PRELIMINARY NOISE STUDY

Liberty High School
County of San Diego, CA

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GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (LDN): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically LDN's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the development of the proposed project. The applicant proposes to develop of the Liberty High School, a California Public Charter School. The proposed development is located in the County of San Diego within the Community of Valle de Oro, The Project is located along the south side of Chase Avenue just West of Jamacha Road.

- On-Site Noise Analysis

  It was determined from the detailed analysis that all NSLU's will comply with the County of San Diego 70 dBA CNEL at the athletic field and based on additional set-backs and the proposed building orientation the site complies with the 65 dBA CNEL exterior noise standard for a school use without mitigation measures. To meet the 50 dBA CNEL interior noise standard at the proposed uses, an interior noise level reduction of minimum 20 dBA CNEL is needed for the proposed project. Therefore with the incorporation of dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the County's 50 dBA CNEL standard.

- Off-Site Noise Analysis

  The project does not create a noise level increase of more than 3 dBA CNEL. Therefore, the proposed project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

- Construction Noise Analysis

  The grading equipment will be spread out over the project site from distances near the occupied property to distances of 400-feet away. Based upon the proposed site plan, most of the combined grading operations will be more than 100-feet away from the adjacent property lines. It was determined that at average distances over 100-feet the grading activities are anticipated not to exceed the County's 75-dBA standard and would not require any mitigation measures. Since most of the time the average distance from all the equipment to the occupied properties is more than 100-feet no impacts are anticipated. Additionally, no offsite construction is proposed.

  No blasting or rock crushing is anticipated during the grading operations. Therefore, no impulsive noise sources are expected and the Project will comply with Section 36.410 of the County Noise Ordinance.

- Operational Analysis

  Based upon the property line noise levels determined above none of the proposed noise sources directly or cumulatively exceeds the property line standards at the shared commercial and residential property lines. Therefore, the proposed development related operational noise levels comply with the daytime and nighttime noise standards at the adjacent property lines. No impacts are anticipated and no mitigation is required.

  Additionally, Section 36.417 of the County of San Diego noise ordinance provides exemptions to specific sources such as school activities. Therefore, noise reasonably related to authorized school: (A) bands, (B) athletic activities and (C) entertainments events would be in compliance with the County's Noise Ordinance.

1.0 INTRODUCTION

1.1 Project Description

This noise study was completed to determine the noise impacts associated with the development of the proposed Liberty High School. The proposed development is located in the County of San Diego within the Community of Valle de Oro, The Project is located along the south side of Chase Avenue just West of Jamacha Road. Access to the Project site is provided along Chase Avenue with an entry only and exit only driveway 600 feet and 400 feet west of Jamacha Road respectively. A general project vicinity map is shown in Figure 1–A.

The proposed Liberty High project consists of the construction of a new Charter High School site on an 8.83 acre parcel. The project requests a Major Use Permit (MUP) to allow for the development of a 450 student high school or 9th thru 12th grade. Classes will be held in a proposed 48,000 square foot, two–story building that will contain 22 classrooms and an administrative office. A gymnasium will also be provided for school assemblies and sports events. The school is expected to hire roughly 33 faculty and staff.

The project also includes parking areas with up to 161 spaces along with a designated student drop off and pick up route. The school will operate during a normal school year calendar (August through June) and during the hours of 8:00 am to 3:30 pm Mondays through Fridays with additional hours for after school activities. The project site plan is shown in Figure 1-B on page 3 of this report.

1.2 Environmental Settings & Existing Conditions

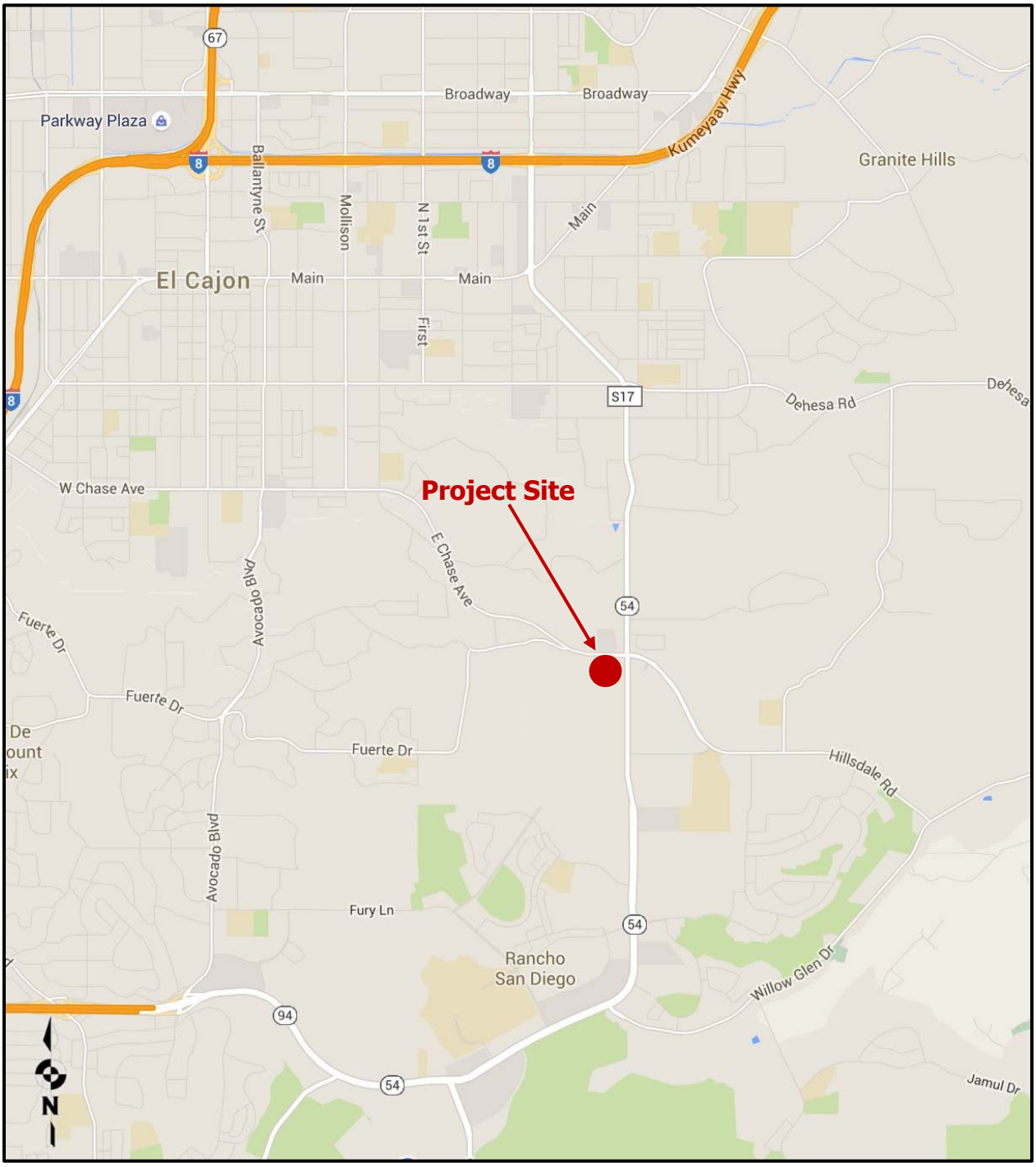
a) Settings & Locations

There are no structures located on the property except for a paved parking area in the northeast section of the site. Land uses surrounding the project site include existing commercial and single family residential with Valhalla High School located approximately ¾ miles to the east of the property.

b) Existing Noise Conditions

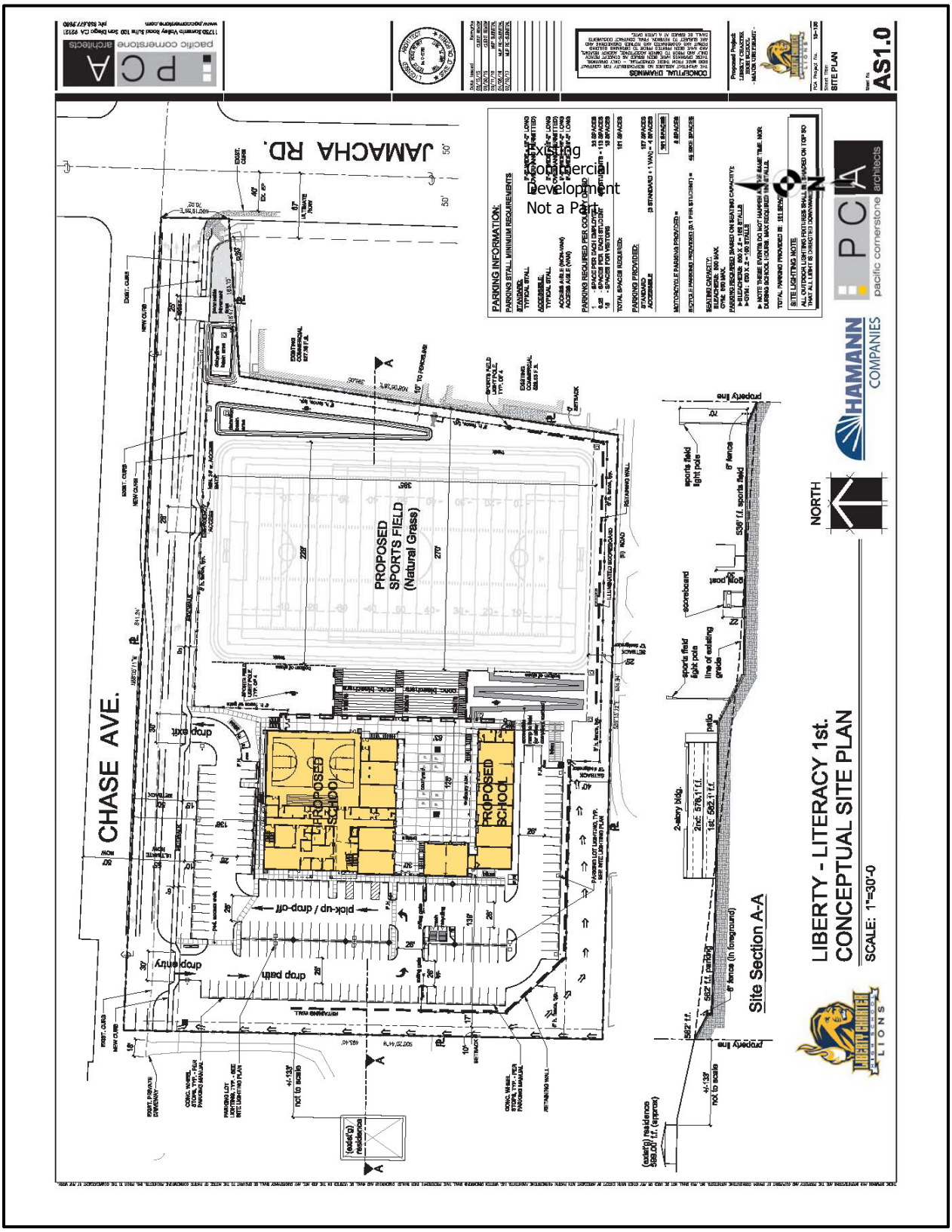
Existing noise occurs mainly from vehicle traffic along Chase Avenue and background traffic along Jamacha Road. Chase Avenue is classified as a *4.1 Major Road* on the County Mobility Element Network map. A posted speed limit of 45 MPH was observed on Chase Avenue. Jamacha Road south of Chase Avenue is classified as a *6.2 Prime Arterial and 4.1 Major Road* north of Chase Avenue on the County Mobility Element Network map. A posted speed limit of 50 MPH was observed on Jamacha Road.

Figure 1-A: Project Vicinity Map



Source: (Google, 2015)

Figure 1-B: Proposed Project Site Plan



1.3 Methodology and Equipment

a) Noise Measuring Methodology and Procedures

To determine the existing noise environment and to assess potential noise impacts, measurements were taken at a single location on the project having a direct line of site to Pine Street/State Route 78 (SR-78). No outdoor activities were occurring on-site during the measurement period. The noise measurements were recorded on May 12, 2015 by Ldn Consulting, Inc. between 4:00 p.m. and 5:00 p.m.

Noise measurements were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 150.

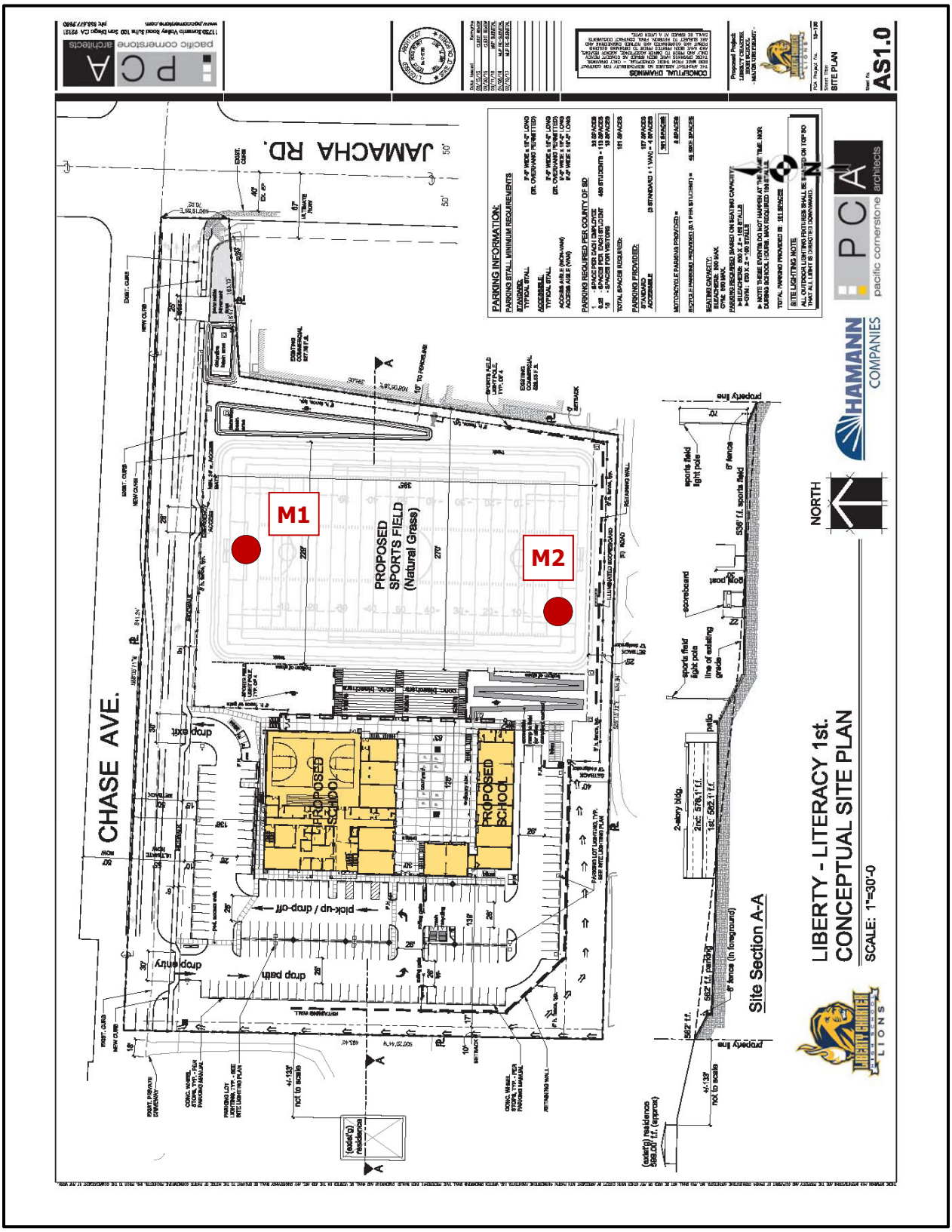
The noise measurement location was determined based on site access and noise impact potential to the project. Monitoring location 1 (M1) was located roughly 150-feet from the center line of Chase Avenue. Monitoring location 2 (M2) was located roughly 450-feet from the center line of Chase Avenue and Jamacha Road. The noise monitoring locations are provided graphically in Figure 1-C on the following page.

The results of the noise level measurements are presented in Table 1-1. The noise measurements were monitored for a time period of 15 minutes. The ambient Leq noise levels measured in the area of the project during the morning hour were found to be 52-56 dBA Leq. The existing noise levels in the project area consisted primarily of existing traffic the roadways.

Table 1-1: Existing Noise Levels

Location	Time	One Hour Noise Levels (dBA)					
		Leq	Lmin	Lmax	L10	L50	L90
M1	4:15–4:30 p.m.	55.9	50.7	65.1	57.8	55.2	53.0
M2	4:35–4:50 p.m.	52.0	46.5	64.8	53.7	51.3	48.8
Source: Ldn Consulting, Inc. May 12, 2015							

Figure 1-C: Existing Noise Measurement Location



b) Noise Modeling Software

The expected roadway noise levels from Chase Avenue and Jamacha Road were projected using Caltrans Sound32 Traffic Noise Prediction Model. Sound32 is a peak hour based traffic noise prediction model. The results of this analysis are based on the California Vehicle Noise Emission Levels (CALVENO). The Sound 32 model was calibrated in accordance with the FHWA Highway Traffic Noise Prediction Manual (Report RD-77-108) and in accordance with Caltrans Technical Noise Supplement (TeNS) section N-5400. The critical model input parameters, which determine the projected vehicular traffic noise levels, include vehicle travel speeds, the percentages of automobiles, medium trucks and heavy trucks in the roadway volume, the site conditions ("hard" or "soft") and the peak hour traffic volume.

The peak hour traffic volumes range between 6-12% of the average daily traffic (ADT) and 10% is generally acceptable for noise modeling purposes. The required coordinate information necessary for the Sound32 traffic noise prediction model input was taken from the preliminary site plans provided by REC Consultants. To predict the future noise levels the preliminary site plans were used to identify the pad elevations, the roadway elevations, and the relationship between the noise source(s) and the NSLU areas. Traffic was consolidated into a single lane located along the centerline of each roadway. For this analysis, the roadway segments were extended a minimum of 300 feet beyond the observer locations. No grade correction or calibration factor (according to Caltrans Policy TAN-02-01 dated January 17, 2002) was included as part of the Sound32 traffic noise prediction model analysis.

To evaluate the potential noise impacts on the proposed development, outdoor observers were located in NSLU areas and placed five feet above the pad elevation and near the center of the NSLU.

c) Noise Calculations and Factors

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy

as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

A vehicle's noise level is from a combination of the noise produced by the engine, exhaust and tires. The cumulative traffic noise levels along a roadway segment are based on three primary factors: the amount of traffic, the travel speed of the traffic, and the vehicle mix ratio or number of medium and heavy trucks. The intensity of traffic noise is increased by higher traffic volumes, greater speeds and increased number of trucks.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiate in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as sound travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

2.0 NOISE SENSITIVE LAND USES (NSLU)

2.1 Guidelines for the Determination of Significance

The County's General Plan Chapter 8 Noise Element uses the Noise Compatibility Guidelines listed in Table N-1 of the General Plan Noise Element (provided below) to determine the compatibility of land use when evaluating proposed development projects. The Noise Compatibility Guidelines indicate ranges of compatibility and are intended to be flexible enough to apply to a range of projects and environments. For example, a commercial project would be evaluated differently than a residential project in a rural area or a mixed-use project in a more densely developed area of the County.

TABLE N-1: NOISE COMPATIBILITY GUIDELINES (CNEL)

Table N-1 Noise Compatibility Guidelines

	Land Use Category	Exterior Noise Level (CNEL)						
			55	60	65	70	75	80
A	Residential—single family residences, mobile homes, senior housing, convalescent homes							
B	Residential—multi-family residences, mixed-use (commercial/residential)							
C	Transient lodging—motels, hotels, resorts							
D*	Schools, churches, hospitals, nursing homes, child care facilities							
E*	Passive recreational parks, nature preserves, contemplative spaces, cemeteries							
F*	Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation							
G*	Office\professional, government, medical\dental, commercial, retail, laboratories							
H*	Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair							

	ACCEPTABLE—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.
	CONDITIONALLY ACCEPTABLE—New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table N-2, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate county decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist.
	UNACCEPTABLE—New construction or development shall not be undertaken.

* Denotes facilities used for part of the day; therefore, an hourly standard would be used rather than CNEL (refer to Table N-2).

Note: For projects located within an Airport Influence Area of an adopted Airport Land Use Compatibility Plan (ALUCP), additional Noise Compatibility Criteria restrictions may apply as specified in the ALUCP.

A land use located in an area identified as "acceptable" indicates that standard construction methods would attenuate exterior noise to an acceptable indoor noise level and that people can carry out outdoor activities with minimal noise interference. Land uses that fall into the "conditionally acceptable" noise environment should have an acoustical study that considers the type of noise source, the sensitivity of the noise receptor, and the degree to which the noise source may interfere with sleep, speech, or other activities characteristic of the land use. For land uses indicated as "conditionally acceptable," structures must be able to attenuate the exterior noise to the indoor noise level as indicated in the Noise Standards listed in Table N-2 of the General Plan Noise Element (provided below). For land uses where the exterior noise levels fall within the "unacceptable" range, new construction generally should not be undertaken.

TABLE N-2: NOISE STANDARDS

Table N-2 Noise Standards[Note]
1. The exterior noise level (as defined in Item 3) standard for Category A shall be 60 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
2. The exterior noise level standard for Categories B and C shall be 65 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
3. The exterior noise level standard for Categories D and G shall be 65 CNEL and the interior noise level standard shall be 50 dBA L_{eq} (one hour average).
4. For single-family detached dwelling units, "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: *(i)* for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, *(ii)* for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; *(iii)* for lots over 10 acres in area, the exterior area shall include 1 acre.
5. For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas which are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.
6. For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.
7. For noise sensitive land uses where people normally do not sleep at night, the exterior and interior noise standard may be measured using either CNEL or the one-hour average noise level determined at the loudest hour during the period when the facility is normally occupied.
8. The exterior noise standard does not apply for land uses where no exterior use area is proposed or necessary, such as a library.
9. For Categories E and F the exterior noise level standard shall not exceed the limit defined as "Acceptable" in Table N-1 or an equivalent one-hour noise standard.

Note: Exterior Noise Level compatibility guidelines for Land Use Categories A-H are identified in Table N-1, Noise Compatibility Guidelines.

2.2 Potential Noise Impacts

To determine the future noise environment and impact potentials the Caltrans Sound32 noise model was utilized. The critical model input parameters, to determine the projected traffic noise levels, include vehicle travel speeds, the percentages of automobiles, medium trucks and heavy trucks in the roadway volume, the site conditions (hard or soft) and the peak hour traffic volume. The peak hour traffic volumes range between 6-12% of the average daily traffic (ADT) and 10% is acceptable for noise modeling.

The projected roadway noise levels from vehicular traffic were calculated using the methods in the Highway Noise Model published by the Federal Highway Administration (FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978). The FHWA Model uses the traffic volume, vehicle mix, speed, and roadway geometry to compute the equivalent noise level. A spreadsheet calculation was used which computes equivalent noise levels for each of the time periods used in the calculation of CNEL. Weighting these equivalent noise levels and summing them gives the CNEL for the traffic projections.

It is expected that the primary source of potential noise impacts to the project site will occur from traffic noise along Chase Avenue and Jamacha Road. The Buildout scenario includes the future year 2030 traffic volume forecasts provided by County of San Diego General Plan Update traffic volumes. The future average daily traffic (ADT) along Chase Avenue, adjacent to the project site, is estimated to be 21,000 ADT. The future traffic along Jamacha Road is forecasted to be 28,000 ADT. To assess the peak hour traffic noise conditions, 10% of the ADT was utilized and a typical County vehicle mix of 95% Autos, 3% Medium Trucks and 2% Heavy Trucks along the roadway was utilized. The future roadway parameters and inputs utilized in this analysis are provided in Table 2-1.

Table 2-1: Buildout 2030 Traffic Parameters

Roadway	Average Daily Traffic (ADT)	Peak Hour Volume[1]	Modeled Speeds (MPH)	Vehicle Mix %		
				Auto	Medium Trucks	Heavy Trucks
Chase Avenue	21,000	2,100	55	95	3	2
Jamacha Road	28,000	2,800	55	95	3	2

[1] 10% of the ADT.

The only proposed outdoor use area on the site is the proposed athletic field. Based on the exterior noise model for each roadway the worst-case exterior noise level at the athletic field is 68.7 dBA CNEL from Chase Avenue at a distance of 125 feet and 64.2 dBA CNEL from Jamacha Road at a distance of 300 feet. The model does not take into account any noise reductions for

existing or proposed structures, barriers or topographic features. Sound levels are logarithmic and cannot be manipulated without being converted back to a linear scale. You must first antilog each number, add or subtract and then log them again in the following way.

$$L = 10 * Log\,[\sum_{i}^{n} 10\text{^}(\frac{Li}{10})]\ or\ L = 10 * Log\,[10^{\frac{68.7}{10}} + 10^{\frac{64.2}{10}}] = 70.0$$

Adding the two noise sources yields a worst-case, unshielded, future noise level of approximately 70 dBA CNEL at the athletic field. This worst-case noise level is compatible with the County's General Plan and no impacts are anticipated and no mitigation is required. The combined roadway noise level calculation spreadsheet is provided as ***Attachment A*** to this letter.

To be conservative, the future traffic noise levels at the proposed school structure, would also be a worst-case 70 dBA CNEL. To meet the 50 dBA CNEL interior noise standard at the commercial uses, an interior noise level reduction of 20 dBA CNEL is needed for the proposed project. A windows closed condition will typically reduce the interior noise levels 20-25 dBA CNEL if the windows are dual pane and have a minimum sound transmission class (STC) rating of 26. Therefore with the incorporation of a minimum STC 26 rated dual pane windows and mechanical ventilation will achieve the interior noise reductions to meet the County's 50 dBA CNEL standard.

2.3 Off-site Noise Impacts

The off-site project related roadway segment noise levels projected in this report were calculated using the methods in the Highway Noise Model published by the Federal Highway Administration (FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978). The FHWA Model uses the traffic volume, vehicle mix, speed, and roadway geometry to compute the equivalent noise level. A spreadsheet calculation was used which computes equivalent noise levels for each of the time periods used in the calculation of CNEL. Weighting these equivalent noise levels and summing them gives the CNEL for the traffic projections. The noise contours are then established by iterating the equivalent noise level over many distances until the distance to the desired noise contour(s) are found. For this project the 60 dBA CNEL contour was calculated based upon the County of San Diego thresholds.

Hard site conditions were used along all roadway segments to develop the worst-case noise contours and to analyze noise impacts. The future traffic noise model utilizes a standard vehicle mix of 95% Autos, 3% Medium Trucks and 2% Heavy Trucks for all analyzed roadway segments. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks and heavy trucks for input into the FHWA Model.

Direct and cumulative roadway noise impacts would be considered significant if the project increases noise levels for a noise sensitive land use by 3 dBA CNEL and if: (1) the existing noise levels already exceed the 60 dBA CNEL residential standard, or (2) the project increases noise

levels from below the 60 dBA CNEL standard to above 60 dBA CNEL in the area adjacent to the roadway segment. The County of San Diego requires that the Cumulative without Project scenario and the cumulative with project scenario be compared to determine if significant impacts occur. Project generated cumulative roadway noise impacts would be considered significant if the project raises the Cumulative without Project noise level by 1 dBA or greater.

To determine if direct off-site noise level increases associated with the development of the proposed project will create noise impacts. The noise levels for the existing conditions were compared with the noise level increase of existing plus the proposed project. Utilizing the project's traffic assessment (Source: Kimley Horn, 2015) noise contours were developed for the following traffic scenarios:

Existing: Current day noise conditions without construction of the proposed project.

Existing Plus Project: Current day noise conditions plus the completion of the proposed project.

Existing vs. Existing Plus Project: Comparison of the direct project related noise level increases in the vicinity of the proposed project site.

The noise levels and the distances to the 60 dBA CNEL contours for the roadways in the vicinity of the Project site are given in Table 2-2 for the Existing Scenario and in Table 2-3 for the Existing plus Project Scenario. Note that the values given do not take into account the effect of any noise barriers or topography that may affect ambient noise levels. Table 2-4 presents the comparison of the Existing Year with and without project related noise levels. As can be seen in Table 2-4, the roadway segment noise levels will increase only as much as 0.1 dBA CNEL with the development of the proposed project. The project does not create a noise level increase of more than 3 dBA CNEL. Therefore, the proposed project's direct contributions to off-site roadway noise increases will not cause significant impacts to existing or future noise sensitive land uses.

Table 2-2: Existing Noise Levels

Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)	60 dBA CNEL Contour Distance (Feet)
Jamacha Road				
Chase Avenue to Penasco Road	26,170	55	75.6	546
Chase Ave to Shadowside Ln	27,383	55	75.8	563
Chase Avenue				
Jamacha Rd to Fair County Rd	11,884	55	72.1	323
Jamacha Road to Driveway 1	18,434	55	74.1	433
West of Driveway 1	18,434	55	74.1	433

[1] Source: Project Traffic study prepared by Kimley Horn, 2015

Table 2-3: Existing + Project Noise Levels

Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)	60 dBA CNEL Contour Distance (Feet)
Jamacha Road				
Chase Avenue to Penasco Road	26,363	55	75.6	549
Chase Ave to Shadowside Ln	27,570	55	75.8	566
Chase Avenue				
Jamacha Rd to Fair County Rd	12,001	55	72.2	325
Jamacha Road to Driveway 1	18,975	55	74.2	441
West of Driveway 1	18,478	55	74.1	433
[1] Source: Project Traffic study prepared by Kimley Horn, 2015				

Table 2-4: Existing vs. Existing + Project Noise Levels

Roadway Segment	Existing Noise Level @ 50-Feet (dBA CNEL)	Existing + Project Noise Level @ 50-Feet (dBA CNEL)	Project Related Direct Noise Level Increase (dBA CNEL)
Jamacha Road			
Chase Avenue to Penasco Road	75.6	75.6	0.0
Chase Ave to Shadowside Ln	75.8	75.8	0.0
Chase Avenue			
Jamacha Rd to Fair County Rd	72.1	72.2	0.0
Jamacha Road to Driveway 1	74.1	74.2	0.1
West of Driveway 1	74.1	74.1	0.0
Sound Levels provided are worst-case and do not take into account topography or shielding from barriers.			

2.4 Conclusions

It was determined from the detailed analysis that all NSLU's will comply with the County of San Diego 70 dBA CNEL at the athletic field and based on additional set-backs and the proposed building orientation the site complies with the 65 dBA CNEL exterior noise standard for a school use without mitigation measures. To meet the 50 dBA CNEL interior noise standard at the proposed uses, an interior noise level reduction of minimum 20 dBA CNEL is needed for the proposed project. Therefore with the incorporation of dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the County's 50 dBA CNEL standard.

The project does not create a noise level increase of more than 3 dBA CNEL. Therefore, the proposed project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

3.0 CONSTRUCTION ACTIVITIES

3.1 Guidelines for the Determination of Significance

Construction Noise: Noise generated by construction activities related to the project will exceed the standards listed in San Diego County Code Sections as follows.

SEC. 36.408: HOURS OF OPERATION OF CONSTRUCTION EQUIPMENT

Except for emergency work, it shall be unlawful for any person to operate or cause to be operated, construction equipment:

a. Between 7 p.m. and 7 a.m.

b. On a Sunday or a holiday. For purposes of this section, a holiday means January 1st, the last Monday in May, July 4th, the first Monday in September, December 25th and any day appointed by the President as a special national holiday or the Governor of the State as a special State holiday. A person may, however, operate construction equipment on a Sunday or holiday between the hours of 10 a.m. and 5 p.m. at the person's residence or for the purpose of constructing a residence for himself or herself, provided that the operation of construction equipment is not carried out for financial consideration or other consideration of any kind and does not violate the limitations in sections 36.409 and 36.410.

SEC. 36.409: SOUND LEVEL LIMITATIONS ON CONSTRUCTION EQUIPMENT

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 decibels for an eight-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

SEC. 36.410: SOUND LEVEL LIMITATIONS ON IMPULSIVE NOISE

In addition to the general limitations on sound levels in section 36.404 and the limitations on construction equipment in section 36.409, the following additional sound level limitations shall apply:

(a) Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410A (provided below), when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410A are as described in the County Zoning Ordinance.

TABLE 36.410A: MAXIMUM SOUND LEVEL (IMPULSIVE) MEASURED AT OCCUPIED PROPERTY IN DECIBELS (dBA)

OCCUPIED PROPERTY USE	DECIBELS (dBA)
Residential, village zoning or civic use	82
Agricultural, commercial or industrial use	85

(b) Except for emergency work, no person working on a public road project shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410B, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410B are as described in the County Zoning Ordinance.

TABLE 36.410B: MAXIMUM SOUND LEVEL (IMPULSIVE) MEASURED AT OCCUPIED PROPERTY IN DECIBELS (dBA) FOR PUBLIC ROAD PROJECTS

OCCUPIED PROPERTY USE	dB(A)
Residential, village zoning or civic use	85
Agricultural, commercial or industrial use	90

(c) The minimum measurement period for any measurements conducted under this section shall be one hour. During the measurement period a measurement shall be conducted every minute from a fixed location on an occupied property. The measurements shall measure the maximum sound level during each minute of the measurement period. If the sound level caused by construction equipment or the producer of the impulsive noise exceeds the maximum sound level for any portion of any minute, it will be deemed that the maximum sound level was exceeded during that minute.

3.2 Potential Property Line Noise Impacts

a) Potential Build Out Noise Conditions

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment can range from 60 dBA to in excess of 100 dBA when measured at 50 feet. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 75 dBA measured at 50 feet from the noise source to the receptor would be reduced to 69 dBA at 100 feet from the source to the receptor, and reduced to 63 dBA at 200 feet from the source.

b) Potential Noise Impact Identification

Using a point-source noise prediction model, calculations of the expected construction noise impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers.

Based empirical data and the amount of equipment needed, worst case noise impacts from this construction equipment would occur during the grading operations. In order to determine the worst case scenario for the grading activities all the equipment was place in a common location, which is not physically possible. As can be seen in Table 3-1, even if all the equipment were placed together the cumulative grading activities noise levels would be 80.6 dBA and would attenuate 6.0 dBA at a distance of 100-feet from the point source noise and would be at or below the 75 dBA threshold.

Table 3-1: Construction Noise Levels

Construction Equipment	Quantity	Source Level @ 50-Feet (dBA)[1]	Duty Cycle (Hours/Day)	Cumulative Noise Level @ 50-Feet (dBA)
Dozer - D8	1	72	8	72.0
Tractor/Backhoe	2	74	8	77.0
Loader/Grader	2	73	8	76.0
Water Trucks	1	70	8	70.0
			Cumulative Levels @ 50 Feet	80.6
			Distance To Property Line (Feet)	100
			Noise Reduction Due To Distance	-6.0
			NEAREST PROPERTY LINE NOISE LEVEL	**74.6**

[1] Source: U.S. Environmental Protection Agency (U.S. EPA), 1971 and Empirical Data

The grading equipment will be spread out over the project site from distances near the occupied property to distances of over 400-feet away. Based upon the proposed site plan, grading operation will be within 100-feet away of the western and southern property lines. These activities will be intermittent and limited to the slope preparation for the parking lot with a single piece of equipment operating in one location. The majority of the grading operations will occur more than 100-feet from the property lines.

At average distances over 100-feet the grading activities are anticipated not to exceed the County's 75-dBA standard and would not require any mitigation measures. This means that most of the time the average distance from the equipment to the occupied properties is more than 100-feet and in that situation no impacts are anticipated. Additionally, no offsite construction is proposed.

No blasting or rock crushing is anticipated during the grading operations. Therefore, no impulsive noise sources are expected and the Project is anticipated to comply with Section 36.410 of the County Noise Ordinance and no further analysis is required.

3.3 Conclusions

The grading equipment will be spread out over the project site from distances near the occupied property to distances of 400-feet away. Based upon the proposed site plan, most of the combined grading operations will be more than 100-feet away from the adjacent property lines. It was determined that at average distances over 100-feet the grading activities are anticipated not to exceed the County's 75-dBA standard and would not require any mitigation measures. Since most of the time the average distance from all the equipment to the occupied properties is more than 100-feet no impacts are anticipated. Additionally, no offsite construction is proposed.

No blasting or rock crushing is anticipated during the grading operations. Therefore, no impulsive noise sources are expected and the Project will comply with Section 36.410 of the County Noise Ordinance.

4.0 OPERATIONAL ACTIVITIES

4.1 Guidelines for the Determination of Significance

Section 36.404 of the County of San Diego noise ordinance provides performance standards and noise control guidelines for determining and mitigating non-transportation, or stationary, noise source impacts to adjacent properties. The purpose of the noise ordinance is to protect, create and maintain an environment free from noise and vibration that may jeopardize the health or welfare, or degrade the quality of life. The sound level limits in Table 36.404 of the County's Noise Ordinance are provided below in Table 4-1.

Table 4-1: Property Line Sound Level Limits in Decibels (dBA)

Zone	Time	One-Hour Average Sound Level Limits (dBA)
(1) RS, RD, RR, RMH, A70, A72, S80, S81, S87, S90, S92, RV, and RU with a density of less than 11 dwelling units per acre.	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
(2) RRO, RC, RM, S86, V5, RV and RU with a density of 11 or more dwelling units per acre.	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
(3) S94, V4, and all commercial zones.	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
(4) V1, V2	7 a.m. to 7 p.m.	60
V1, V2	7 p.m. to 10 p.m.	55
V1	10 p.m. to 7 a.m.	55
V2	10 p.m. to 7 a.m.	50
V3	7 a.m. to 10 p.m.	70
	10 p.m. to 7 a.m.	65
(5) M50, M52, and M54	Anytime	70
(6) S82, M56, and M58.	Anytime	75
(7) S88 (see subsection (c) below)		

Source: County of San Diego Noise Ordinance Section 36.404

a) Except as provided in section 36.409 of this chapter, it shall be unlawful for any person to cause or allow the creation of any noise, which exceeds the one-hour average sound level limits in Table 36.404, when the one-hour average sound level is measured at the property line of the property on which the noise is produced or at any location on a property that is receiving the noise.

b) Where a noise study has been conducted and the noise mitigation measures recommended by that study have been made conditions of approval of a Major Use Permit, which authorizes the noise-generating use or activity and the decision making body approving the Major Use Permit determined that those mitigation measures reduce potential noise impacts to a level below significance, implementation and compliance with those noise mitigation measures shall constitute compliance with subsection (a) above.

c) S88 zones are Specific Planning Areas which allow different uses. The sound level limits in Table 36.404 above

that apply in an S88 zone depend on the use being made of the property. The limits in Table 36.404, subsection (1) apply to property with a residential, agricultural or civic use. The limits in subsection (3) apply to property with a commercial use. The limits in subsection (5) apply to property with an industrial use that would only be allowed in an M50, M52 or M54 zone. The limits in subsection (6) apply to all property with an extractive use or a use that would only be allowed in an M56 or M58 zone.

d) If the measured ambient noise level exceeds the applicable limit in Table 36.404, the allowable one-hour average sound level shall be the one-hour average ambient noise level, plus three decibels. The ambient noise level shall be measured when the alleged noise violation source is not operating.

e) The sound level limit at a location on a boundary between two zones is the arithmetic mean of the respective limits for the two zones. The one-hour average sound level limit applicable to extractive industries, however, including but not limited to borrow pits and mines, shall be 75 decibels at the property line regardless of the zone in which the extractive industry is located.

f) A fixed-location public utility distribution or transmission facility located on or adjacent to a property line shall be subject to the sound level limits of this section measured at or beyond six feet from the boundary of the easement upon which the facility is located.

According to the stationary source exterior noise standards, no person shall operate any source of sound at any location within the County or allow the creation of any noise on a property which causes the noise levels to exceed the exterior noise limits at the property boundary. Additionally, Section 36.404(e) states that the sound level limits at a location on a boundary between two zones are the arithmetic mean of the respective limits for the two zones.

Additionally, Section 36.417 of the County of San Diego noise ordinance provides exemptions to Section 36.404 based on specific sources such as school activities. The relevant sections are presented below.

This chapter shall not apply to:

- Noise reasonably related to authorized school: (A) bands, (B) athletic activities and (C) entertainments events.
- Sporting, entertainment and public events which are conducted pursuant to a license or permit issued by the County, within the scope of the license or permit. This section is not intended to excuse the act of an individual not participating in the event who violates this chapter.
- Any activity preempted by State or federal law.

4.2 Potential Noise Impacts

This section examines the potential stationary noise source impacts associated with the development and operation of the proposed project. More specifically, noise levels from the proposed mechanical ventilation. The Project and surrounding properties are zoned residential with the exception of the commercial use directly east of the site. Section 36.404 of the Noise Ordinance sets a most restrictive operational exterior noise limit for residential noise sensitive land uses of 50 dBA Leq for daytime hours of 7 a.m. to 10 p.m. and 45 dBA

Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. as shown in Table 4-1 above.

Sound from a small localized source (a "point" source) radiates uniformly outward as it travels away from the source. The sound level attenuates or drops-off at a rate of 6 dBA for each doubling of distance. A drop-off rate of 6 dBA per doubling of distance was used for this piece of equipment.

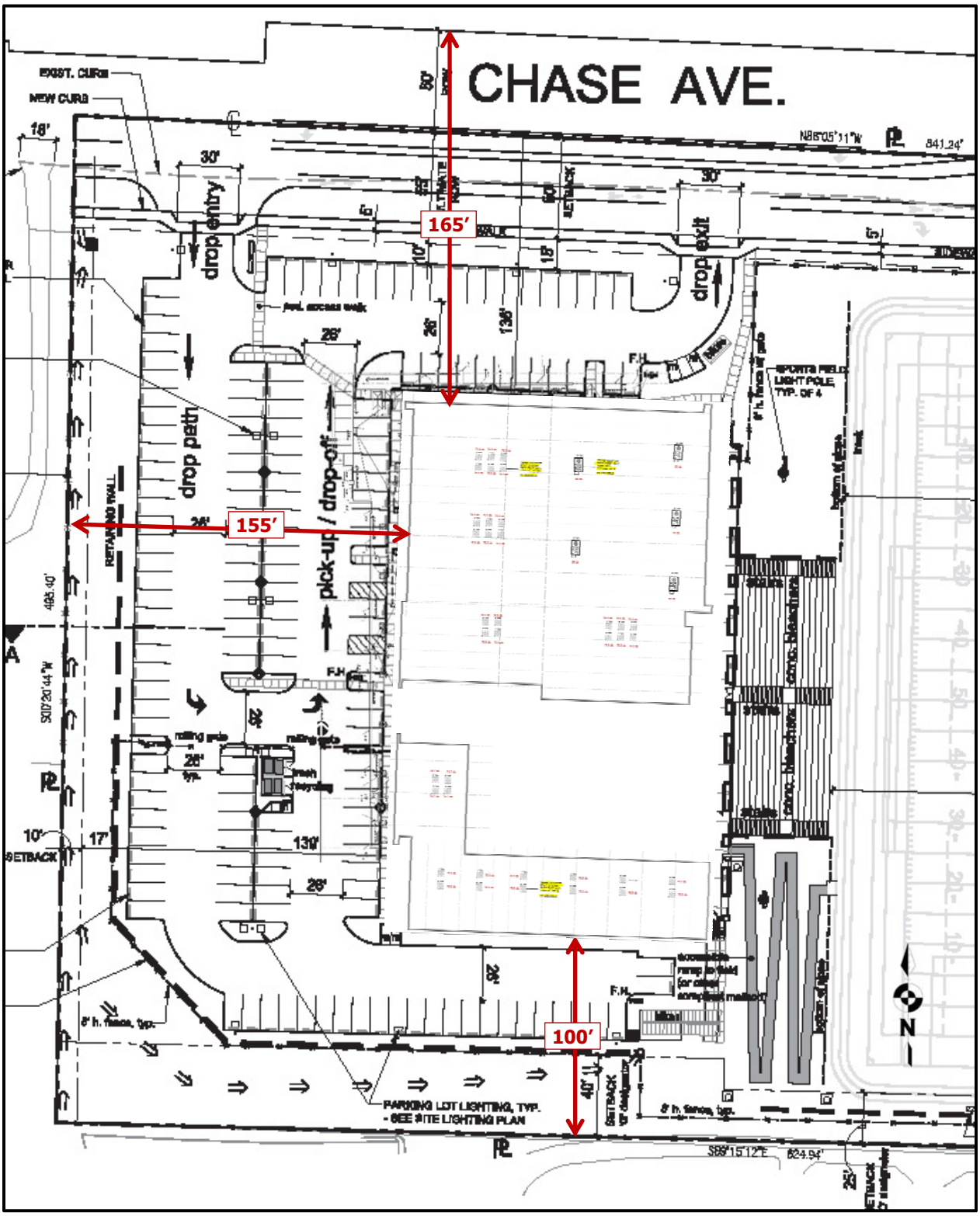
HVAC Noise

The project plans to utilize 3 ton, 4 ton and 10 ton A.C. units. To assess the mechanical ventilation system (packaged heat pump) noise impacts, typical outdoor sound power levels were provided by Rheem. The noise ratings provided by Rheem indicated that packaged heat pumps of this size will produce unmitigated noise levels of 74.7, 76.5 and 88.0 dBA, respectively when measured at a distance of 3 feet. The Rheem noise specifications are provided as ***Attachment B***. To predict the worst-case future noise environment, a continuous reference noise levels of 74.7, 76.5 and 88.0 dBA at 3 feet were used to represent the roof-top mechanical ventilation system. Even though the mechanical ventilation system will cycle on and off throughout the day, this approach presents the worst-case noise condition. In addition, these units have been designed to provide cooling during the peak summer daytime periods, and it is unlikely that all the units will be operating continuously throughout the noise sensitive nighttime periods. To assess the mechanical equipment noise impacts the worst-case nighttime standard of 45 dBA was utilized.

The condenser units are proposed on the roof of the proposed buildings and the locations were provided by the mechanical contractor. The overall locations of the mechanical equipment in relationship to the property lines can be seen in Figure 4-A. It was determined based on the site configuration and equipment locations that the worst case noise exposure would occur at the southern property line. The eastern, northern and western property lines have more distance separation from the equipment and would experience lower noise.

The noise levels associated with the roof-top mechanical ventilation system will be limited with the proposed parapet walls that will vary in height but will be roughly the same height as the HVAC units to shield them both visually and acoustically. Hence, the parapet wall will block the line-of-sight from the adjacent residential units. To determine the noise level reductions from the parapet walls that are planned to be at least as high as the HVAC units the Fresnel Barrier Reduction Calculations based on distance, source height, receiver elevation and the top of barrier were modeled.

Figure 4-A: Proposed Roof Mounted HVAC Configuration



The noise level reductions due to distance and the parapet walls for the nearest property line located to the south is provided in Table 4-2 below. The Fresnel barrier reduction calculations for the parapets are provided in ***Attachment C*** of this report.

Table 4-2: Project HVAC Noise Levels (Nearest Property Line)

Distance To Observer Location (Feet)	Hourly Reference Noise Level (dBA)	Noise Source Reference Distance (Feet)	Noise Reduction Due To Distance (dBA)	Reduction Due To Parapets (dBA)	Quantity	Property Line Cumulative Noise Level (dBA)
130	76.5	3	-32.7	-12.2	12	42.4
170	74.7	3	-35.1	-14.2	4	31.5
240	76.5	3	-38.1	-15.6	10	32.8
260	88.0	3	-38.8	-15.0	1	34.2
280	88.0	3	-39.4	-15.3	1	33.3
290	76.5	3	-39.7	-16.1	6	28.5
300	88.0	3	-40.0	-15.5	1	32.5
330	76.5	3	-40.8	-16.3	6	27.2
330	88.0	3	-40.8	-15.7	1	31.5
340	88.0	3	-41.1	-15.8	1	31.1
Unshielded Cumulative Noise Level (dBA)						**44.9***
*Complies with the nighttime Noise Standard of 45 dBA.						

No impacts are anticipated at the property lines with the incorporation of the proposed roof parapets along with the distance from the properties. All other property lines are located further from the proposed HVAC units and the resulting noise levels would also be below the 45 dBA threshold. Since the HVAC units will be spread out over the entire roof and not all operating at the same time, no impacts are anticipated at the property lines.

Bell Noise

The proposed school will utilize bells to announce the start and end of school periods. Traditional school bells have been recorded having sound levels above 100 decibels and peak levels of as high as 115 decibels in a report submitted to the Center for Hearing and Communication in 2000 (http://chchearing.org/noise/archives/stop-the-noise-sound-levels-elementary-school/). All the measurements were taken inside a school hallway at distances of 5-6 feet from the bells. The hallway consisted of hard surface floors, ceiling and walls. The hard surfaces would add 12 decibels to the overall noise level due to reflection. Additionally, the bells were found only to be operational for 4-5 seconds. Due to concerns of the traditional bells noise levels within schools, modern bells have a synthetic/computer generated sound that is 10 decibels lower and designed

to be directional.

The proposed school will have a modern outdoor bell mounted to the building to notify students in the parking area and one at the athletic fields. The bells would be mounted on the building and the building façade could reflect or add 3 dBA, to the noise level but would be 9 decibels lower than the indoor bells. To predict the noise levels from the bells, a modern bell having a sound level of 96 decibels (105-12+3) was utilized. The bells are anticipated to operate for only 4-5 seconds and at most twice in any given hour. The limited operations of the bells, also referred to as duty-cycle, would reduce the noise 26 dBA over a one hour period. The nearest property line is located 100 feet from the proposed building. The distance separation from the bell to the nearest property line would further reduce the noise level 24.4 dBA. The hourly noise level from the modern bells would be 45.6 dBA Leq or less at the nearest property line. The bells will only operate during the daytime hours of 7 am to 10 pm and therefore comply with the 50 dBA Leq standard and no impacts are anticipated.

Cumulative Noise

Cumulatively, the HVAC and bell noise levels would equate to 48.3 dBA Leq (44.9 plus 45.6). As stated above the bells will only operate during the daytime hours. Therefore, the cumulative noise from the HVAC and school bells will be in compliance with the 50 dBA Leq standard and no impacts are anticipated.

4.3 Conclusions

Based upon the property line noise levels determined above none of the proposed noise sources directly or cumulatively exceeds the property line standards at the shared commercial and residential property lines. Therefore, the proposed development related operational noise levels comply with the daytime and nighttime noise standards at the adjacent property lines. No impacts are anticipated and no mitigation is required.

5.0 SUMMARY OF PROJECT IMPACTS, MITIGATION & CONCLUSIONS

- On-Site Noise Analysis
  It was determined from the detailed analysis that all NSLU's will comply with the County of San Diego 70 dBA CNEL at the athletic field and the 65 dBA CNEL exterior noise standard for a school use without mitigation measures. To meet the 50 dBA CNEL interior noise standard at the proposed uses, an interior noise level reduction of minimum 20 dBA CNEL is needed for the proposed project. Therefore, with the incorporation of dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the County's 50 dBA CNEL standard.

- Off-Site Noise Analysis
  The project does not create a noise level increase of more than 3 dBA CNEL. Therefore, the proposed project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

- Construction Noise Analysis
  The grading equipment will be spread out over the project site from distances near the occupied property to distances of 400-feet away. Based upon the proposed site plan, most of the combined grading operations will be more than 100-feet away from the adjacent property lines. It was determined that at average distances over 100-feet the grading activities are anticipated not to exceed the County's 75-dBA standard and would not require any mitigation measures. Since most of the time the average distance from all the equipment to the occupied properties is more than 100-feet no impacts are anticipated. Additionally, no offsite construction is proposed.

  No blasting or rock crushing is anticipated during the grading operations. Therefore, no impulsive noise sources are expected and the Project will comply with Section 36.410 of the County Noise Ordinance.

- Operational Analysis
  Based upon the property line noise levels determined above none of the proposed noise sources directly or cumulatively exceeds the property line standards at the shared commercial and residential property lines. Therefore, the proposed development related operational noise levels comply with the daytime and nighttime noise standards at the adjacent property lines. No impacts are anticipated and no mitigation is required.

  Additionally, Section 36.417 of the County of San Diego noise ordinance provides exemptions to specific sources such as school activities. Therefore, noise reasonably related to authorized school: (A) bands, (B) athletic activities and (C) entertainments events would be in compliance with the County's Noise Ordinance.

6.0 CERTIFICATIONS

The contents of this report represent an accurate depiction of the future acoustical environment and impacts within and surrounding the Liberty High School development. The report was prepared by Jeremy Louden; a County approved CEQA Consultant for Acoustics.

DRAFT

Jeremy Louden
Principal
Ldn Consulting, Inc.

Date August 3, 2017

ATTACHMENT A

FUTURE COMBINED ROADWAY
CALCULATION

Attachment: Combined Roadway Noise Levels

Project Name:	Liberty High School	Date:	14-Oct-15
Project Number:	15-68	Location:	El Cajon

Traffic Volumes, Mix and Speeds

	Autos	Med. Trucks	Heavy Trucks
Mix Ratio by Percent	95.0	3.0	2.0

Propagation Rule Soft

Roadway	ADT	Speed MPH	CNEL @ 50 Feet	60 CNEL (Feet)
Chase Avenue	21,000	55	74.6	472
Jamacha Road	28,000	55	75.9	572

Noise Reduction due to Distance

	Distance	Reduction	Resultant Level
Chase Avenue	125	-5.97	68.7
Jamacha Road	300	-11.67	64.2

Cumulative Noise Level **70.0** **dBA CNEL**

ATTACHMENT B

RHEEM HVAC NOISE LEVELS

3 TON 4 TON

Accessories

Model No.		RP1518	RP1524	RP1530	RP1536	RP1542	RP1548	RP1560
Compressor crankcase heater		44-17402-44	44-17402-44	44-17402-44	44-17402-44	44-17402-45	Factory Standard	Factory Standard
Low ambient control		RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08
Compressor sound cover		68-23427-26	68-23427-26	68-23427-26	68-23427-26	68-23427-25	68-23427-25	68-23427-25
Compressor hard start kit		SK-A1	SK-A1	SK-A1	SK-A1	SK-A1	SK-A1	SK-A1
Low pressure control*		Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard
High pressure control*		Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard	Factory Standard
Liquid Line Solenoid (24 VAC, 50/60 Hz)	Solenoid Valve	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD3T3TVLC	200RD3T3TVLC
	Solenoid Coil	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V
	Bi-flow kit*	KS30387	KS30387	KS30387	KS30387	KS30387	KS30387	KS30387
Liquid Line Solenoid (120/240 VAC, 50/60 Hz)	Solenoid Valve	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD3T3TVLC	200RD3T3TVLC
	Solenoid Coil	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V
	Bi-flow kit*	KS30387	KS30387	KS30387	KS30387	KS30387	KS30387	KS30387
Classic Top Cap w/Label		91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21
Heat Pump Riser – 6 inch		686020	686020	686020	686020	686020	686020	686020

*Bi-flow kits are required when installing a liquid line solenoid on a heat pump.

Weighted Sound Power Level (dBA)

Unit Size – Voltage, Series		Standard Rating (dBA)	TYPICAL OCTAVE BAND SPECTRUM (dBA without tone adjustment)						
			125	250	500	1000	2000	4000	8000
RP1518B		75.2	53.8	60.2	64.3	66	62.5	57.6	53.5
RP1524B		75.8	53.9	60.6	65.8	66.4	63.0	57.8	50.2
RP1530B		73.3	51.8	56.6	63.4	62.9	60.8	55.9	51.5
3 TON	RP1536A	74.7	48.9	54.3	63.1	66.4	62.2	53.2	53.2
	RP1542A	74.1	52.9	55.9	64	63.5	61.4	58	52.1
4 TON	RP1548A	76.5	55.8	59	68.2	66.3	64.3	60.5	55.4
	RP1560A	73.9	58.9	55.7	63.4	63.3	61.5	58.6	56.4

NOTE: Tested in accordance with AHRI Standard 270-08 (not listed in AHRI)

Thermostats

200-Series *
Programmable

300-Series *
Deluxe
Programmable

400-Series *
Special Applications/
Programmable

500-Series *
Communicating/
Programmable

Brand		Descripter (3 Characters)	Series (3 Characters)	System (2 Characters)	Type (2 Characters)
RHC	-	TST	213	UN	MS
RHC=Rheem		TST=Thermostat	200=Programmable 300=Deluxe Programmable 400=Special Applications/ Programmable 500=Communicating/ Programmable	GE=Gas/Electric UN=Universal (AC/HP/GE) MD=Modulating Furnace DF=Dual Fuel CM=Communicating	SS=Single-Stage MS=Multi-Stage

** Photos are representative. Actual models may vary.*

For detailed thermostat match-up information, see specification sheet form number T11-001.

10 TON

NOMINAL SIZES 7.5 & 10 TONS [26.4 & 35.2 kW]

Model RJNL- Series	B090YN	B120CL	B120CM	B120DL
Cooling Performance[1]				CONTINUED →
Gross Cooling Capacity Btu [kW]	98,000 [28.71]	125,000 [36.62]	125,000 [36.62]	125,000 [36.62]
EER/SEER[2]	11/NA	11/NA	11/NA	11/NA
Nominal CFM/AHRI Rated CFM [L/s]	3000/2925 [1416/1380]	4000/4000 [1888/1888]	4000/4000 [1888/1888]	4000/4000 [1888/1888]
AHRI Net Cooling Capacity Btu [kW]	94,000 [27.54]	120,000 [35.16]	120,000 [35.16]	120,000 [35.16]
Net Sensible Capacity Btu [kW]	70,800 [20.74]	91,600 [26.84]	91,600 [26.84]	91,600 [26.84]
Net Latent Capacity Btu [kW]	23,200 [6.8]	28,400 [8.32]	28,400 [8.32]	28,400 [8.32]
Integrated Part Load Value[3]	N/A	N/A	N/A	N/A
Net System Power kW	8.54	10.91	10.91	10.91
Heating Performance (Heat Pumps)				
Heating Input Btu [kW] Rating	87,000 [25.49]	109,000 [31.94]	109,000 [31.94]	109,000 [31.94]
System Power KW/COP	7.5/3.4	9.39/3.4	9.39/3.4	9.39/3.4
Low Temp. Btuh [kW] Rating	52,000 [15.24]	69,000 [20.22]	69,000 [20.22]	69,000 [20.22]
System Power KW/COP	6.62/2.3	8.79/2.3	8.79/2.3	8.79/2.3
Compressor				
No./Type	1/Scroll	1/Scroll	1/Scroll	1/Scroll
Outdoor Sound Rating (dB)[4]	88	88	88	88
Outdoor Coil—Fin Type	Louvered	Louvered	Louvered	Louvered
Tube Type	Rifled	Rifled	Rifled	Rifled
Tube Size in. [mm] OD	0.375 [9.5]	0.375 [9.5]	0.375 [9.5]	0.375 [9.5]
Face Area sq. ft. [sq. m]	24.88 [2.31]	28.8 [2.68]	28.8 [2.68]	28.8 [2.68]
Rows / FPI [FPcm]	2 / 22 [9]	2 / 22 [9]	2 / 22 [9]	2 / 22 [9]
Refrigerant Control	TX Valves	TX Valves	TX Valves	TX Valves
Indoor Coil—Fin Type	Louvered	Louvered	Louvered	Louvered
Tube Type	Rifled	Rifled	Rifled	Rifled
Tube Size in. [mm]	0.375 [9.5]	0.375 [9.5]	0.375 [9.5]	0.375 [9.5]
Face Area sq. ft. [sq. m]	13.5 [1.25]	15.75 [1.46]	15.75 [1.46]	15.75 [1.46]
Rows / FPI [FPcm]	3 / 18 [7]	4 / 15 [6]	4 / 15 [6]	4 / 15 [6]
Refrigerant Control	TX Valves	TX Valves	TX Valves	TX Valves
Drain Connection No./Size in. [mm]	1/1 [25.4]	1/1 [25.4]	1/1 [25.4]	1/1 [25.4]
Outdoor Fan—Type	Propeller	Propeller	Propeller	Propeller
No. Used/Diameter in. [mm]	2/24 [609.6]	2/24 [609.6]	2/24 [609.6]	2/24 [609.6]
Drive Type/No. Speeds	Direct/1	Direct/1	Direct/1	Direct/1
CFM [L/s]	8000 [3775]	8000 [3775]	8000 [3775]	8000 [3775]
No. Motors/HP	2 at 1/3 HP	2 at 1/2 HP	2 at 1/2 HP	2 at 1/2 HP
Motor RPM	1075	1075	1075	1075
Indoor Fan—Type	FC Centrifugal	FC Centrifugal	FC Centrifugal	FC Centrifugal
No. Used/Diameter in. [mm]	1/15x15 [381x381]	1/15x15 [381x381]	1/15x15 [381x381]	1/15x15 [381x381]
Drive Type/No. Speeds	Belt/Variable	Belt/Variable	Belt/Variable	Belt/Variable
No. Motors	1	1	1	1
Motor HP	3	2	3	2
Motor RPM	1725	1725	1725	1725
Motor Frame Size	56	56	56	56
Filter—Type	Disposable	Disposable	Disposable	Disposable
Furnished	Yes	Yes	Yes	Yes
(No.) Size Recommended in. [mm]	(6)2x18x18 [51x457x457]	(3)2x18x18 [51x457x457]	(3)2x18x18 [51x457x457]	(3)2x18x18 [51x457x457]
		(3)2x18x24 [51x457x610]	(3)2x18x24 [51x457x610]	(3)2x18x24 [51x457x610]
Refrigerant Charge Oz. (Sys. 1/Sys. 2) [g]	350 [9922]	496 [14062]	496 [14062]	496 [14062]
Weights				
Net Weight lbs. [kg]	1017 [461]	1185 [538]	1193 [541]	1185 [538]
Ship Weight lbs. [kg]	1097 [498]	1265 [574]	1273 [577]	1265 [574]

See Page 15 for Notes.

[ ] Designates Metric Conversions

ATTACHMENT C

FRESNEL BARRIER REDUCTION
CALCULATIONS

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 115.00
Source to Barrier Horizontal Distance (ft) = 15.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 118.13
Distance Source to Barrier top (ft) d1 = 15.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 6.443
Frequency (Hz) = 4000 Attenuation (db) = 18.0 Fresnel N = 3.222
Frequency (Hz) = 2000 Attenuation (db) = 15.0 Fresnel N = 1.611
Frequency (Hz) = 1000 Attenuation (db) = 12.7 Fresnel N = 0.805
Frequency (Hz) = 500 Attenuation (db) = 10.6 Fresnel N = 0.403
Frequency (Hz) = 250 Attenuation (db) = 8.9 Fresnel N = 0.201
Frequency (Hz) = 125 Attenuation (db) = 7.6 Fresnel N = 0.101
Frequency (Hz) = 63 Attenuation (db) = 6.5 Fresnel N = 0.050

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 155.00
Source to Barrier Horizontal Distance (ft) = 55.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 157.33
Distance Source to Barrier top (ft) d1 = 55.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 17.701
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 8.851
Frequency (Hz) = 2000 Attenuation (db) = 19.4 Fresnel N = 4.425
Frequency (Hz) = 1000 Attenuation (db) = 16.4 Fresnel N = 2.213
Frequency (Hz) = 500 Attenuation (db) = 13.7 Fresnel N = 1.106
Frequency (Hz) = 250 Attenuation (db) = 11.5 Fresnel N = 0.553
Frequency (Hz) = 125 Attenuation (db) = 9.7 Fresnel N = 0.277
Frequency (Hz) = 63 Attenuation (db) = 8.2 Fresnel N = 0.138

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 175.00
Source to Barrier Horizontal Distance (ft) = 75.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 177.07
Distance Source to Barrier top (ft) d1 = 75.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 21.441
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 10.721
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 5.360
Frequency (Hz) = 1000 Attenuation (db) = 17.2 Fresnel N = 2.680
Frequency (Hz) = 500 Attenuation (db) = 14.4 Fresnel N = 1.340
Frequency (Hz) = 250 Attenuation (db) = 12.0 Fresnel N = 0.670
Frequency (Hz) = 125 Attenuation (db) = 10.2 Fresnel N = 0.335
Frequency (Hz) = 63 Attenuation (db) = 8.6 Fresnel N = 0.168

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 235.00
Source to Barrier Horizontal Distance (ft) = 135.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 236.55
Distance Source to Barrier top (ft) d1 = 135.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 28.890
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 14.445
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 7.222
Frequency (Hz) = 1000 Attenuation (db) = 18.5 Fresnel N = 3.611
Frequency (Hz) = 500 Attenuation (db) = 15.5 Fresnel N = 1.806
Frequency (Hz) = 250 Attenuation (db) = 13.0 Fresnel N = 0.903
Frequency (Hz) = 125 Attenuation (db) = 10.9 Fresnel N = 0.451
Frequency (Hz) = 63 Attenuation (db) = 9.2 Fresnel N = 0.226

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 260.00
Source to Barrier Horizontal Distance (ft) = 160.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 261.40
Distance Source to Barrier top (ft) d1 = 160.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 30.988
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 15.494
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 7.747
Frequency (Hz) = 1000 Attenuation (db) = 18.8 Fresnel N = 3.874
Frequency (Hz) = 500 Attenuation (db) = 15.8 Fresnel N = 1.937
Frequency (Hz) = 250 Attenuation (db) = 13.3 Fresnel N = 0.968
Frequency (Hz) = 125 Attenuation (db) = 11.1 Fresnel N = 0.484
Frequency (Hz) = 63 Attenuation (db) = 9.4 Fresnel N = 0.242

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 295.00
Source to Barrier Horizontal Distance (ft) = 195.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 296.23
Distance Source to Barrier top (ft) d1 = 195.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 33.333
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 16.666
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 8.333
Frequency (Hz) = 1000 Attenuation (db) = 19.1 Fresnel N = 4.167
Frequency (Hz) = 500 Attenuation (db) = 16.1 Fresnel N = 2.083
Frequency (Hz) = 250 Attenuation (db) = 13.5 Fresnel N = 1.042
Frequency (Hz) = 125 Attenuation (db) = 11.3 Fresnel N = 0.521

Frequency (Hz) = 63 Attenuation (db) = 9.5 Fresnel N = 0.260

Elevated Point Source
Source to Receiver Horizontal Distance (ft) = 320.00
Source to Barrier Horizontal Distance (ft) = 220.00
Barrier to Receiver Horizontal Distance (ft) = 100.00
Source Height (ft) = 32.00
Receiver Height (ft) = 5.00
Barrier Height (ft) = 32.00
Distance Source to Receptor (ft) d = 321.14
Distance Source to Barrier top (ft) d1 = 220.00
Distance Barrier top to Receiver (ft) d2 = 103.58

Frequency (Hz) = 8000 Attenuation (db) = 20.0 Fresnel N = 34.695
Frequency (Hz) = 4000 Attenuation (db) = 20.0 Fresnel N = 17.348
Frequency (Hz) = 2000 Attenuation (db) = 20.0 Fresnel N = 8.674
Frequency (Hz) = 1000 Attenuation (db) = 19.3 Fresnel N = 4.337
Frequency (Hz) = 500 Attenuation (db) = 16.3 Fresnel N = 2.168
Frequency (Hz) = 250 Attenuation (db) = 13.7 Fresnel N = 1.084
Frequency (Hz) = 125 Attenuation (db) = 11.4 Fresnel N = 0.542
Frequency (Hz) = 63 Attenuation (db) = 9.6 Fresnel N = 0.271