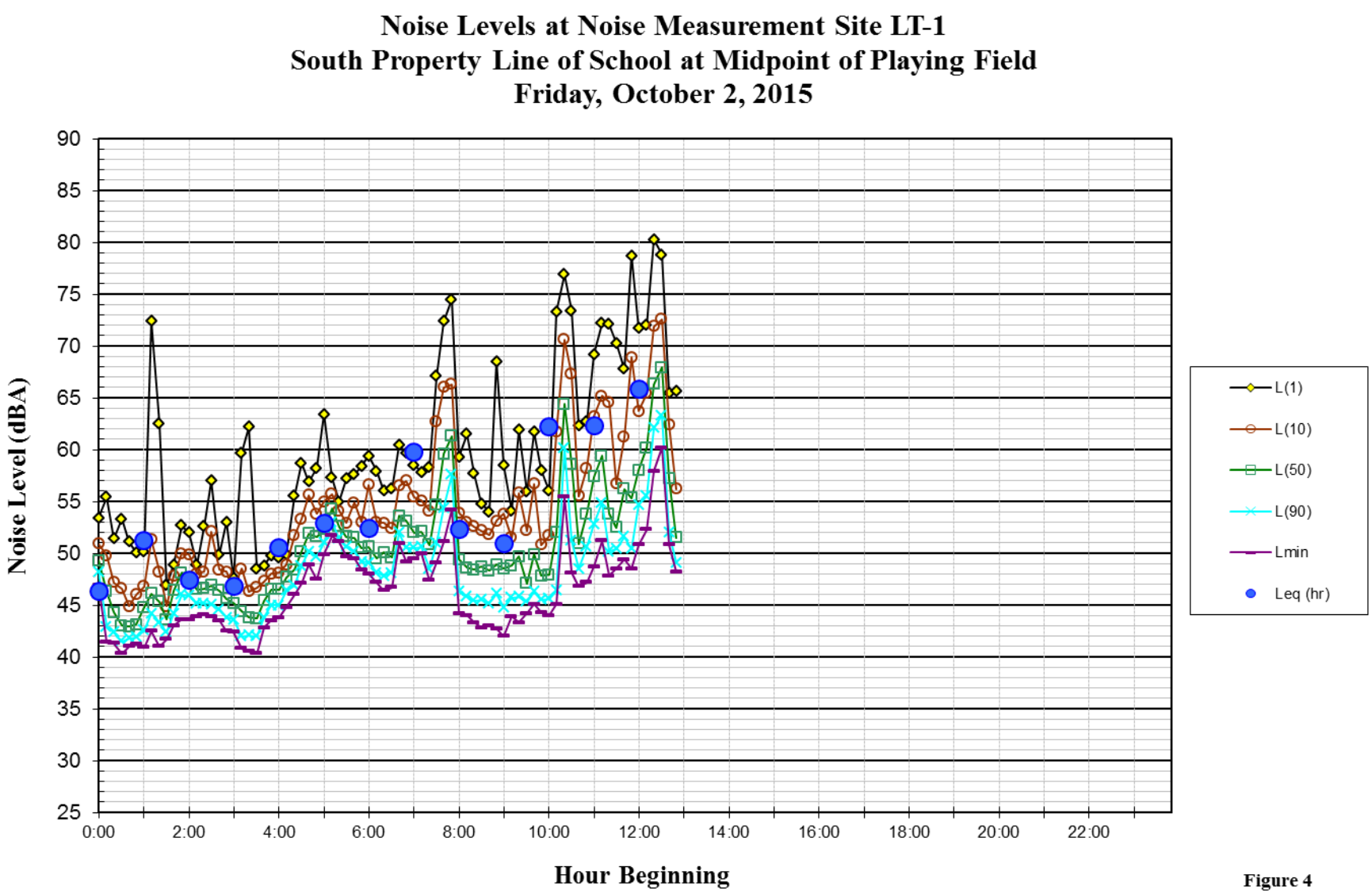

Noise Levels at Noise Measurement Site LT-1
South Property Line of School at Midpoint of Playing Field
Friday, October 2, 2015
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 4

TABLE 3 Summary of Long and Short-Term Noise Measurement Data (A-Weighted Decibels, dBA)

Noise Measurement Location	Measured Daytime Noise Levels		Primary Noise Sources
	L_{50}	L_{eq}	
LT-1: South property line of school at midpoint of playfield. (10/1/2015)	47-68	51-67	Student activities, traffic, BART trains
ST-1: South of Chung Mei classroom building. School children indoors. (9/30/2015, 11:10 -11:20 am)	54	55	Traffic, BART trains
ST-2: South of Gymnasium. School children indoors. (9/30/2015, 11:30 -11:40 am)	50	51	BART trains, aircraft
ST-3: North of Chung Mei classroom building. School children outdoors during lunch. (10/2/2015, 12:10 -12:20 pm)	53	55	Traffic, BART trains
ST-4: Northeast corner of school. School children outdoors during lunch. (10/2/2015, 12:20 -12:30 pm)	48	50	Traffic, BART trains, School children
ST-5: Parking lot near playing field. School children outdoors during lunch. (10/2/2015, 12:33 -12:43 pm)	64	66	School children

Notes: L_{50} - The A-weighted noise level that is exceeded 50% of the time during the measurement period or median sound level.
L_{eq} - The average A-weighted noise level during the measurement period.

NOISE IMPACT AND MITIGATION MEASURES

Significance Criteria

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

(a) Expose people to or generate noise levels in excess of established in the local general plan, noise ordinance, or applicable standards of other agencies.

General Plan Policy H3.2, Outdoor Noise Levels, establishes an L_{dn} of 60 dB as the noise goal where outdoor use is a major consideration (e.g., backyards in single-family). Where the city determines that providing and L_{dn} of 60 dB or lower outdoors is not feasible, the outdoor goal may be increased to an L_{dn} of 65 dB at the discretion of the Planning Commission.

(c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

General Plan Policy H3.9, Noise Environment in Existing Residential Areas, requires the evaluation of mitigation measures for projects under the following circumstances:

1. The project would cause the L_{dn} to increase 3 dB(A) or more.
2. Any increase would result in an L_{dn} greater than 60 dB(A).
3. The L_{dn} already exceeds 60 dB(A).
4. The project has the potential to generate significant adverse community response.

Impact 1: On-site Operations. Proposed project operations would not result in the exposure of persons to excessive noise levels or result in a substantial increase in existing noise levels without the project. **This is a less-than-significant impact.**

The proposed project would amend the existing use permit to allow grades 7-12 at the site, to increase the maximum number of students to 630, to extend school hours until 3:30 p.m. and to increase maximum summer enrollment to 315 students.

Based on observations made during the noise monitoring survey, the use of the playing field generates the highest noise levels on the school campus. No changes to use of the outside area are proposed as a part of the project. Noise levels in areas near the gymnasium and classroom are substantially less. Currently, all after-school sports practices are based in the gymnasium, with the exception of some use of the outdoor playfield for soccer practice. Soccer practice also occurs in the gymnasium and the use of the field for these practices is intermittent at this time. The use of the gymnasium results in maximum instantaneous noise levels ranging from 47 to 50 dBA outside of the gymnasium building.

Figure 3 summarizes the ambient noise data collected at Site LT-1. Between the hours of 7:00 a.m. and 4:00 p.m. (primary school hours), hourly average noise levels ranged from 51 to 67 dBA L_{eq} at the residential property line. The highest hourly average noise levels coincided with outdoor activity such as the lunchtime period between 12:10 p.m. and 12:45 p.m. During non-school hours, hourly average noise levels ranged from 45 to 62 dBA L_{eq}. The L_{dn} on Thursday, October 1, 2015 was 60 dBA.

To determine the L_{dn} attributable to the operation of the school, the data collected between the hours of 7:00 a.m. and 4:00 p.m. (primary school hours) were input into the equation used to calculate the L_{dn}. Following this method, it was conservatively assumed that all noise measured at Site LT-1 during the hours of 7:00 a.m. to 4:00 p.m. was produced by the school. The result of the calculation showed that the school generates an L_{dn} noise level of 57 dBA at the residential property line. This noise level does not include the noise reduction provided by the exiting noise barrier that separates the playing field from residential outdoor activity areas. The L_{dn} noise level calculated for non-school hours was 56 dBA L_{dn} at the residential property line. The L_{dn} for school and non-school sounds is 60 dBA L_{dn} on the school property north of the noise barrier.

The results of previous studies[1] show that the existing noise barrier provides at least an 8 dBA reduction in noise levels from school-related noise sources. Therefore, existing school-related noise is calculated to be 49 dBA L_{dn} in the rear yards of Manor Circle residences assuming that the existing noise barrier provides 8 dBA of noise reduction. The estimated L_{dn} noise level in the rear yard of Manor Circle residences is 57 dBA L_{dn} (i.e., 49 dBA L_{dn} + 56 dBA L_{dn} = 57 dBA L_{dn}).

The project proposes to increase the number of students from 240 students to 630 students. The increase in the number of students is calculated to increase noise levels emanating from the playing field by up to 4 dBA during school hours. With the project, school-related noise is calculated to be 53 dBA L_{dn} in the rear yards of Manor Circle residences assuming that the noise barrier would continue to provide 8 dBA of noise reduction from school-related noise sources. When added to the L_{dn} noise level calculated for non-school hours (56 dBA L_{dn}), the overall L_{dn} in the rear yards of Manor Circle residences is calculated to increase by 1 dBA L_{dn} to 58 dBA L_{dn}. The resultant L_{dn} noise level would remain below 60 dBA L_{dn}, and would not be substantially increased with the project (increase is less than 3 dBA L_{dn}), resulting in a less-than-significant impact.

Mitigation Measures: **None Required**

Impact 2: **Project-Generated Traffic.** Traffic noise levels along roadways serving the site would not be substantially increased with the operation of the project. **This is a less-than-significant impact.**

Roadways serving the site include Elm Street, Key Boulevard, and Hill Street. Traffic volumes supplied for 5 intersections in the vicinity of the project were reviewed to calculate noise level increases due to additional project traffic occurring during the AM Peak Hour and After-school PM Peak Hour. Based on a review of these traffic volumes, traffic noise levels are anticipated to increase by 2 dBA L_{eq} or less at all study intersections as a result of the project during the AM Peak Hour and After-school PM Peak Hour. The project will generate little to no traffic outside of the AM Peak Hour and After-school PM Peak Hour; therefore, the increase to the L_{dn} would be less than 1 dBA when averaged over a 24-hour basis. The project would not cause the L_{dn} to increase 3 dBA or more, and the impact is a less-than-significant.

Mitigation Measures: **None Required**

1 LSA Associates, Inc., for City of El Cerrito, April 2007, *Windrush School Master Plan Initial Study/ Mitigated Negative Declaration*.