

NOISE STUDY

Highland Mixed Use Development City of Highland

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	II
LIST OF FIGURES.....	III
LIST OF TABLES.....	III
GLOSSARY OF COMMON TERMS	IV
EXECUTIVE SUMMARY	V
1.0 PROJECT INTRODUCTION	1
1.1 PURPOSE OF THIS STUDY.....	1
1.2 PROJECT LOCATION	1
1.3 PROJECT SETTING	1
2.0 ACOUSTICAL FUNDAMENTALS	4
3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS	6
3.1 CONSTRUCTION NOISE.....	6
3.2 OPERATIONAL NOISE.....	6
3.3 CITY CEQA SIGNIFICANCE DETERMINATION THRESHOLDS	9
4.0 EXISTING NOISE ENVIRONMENT	10
5.0 FUTURE ON-SITE OPERATIONAL NOISE LEVELS	12
5.1 REFERENCE NOISE LEVELS	13
5.2 CUMULATIVE PROJECT NOISE LEVELS	19
5.3 CONCLUSIONS	20
6.0 TRANSPORTATION NOISE LEVELS.....	21
6.1 ONSITE TRANSPORTATION RELATED NOISE LEVELS.....	21
6.2 OFFSITE PROJECT RELATED TRANSPORTATION NOISE LEVELS	21
6.3 TRANSPORTATION NOISE CONCLUSIONS	22
7.0 CONSTRUCTION NOISE LEVELS	23
7.1 ON-SITE CONSTRUCTION NOISE LEVELS	23
7.2 CONCLUSIONS	24
8.0 SUMMARY OF PROJECT CONCLUSIONS	25

LIST OF FIGURES

FIGURE 1-1: PROJECT VICINITY MAP	2
FIGURE 1-2: PROJECT SITE PLAN	3
FIGURE 4-1: AMBIENT NOISE MONITORING LOCATIONS	11
FIGURE 5-1: NOISE SOURCE LOCATIONS	14

LIST OF TABLES

TABLE 3-1: SOUND LEVEL LIMITS IN DECIBELS (DBA)	7
TABLE 3-2: LAND USE COMPATIBILITY GUIDELINES FOR NOISE.....	8
TABLE 4-1: MEASURED AMBIENT NOISE LEVELS.....	10
TABLE 5-1: PROJECT RELATED OPERATIONAL NOISE SOURCES (TRACTOR SUPPLY)	15
TABLE 5-2: OPERATIONAL NOISE LEVELS (TRACTOR SUPPLY).....	16
TABLE 5-3: DELIVERY TRUCK NOISE LEVELS (GROCERY STORE)	17
TABLE 5-4: PROJECT HVAC NOISE LEVELS (NEAREST RESIDENTIAL PROPERTY LINE)	18
TABLE 5-5: CUMULATIVE NOISE LEVELS (NEAREST RESIDENTIAL PROPERTY LINE).....	20
TABLE 7-1: GRADING AND SITE PREPARATION NOISE LEVELS	24

GLOSSARY OF COMMON TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 μ Pa. 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. L_{eq} 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 nighttime 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 mixed-use project. The proposed Highland Avenue Mixed-Use Development proposes the development of four commercial tenant buildings, a multi-family residential building, and two single family residences. The Project is located west of State Route 210, north along Base Line Street between Palm Avenue and Church Avenue in the City of Highland, CA.

Operational Noise Levels

Based upon the property line noise levels determined for the Project none of the proposed noise sources exceeds the property line standards. Therefore, the proposed development related operational noise levels comply with the City's daytime and evening noise standards. No impacts are anticipated and no mitigation is required.

On-Site Transportation Noise Findings

The future noise levels at the residential uses were found to be below 60 dBA CNEL and are below the City of Highland 65 dBA CNEL exterior noise level standard. To meet the 50 dBA CNEL interior noise standard at the commercial uses, an interior noise level reduction between 20-25 dBA CNEL is needed for the proposed project. Therefore, with the incorporation of a minimum STC 26 rated dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the City's 50 dBA CNEL standard.

The San Bernardino International Airport Layout Plan Narrative Report dated September 22, 2010 was compared to the project site location. According to the report the project is located approximately one mile from the 65 dBA CNEL noise contour for the airport. Therefore, no impacts from the existing airport are anticipated at the project site.

Off-Site Transportation Noise Findings

The project does not create a direct noise increase of more than 3 dBA CNEL along Base Line Street and local area roadways. Therefore, the 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. No mitigation is required.

Construction Noise Findings

Section 15.48.030 of the Highland Municipal Code prohibits construction activities to commence any earlier than one-half hour before sunrise or to terminate no later than one-half hour after sunset Monday through Sunday. As a condition of approval, non-emergency construction activities adjacent to existing noise sensitive uses should be limited to daylight hours between 7:00 a.m. and 6:00 p.m. Construction on weekends or holidays are to be discouraged except in the case of construction proximate to schools where these operations could disturb the classroom environment.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine potential onsite traffic noise impacts (if any) created from adjacent Base Line Street. Should impacts be determined, the intent of this study would be to recommend suitable mitigation measures to bring those impacts to a level that would be considered less than significant.

1.2 Project Location

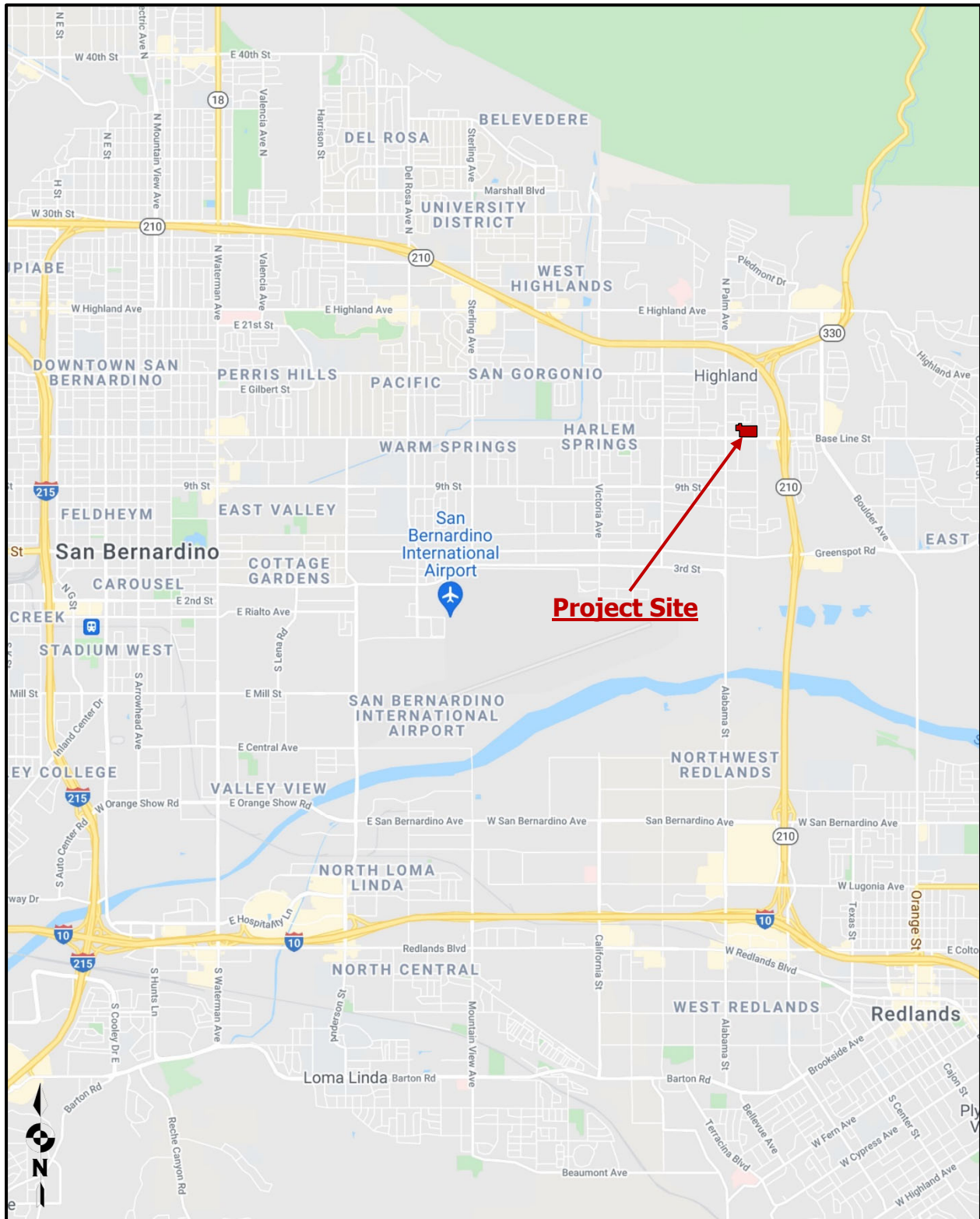
The proposed development is located in the City of Highland which is located within the boundaries of the County of San Bernardino California within the South Coast Air Basin (SCAB). The project site is located at the N/W corner of Base Line Road and Church Avenue in the City of Highland, San Bernardino County, California. The overall property consists of two legal parcels, APNs 1200-381-05-0-000 and 1200-381-43-0-000; Parcel "05" is zoned Mixed Use (MU) and Parcel "43" has split zoning Mixed Use (MU) and Residential Single Family (R1). A general project vicinity map is shown in Figure 1-A. San Bernardino International Airport is located approximately 1.4 miles southwest of the project site.

1.3 Project Setting

The Applicant proposes to construct a Mixed-Use development which would consist of a 38,940 square foot (SF) Tractor Supply Site, 28,037 SF of retail space and 6,540 SF fast food restaurant. In addition, the project would construct a residential development which would consist of a 15-unit multi-family residential building, and two single family residences on approximately 9.06 acres.

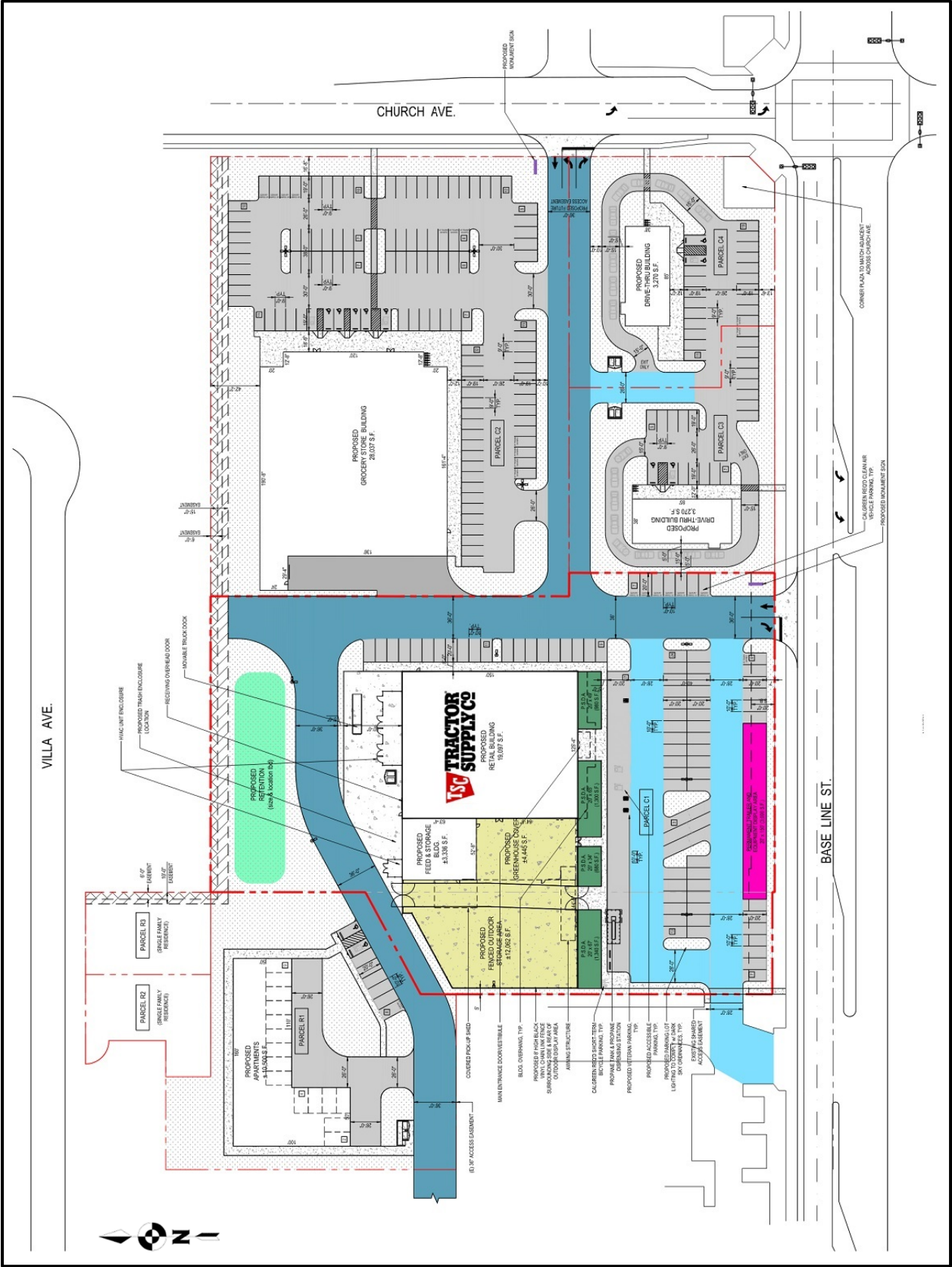
Access for the commercial portion of the project will be taken via two newly constructed driveways along Base Line Road and Church Avenue, connection to Foster Avenue, and shared access (pending legal approval) with parcel 1200-381-42-0-000 (Family Dollar) contiguous on the West side of Parcel "43". The overall property consists of two legal parcels, APNs 1200-381-05-0-000 and 1200-381-43-0-000; Parcel "05" is zoned Mixed Use (MU) and Parcel "43" has split zoning Mixed Use (MU) and Residential Single Family (R1). The proposed project land use will not require a zone change or General Plan amendment. Construction would begin early 2022 and be completed roughly one year later. A site development plan is shown in Figure 1-B.

Figure 1-1: Project Vicinity Map



Source: Google Maps, 2021

Figure 1-2: Project Site Plan



Source: MPA Architects, Inc., 2021

2.0 ACOUSTICAL FUNDAMENTALS

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 L_{eq} 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 it 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.

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Construction Noise

Section 15.48.030 of the Highland Municipal prohibits construction activities to commence any earlier than one-half hour before sunrise or to terminate no later than one-half hour after sunset Monday through Sunday.

Goal 7.3 of the Highland General Plan Noise Element protects residences from the effects of “spill over” of nuisance noise with the following noise mitigation measures:

- Require that construction activities employ feasible and practical techniques to minimize noise impacts on adjacent uses. Particular emphasis shall be placed on the restriction of house in which work other than emergency work may occur.
- As a condition of approval, non-emergency construction activities adjacent to existing noise-sensitive uses should be limited to daylight hours between 7:00 a.m. and 6:00 p.m. Construction on weekends or holidays are to be discouraged except in the case of construction proximate to schools where these operations could disturb the classroom environment.
- The use of portable noise barriers for heavy equipment operations performed within 100 feet of existing residences, are to be encouraged, or the applicant shall provide evidence as to why the use of such barriers is infeasible.

Pursuant to Section 8.50.060 (Exemptions), noise associated with “construction, repair, or excavation work performed pursuant to a valid written agreement with the city or any of its political subdivisions, which agreement provides for noise mitigation measures”, is exempt.

3.2 Operational Noise

Although exempt from numerical noise standards, The Noise Element provides the following exterior noise standards for the indicated land uses. Although the metric indicated for exterior noise standards is a CNEL, because by definition CNELs are a 24-hour average and the land use table assigns varying CNEL thresholds based on time of day it is likely that an hourly Leq might be more appropriate. Nevertheless, these standards are presented below with the caveat that construction activities are exempt.

Table 3-1: Sound Level Limits in Decibels (dBA)

<i>Type of Land Use</i>	<i>Time Interval</i>	<i>CNEL (dBA)</i>
Residential	10:00 p.m. – 7:00 a.m.	55
	7:00 a.m. – 10:00 p.m.	60
Agricultural/Equestrian	10:00 p.m. – 7:00 a.m.	60
	7:00 a.m. – 10:00 p.m.	65
Commercial	10:00 p.m. – 7:00 a.m.	65
	7:00 a.m. – 10:00 p.m.	70
Manufacturing or Industrial	Any Time	75
Open Space	Any Time	75
Source: Chapter 8.50, Noise Control, City of Highland Municipal Code.		

Chapter 8.50 of the Noise Ordinance sets a more restrictive operational exterior noise limit at the residential uses of 60 dBA CNEL for daytime hours of 7 a.m. to 10 p.m. and 55 dBA Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. Project components will only operate during the daytime hours but a few may operate during nighttime or early morning hours and therefore the most conservative approach is to apply the 55 dBA Leq nighttime standard at the property lines.

City General Plan

The State of California has established guidelines for acceptable community noise levels that are based upon the CNEL rating scale to ensure that noise exposure is considered in any development. CNEL-based standards apply to noise sources whose noise generation is preempted from local control (such as from on-road vehicles, trains, airplanes, etc.) and are used to make land use decisions as to the suitability of a given site for its intended use. These CNEL-based standards are typically articulated in the Noise Element of the General Plan.

The City of Highland Noise Element (General Plan, 2006) specifies CNEL-based standards for various land uses. The recommended guidelines for noise and land use compatibility are illustrated in Table 3-2, Land Use Compatibility Guidelines for Noise. For residential use the guidelines indicate an exterior noise level of less than 60 dB CNEL to be “normally acceptable” without any special noise requirements. Exterior noise levels up to 70 dB CNEL are considered “conditionally acceptable”, such that construction should only occur after a detailed analysis of the noise reduction requirements is made and noise attenuation features are included in the project design.

Table 3-2: Land Use Compatibility Guidelines for Noise

Land Uses Category	Community Noise Exposure Level Ldn or CNEL, dBA					
	55	60	65	70	75	80
Residential-Low Density Single Family Dwellings, Duplexes and Mobile Homes						
Residential Multi-Family Dwellings						
Transient Lodging – Motels, Hotels						
Schools, Libraries, Churches, Hospitals, Nursing Homes						
Auditoriums, Concert Halls, Amphitheaters						
Sports Arena, Outdoor Spectator Sports						
Playgrounds, Neighborhood Parks						
Golf Courses, Riding Stables, Water Recreation, Cemeteries						
Commercial and Office Buildings						
Industrial, Manufacturing, Utilities, Agriculture						
Explanatory Notes <div> <div></div> Normally Acceptable: Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements. </div> <div> <div></div> Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply system or air conditioning will normally suffice. Outdoor environment will seem noisy. </div> <div> <div></div> Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made with needed noise insulation features included in the design. Outdoor areas must be shielded. </div> <div> <div></div> Clearly Unacceptable: New construction or development should generally not be undertaken. Construction cost to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable. </div>						
Source: California Office of Noise Control						

Although the City of Highland guidelines allow residential exterior noise levels of up to 70 dB CNEL, a noise level of 65 dB is the level at which ambient noise begins to interfere with one's ability to carry on a normal conversation at reasonable separation without raising one's voice. The City of Highland General Plan Goal 7.1 recommends an exterior threshold of 65 dBA CNEL as the compatibility guideline for new residential dwellings in Highland and is used as the guideline for this analysis. However, exterior noise attenuation features could include, but are not limited to, setbacks to place structures outside the 65 dB CNEL noise contour, orienting structures so no windows open to the noise source, and /or installing noise barriers such as berms or solid walls.

Exterior standards apply to normally used recreational exterior space (patio, porch, pool/spa, etc.). They are also a guide to likely interior noise exposure based on the structural attenuation normally achievable with various types of construction.

The City of Highland interior noise standard uses a weighted noise exposure of 45 dBA CNEL as the guideline level for single and multi-family dwelling units. Conventional construction with closed windows and a fresh air supply will normally suffice. Normal noise attenuation within residential structures with closed windows is about 25-30 dB. Therefore, an exterior noise level of up to 70-75 dB CNEL could allow for the interior threshold to be met with no special noise attenuation features.

The City of Highland is pre-empted from regulating on-road traffic noise. However, when traffic noise exceeds the planning standard for an affected land use, CNEL-based standards are the accepted significance threshold for any CEQA environmental analysis.

3.3 City CEQA Significance Determination Thresholds

In accordance with CEQA, a project should not have a noticeable adverse impact on the surrounding environment. Noise level changes greater than 3 dBA, or a doubling of the acoustic energy, are often identified as audible and considered potentially significant, while changes less than 1 dBA are not discernible. In the range of 1 to 3 dBA, humans who are very sensitive to noise may perceive a slight change. For the purposes for this analysis, a direct and cumulative roadway noise impact would be considered significant if the project increases noise levels at a noise sensitive land use 3 dBA CNEL and if the noise level increases above an unacceptable noise level per the City's General Plan.

4.0 EXISTING NOISE ENVIRONMENT

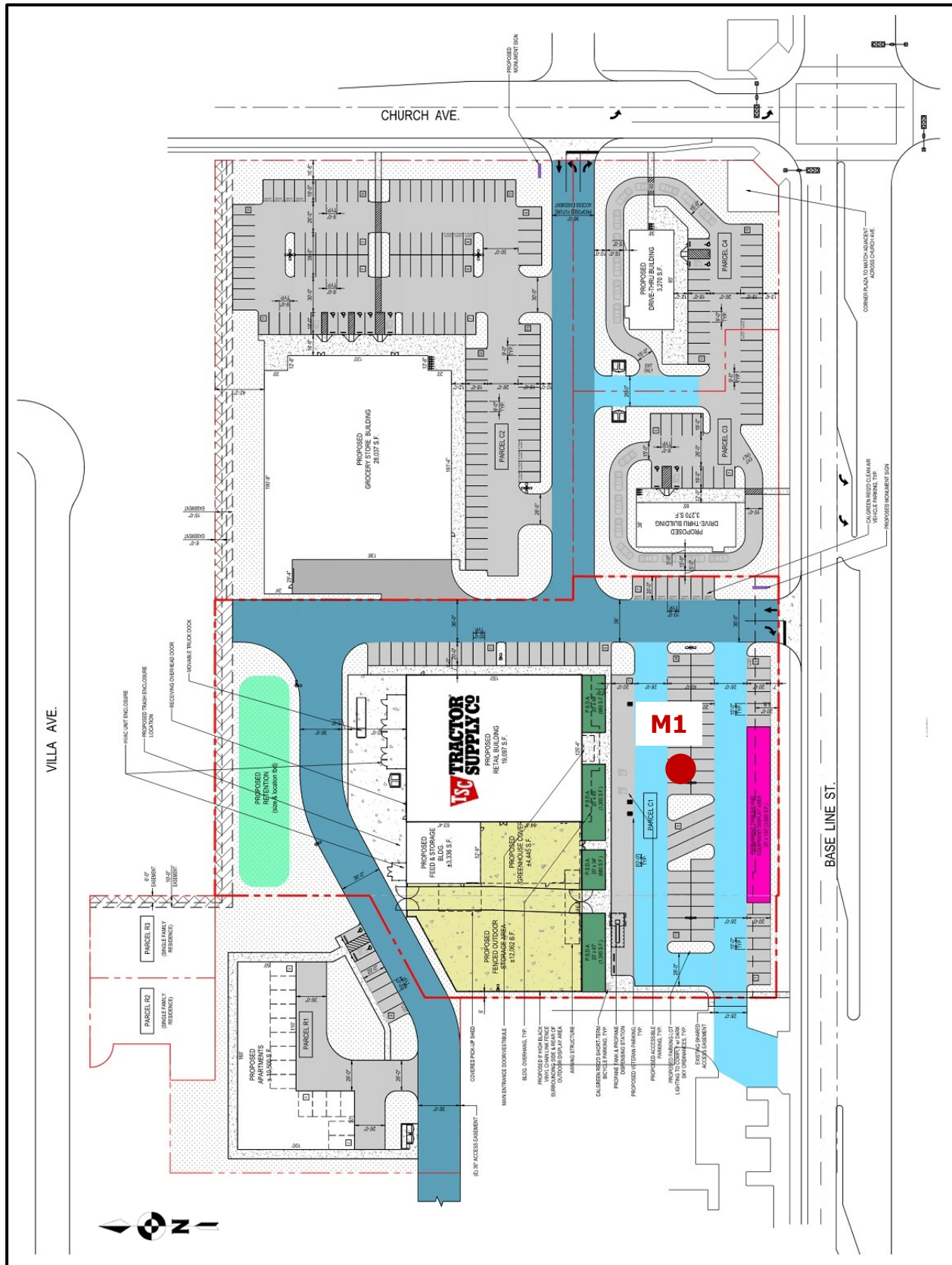
Noise measurements were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200.

Monitoring location 1 (M1) was located roughly 140-feet from the centerline of Base Line Street. The results of the noise level measurements are presented in Table 4-1. The noise measurements were monitored for a time period of 15 minutes. The existing noise levels in the project area consisted primarily of traffic along Base Line Street. The ambient Leq noise level measured in the area of the project during the morning hour was found to be 55.8 dBA Leq. The statistical indicators Lmax, Lmin, L10, L50 and L90, are given for the monitoring location. As can be seen from the L90 data, 90% of the time the noise level was 47.7 dBA. The noise monitoring locations are provided graphically in Figure 4-1 on the following page.

Table 4-1: Measured Ambient Noise Levels

Measurement Identification	Description	Time	Noise Levels (dBA)					
			Leq	Lmax	Lmin	L10	L50	L90
M1	Base Line Street	11:00-11:15 a.m.	55.8	69.7	43.9	58.6	54.1	47.7
Source: Ldn Consulting, Inc. April 15, 2021								

Figure 4-1: Ambient Noise Monitoring Locations



5.0 FUTURE ON-SITE OPERATIONAL NOISE LEVELS

This section examines the potential stationary noise source impacts associated with the development and operation of the proposed project. Fixed or 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. Using a point-source noise prediction model, calculations of the expected operational 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. Noise levels drop 3 decibels each time the duration of the source is reduced in half. Therefore, an hourly noise level over a 15-minute period would be reduced by 6 decibels based on the limited time of operation.

According to the information provided by the Project Proponent, anticipated on-site operational noise sources for the Tractor Supply will primarily be delivery truck “reverse signals,” a forklift, an outside cardboard baler, and ground mounted HVAC units. It is anticipated that each week there will be approximately 2-3 delivery trucks Monday through Friday between the hours of 8:00 a.m. and 9:00 p.m.; there will be 1 forklift utilized to unload delivery trucks and for moving general merchandise around the outdoor storage lots; an outside cardboard baler along the northern building façade; and it is anticipated that 4 ground mounted HVAC units will be located at the rear of the building. Operation noise sources associated with the proposed grocery store include delivery and trash truck operations as well as roof mounted HVAC units. In addition to these noise sources, the drive-thru restaurants are expected to generate noise from the menu boards and speaker posts.

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.

The locations of the noise sources are shown in Figure 5-1. Each building will have a series of HVAC unit for temperature control and are discussed in more detail below. The most sensitive property line to the operational noise sources, by distance and orientation, is the property line at the proposed town homes. The City of Highland Noise Ordinance sets an operational exterior noise limit of 60 decibels (dBA) from 7

a.m. to 10 p.m. and 55 decibels (dBA) from 10 p.m. to 7 a.m. for the residential noise sensitive land uses. The section will analyze the property line to determine the worst case noise levels. All other property lines are located further from the noise sources and have a commercial zoning allowing a less restrictive noise standard or a higher noise level.

5.1 Reference Noise Levels

This section provides a detailed description of the reference noise level measurement results. It is important to note that the following projected noise levels assume the worst-case noise environment with the Tractor Supply operations, delivery trucks, drive-thru activities and mechanical ventilation (HVAC) all occurring at the same time. In reality, these noise levels will vary throughout the day. The mechanical ventilation may operate during nighttime hours and the delivery trucks may arrive during early evening or morning hours.

The Project must meet the most restrictive daytime and evening standards of 60.0 dBA and 55.0 dBA at the residential property lines as shown in Table 3-2 above. Each anticipated noise source is provided in more detail below to determine if direct noise impacts will occur. A cumulative noise level analysis with associated distances, noise reductions and calculations of the proposed sources is provided at the end of this section along with a table showing the individual noise sources and their associated property line noise levels.

[illegible]

Tractor Supply

Based on a Tractor Supply facility in Lakeside, the project related noise sources are provided in Table 5-1 (Source: Tractor Supply Company Community of Lakeside Acoustical Analysis Report, Arcadis 2014).

Table 5-1: Project Related Operational Noise Sources (Tractor Supply)

Quantity	Equipment Description	Manufacturer	Frequency	Related Sound Level Distance (ft)	Noise Level (dBA)
1	WB-65 Delivery Trucks "reverse signal"	ECCO	2-3 per week for 2.5 minutes each for unloading	4	87.0
1	Propane forklift	Toyota	15 minutes/day during business hours	5	77.0
1	Vertical Baler	MAX-PAK (Model: MP7240)	5 minutes/day during business hours	5	90.3
Source: Tractor Supply Company Community of Lakeside Acoustical Analysis Report, Arcadis 2014.					

The noise levels for each source along with the calculated hourly noise levels based upon individual operating times are shown below in Table 5-2 for the nearest residential property line. It was anticipated that the delivery trucks and forklift operations would occur at least 150 feet from the nearest residential property line to west.

Also, included in Table 5-2 is the relative property line standards for clarity. The combined noise levels at the adjacent property lines based upon distance separation and limited duty-cycles were projected to be below the City's Noise Ordinance standards with no barriers or shielding of the equipment. Therefore, no impacts are anticipated and no mitigation is required for the continued operations.

Table 5-2: Operational Noise Levels (Tractor Supply)

Source	Reference Noise Level (dBA)	Reference Distance (Feet)	Minimum Distance to Property Line (Feet)	Duty Cycle (Seconds/Hour)	Resultant Noise Level at Property Line (dBA Leq)
Delivery Trucks	87	4	150	150	42
Propane forklift	77	5	150	600	40
Vertical Baler	90	5	70	300	56
CUMULATIVE NOISE LEVEL @ PROPERTY LINE (dBA)					57
Property Line Standard					60
Complies with Noise Ordinance					Yes

Grocery Store Delivery Trucks

In order to evaluate the truck delivery noise impacts, the analysis utilized reference noise level measurements taken at an Albertson's Shopping Center in San Diego, California in 2011. The measurements include truck drive-by noise, truck loading/unloading and truck engine noise. The unmitigated exterior noise levels for truck drive-by noise and truck engine noise were measured at 66.5 dBA Leq at a distance of 25-feet from the loading dock.

There is one loading dock proposed at the grocery facility approximately 65 feet from the closest residential property line to the north. A truck will take approximately 5 minutes to drive in the site and position itself into a bay, 30-45 minutes to be unloaded or loaded, and another 5 minutes to exit the bay secure doors, complete necessary paperwork and drive out of the site. This equates to 40-55 minutes it would take for one truck to complete a delivery or pickup, therefore only one truck at the most could deliver to this facility in one hour. During the loading/unloading of the truck the engine can only idle for five (5) minutes in compliance with State air quality requirements. To be conservative, it was assumed the truck engine could be operating for 15 minutes of the total time required during the delivery process (5 minutes at arrival, 5 minutes of idle and 5 minutes at departure).

Noise levels drop 3 decibels each time the duration of the source is reduced in half. Therefore, hourly truck noise level over a 15-minute period would be reduced 6 decibels to 60.5 dBA at a distance of 25-feet based on the limited time of operation. The nearest loading dock at the grocery facility is roughly 65 feet from the nearest residential

property line to the north and the noise level reduction due to distance would be -8.3 dBA. This would result in an unshielded noise level of 52.2 dBA Leq which is below the 60.0 dBA Leq property line standard. No noise impacts are anticipated.

Table 5-3: Delivery Truck Noise Levels (Grocery Store)

Distance to Observer (Feet)	Reference Noise Level (dBA)	Noise Source Reference Distance (Feet)	Noise Reduction Due to Distance (dBA)	Noise Level at Property Line (dBA)	Quantity per hour	Property Line Cumulative Noise Level (dBA)
65	60.5	25	-8.3	52.2	1	52.2*
*Complies with the nighttime Noise Standard of 55 dBA.						

Fast Food Restaurant

In order to examine the potential stationary noise source impacts associated with the operation of the proposed fast-food restaurants, reference noise levels were used for the menu board and speaker post (Source: HME Electronics, Inc., HME SPP2 Speaker Post). The reference noise level of the speaker board is 54 dBA CNEL at 32 feet. The future drive-thru speakers are located approximately 350 from the nearest residential property line to the north resulting in an anticipated noise level of approximately 36 dBA. Therefore, the proposed operations of the fast-food restaurants and drive-thru would not exceed the City's daytime threshold of 60 dBA and the most restrictive nighttime threshold of 55 dBA. Therefore, no additional noise reductions would be required.

Air Conditioning Units

The Tractor Supply would have ground mounted mechanical ventilation units (HVAC) installed at the rear of the building. The remainder of the buildings would have rooftop HVAC units installed on the buildings. In order to evaluate the HVAC noise impacts, the analysis utilized reference noise level measurements taken at a Von's Shopping Center in Murrieta, CA in 2010. The unshielded noise levels for the HVAC units were measured at 67 dBA Leq at a distance of 6-feet. The grocery is proposed with a larger 18-ton unit and one smaller unit having a reference noise level of 76 dBA at 3-feet (Source: Lennox Commercial HVAC Units – October 2005). The Tractor Supply is proposed with two larger 18-ton units and two smaller units.

To predict the worst-case future noise environment, a continuous reference noise level of 67 dBA at 6-feet was used to represent the mechanical ventilation system for the smaller units and a reference noise level of 76.0 dBA at 3-feet (or 70 dBA at 6-feet) for the larger units. 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 are designed to provide cooling during the peak summer daytime periods, and it is unlikely that all the units will be operating continuously.

The noise levels associated with the roof-top mechanical ventilation systems will be limited with the proposed parapet walls on each building that will vary in height but will be roughly 1-foot higher than 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. No additional reductions were taken for the parapet walls. The noise level reductions due to distance for the nearest residential uses located to the north is provided in Table 5-4 below for each building. The number of HVAC units that are proposed for each building is also provided in Table 5-4 along with the cumulative noise levels.

Table 5-4: Project HVAC Noise Levels (Nearest Residential Property Line)

Building	Distance to Observer Location (Feet)	Hourly Reference Noise Level (dBA)	Noise Source Reference Distance (Feet)	Noise Reduction Due to Distance (dBA)	Noise Level at Property Line (dBA)	Quantity	Property Line Cumulative Noise Level (dBA)*
Tractor Supply 10-ton	140	76.0	3.0	-33.4	42.6	2	45.6
Tractor Supply 3-ton	35	67.0	6.0	-21.3	45.7	1	48.7
Tractor Supply 3-ton	160	67.0	6.0	-34.5	32.5	1	32.5
Grocery 10-ton	70	76.0	3.0	-27.4	48.6	1	48.6
Grocery 3-ton	70	67.0	6.0	-21.3	45.7	1	45.7
Drive-Thru 3-ton	370	67.0	6.0	-35.8	31.2	4	37.2
Drive-Thru 3-ton	370	67.0	6.0	-35.8	31.2	4	37.2
Combined Cumulative Noise Level at Property Line:							52.9
*Complies with the nighttime Noise Standard of 55 dBA.							

The proposed HVAC operational noise levels are in compliance with the City's daytime 60 dBA property line standard and would also meet the most restrictive nighttime standard of 55 dBA. No impacts are anticipated and no further mitigation is required. Additionally, most of the HVAC units will be located farther from the residential property line as part of the proposed project.

5.2 Cumulative Project Noise Levels

It is possible to calculate the cumulative noise levels from the proposed project along the residential property line from each of the proposed noise sources. Although not all the noise sources are close enough to each other in distance or sound level to create a cumulative effect this method is considered ultra conservative in determining impact potential. The cumulative noise levels are calculated at the residential at the Northern and Western portions of the site below in Table 5-5. These projections include the Tractor Supply operations, delivery truck noise, drive-thru noise and noise from the HVAC systems of each building and their respective distances.

Table 5-5 below presents the cumulative noise levels at the nearest residential property line from the proposed commercial development during the daytime hours. The resultant cumulative noise level at the nearest property lines is projected to be at or below 59.1 dBA Leq. Therefore, cumulatively the proposed commercial development related operational noise levels comply with the daytime noise standards at the nearest residences. No Impacts are anticipated and no mitigation is required.

Table 5-5: Cumulative Daytime Noise Levels (Nearest Residential Property Line)

Source	Distance to Observer Location (Feet)	Hourly Reference Noise Level (dBA)	Noise Source Reference Distance (Feet)	Noise Reduction Due to Distance (dBA)	Reduction Due to Duty Cycle (dBA)	Noise Level at Property Line (dBA)	Quantity	Property Line Cumulative Noise Level (dBA)*
Tractor Supply Deliveries	150	87.0	4	-31.5	-13.8	41.7	1	41.7
Propane Forklift	150	77.0	5	-29.5	-7.8	39.7	1	39.7
Vertical Baler	70	90.0	5	-22.9	-10.8	56.3	1	56.3
Grocery Delivery	65	60.5	25	-8.3	0.0	52.2	1	52.2
Speaker Board	350	54.0	32	-20.8	0.0	33.2	2	36.2
Tractor Supply 10-ton	140	76.0	3	-33.4	0.0	42.6	2	45.6
Tractor Supply 3-ton	35	67.0	3	-21.3	0.0	45.7	1	45.7
Tractor Supply 3-ton	160	67.0	3	-34.5	0.0	32.5	1	32.5
Grocery 10-ton	70	76.0	3	-27.4	0.0	48.6	1	48.6
Grocery 3-ton	70	67.0	6	-21.3	0.0	45.7	1	45.7
Drive-Thru 3-ton	370	67.0	6	-35.8	0.0	31.2	4	37.2
Drive-Thru 3-ton	370	67.0	6	-35.8	0.0	31.2	4	37.2
Combined Cumulative Noise Level at Property Line:								59.1

5.3 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 commercial development related operational noise levels comply with the daytime and nighttime noise standards at the residences. No Impacts are anticipated and no mitigation is required.

6.0 TRANSPORTATION NOISE LEVELS

6.1 Onsite Transportation Related Noise Levels

The primary source of noise impacts to the project site will be from vehicular noise from adjacent Base Line Street. According to the City's General Plan Future Roadway Noise Contours, the future 65 dBA CNEL contour along Base Line Street is located approximately 230 feet from the centerline of the roadway (Source: City of Highland General Plan Noise Element). The proposed multi-family residential buildings are located over 400-feet from the centerline of Base Line Street and partially shielded by the existing and proposed buildings.

Therefore, the exterior noise levels are anticipated to be below 60 dBA CNEL and will meet the City of Highland 65 dBA CNEL standard for multi-family residential developments at all proposed outdoor use areas without mitigation. The proposed single-family residential homes are located over 530-feet from the centerline of Base Line Street and therefore, the exterior noise levels would also meet the City of Highland 65 dBA CNEL standard for single-family residential developments at the proposed rear yards without mitigation.

The San Bernardino International Airport Layout Plan Narrative Report dated September 22, 2010 was compared to the project site location. According to the report the project is located approximately one mile from the 65 dBA CNEL noise contour for the airport. Therefore, no impacts from the existing airport are anticipated at the project site.

Based on the City's General Plan Future Roadway Noise Contours, the retail buildings could be exposed to noise levels between 70 to 75 dBA CNEL. To meet the 50 dBA CNEL interior noise standard at the commercial uses, an interior noise level reduction of between 20 and 25 dBA CNEL is needed for the proposed project. Therefore, with the incorporation of a minimum STC 26 rated dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the City's 50 dBA CNEL standard.

6.2 Offsite Project Related Transportation Noise Levels

To determine if direct or cumulative off-site noise level increases associated with the development of the proposed project would create noise impacts, the traffic volumes for the existing conditions were compared with the traffic volume increase of existing plus the proposed project. The project is estimated to generate 3,363 daily trips with a

peak hour volume of 298 trips. The existing average daily traffic (ADT) volumes on Base Line Street is more than several thousand ADT. Typically, it requires a project to double (or add 100%) the traffic volumes to have a direct impact of 3 dBA CNEL or be a major contributor to the cumulative traffic volumes, therefore, no direct or cumulative impacts are anticipated. Of the project generated traffic, the residential portion of the project accounts for 75 of these daily trips and would not have a significant contribution to the neighborhood roadways.

6.3 Transportation Noise Conclusions

Onsite Transportation Related Noise Levels

The future noise levels at the residential uses were found to be below 60 dBA CNEL and are below the City of Highland 65 dBA CNEL exterior noise level standard. To meet the 50 dBA CNEL interior noise standard at the commercial uses, an interior noise level reduction between 20-25 dBA CNEL is needed for the proposed project. Therefore, with the incorporation of a minimum STC 26 rated dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the City's 50 dBA CNEL standard.

The San Bernardino International Airport Layout Plan Narrative Report dated September 22, 2010 was compared to the project site location. According to the report the project is located approximately one mile from the 65 dBA CNEL noise contour for the airport. Therefore, no impacts from the existing airport are anticipated at the project site.

Offsite Project Related Transportation Noise Levels

The project does not create a direct noise increase of more than 3 dBA CNEL along Base Line Street and local area roadways. Therefore, the 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. No mitigation is required.

7.0 CONSTRUCTION NOISE LEVELS

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.

Pursuant to the Highland Municipal Code, a noise level of 60 dBA is allowable for residential uses and noise levels of 70 dBA and 75 dBA are allowable for commercial and industrial uses, respectively. Pursuant to Section 8.50.060 (Exemptions), construction work performed pursuant to a written agreement with the City or any of its subdivisions, provided that mitigation is incorporated, is exempt.

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.

Using a point-source noise prediction model, calculations of the expected construction noise levels were completed. The essential model input data for these performance equations include the source levels of the equipment, 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.

7.1 On-Site Construction Noise Levels

Based on the EPA noise emissions, empirical data and the amount of equipment needed, worst-case noise levels from the construction equipment operations would occur during the base operations (grading activity). The grading of the project will occur in a single phase, with the entire site being prepared for building construction. The noise levels utilized in this analysis for the grading activities are shown in Table 7-1.

Table 7-1: Grading and Site Preparation Noise Levels

Construction Equipment	Quantity	Source Level @ 50-Feet (dBA)*	Duty Cycle (Hours/Day)	12 Hour Noise Level @ Property Line (dBA)
Tractor/Backhoe	1	72	8	72.0
Loader/Grader	1	73	8	73.0
Water Trucks	1	70	8	70.0
Paver/Blade	1	75	8	75.0
Roller/Compactor	1	74	8	74.0
Cumulative Levels @ 50 Feet (dBA)				80.1
Average Distance to Property Line				200
Noise Reduction Due to Distance				-12.0
NEAREST PROPERTY LINE NOISE LEVEL				68.1
*Source: U.S. Environmental Protection Agency (U.S. EPA), 1971 and Empirical Data				

7.2 Conclusions

Section 15.48.030 of the Highland Municipal Code prohibits construction activities to commence any earlier than one-half hour before sunrise or to terminate no later than one-half hour after sunset Monday through Sunday. As a condition of approval, non-emergency construction activities adjacent to existing noise sensitive uses should be limited to daylight hours between 7:00 a.m. and 6:00 p.m. Construction on weekends or holidays are to be discouraged except in the case of construction proximate to schools where these operations could disturb the classroom environment.

8.0 SUMMARY OF PROJECT CONCLUSIONS

- Operational Noise Findings

Based upon the property line noise levels, 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 commercial development related operational noise levels comply with the daytime and nighttime noise standards at the residences. No impacts are anticipated and no mitigation is required.

- On-Site Transportation Noise Findings

The future noise levels at the residential uses were found to be below the City of Highland 70 dBA CNEL exterior noise level standard. An interior noise assessment is required for the residential units along the roadways prior to the issuance of the first building permit once the architectural floor plans are available. This final report would identify the interior noise requirements to meet the City's established interior noise limit of 45 dBA CNEL.

To meet the 50 dBA CNEL interior noise standard at the commercial uses, an interior noise level reduction between 20-25 dBA CNEL is needed for the proposed project. Therefore, with the incorporation of a minimum STC 26 rated dual pane windows and mechanical ventilation will achieve the necessary interior noise reductions to meet the City's 50 dBA CNEL standard.

- Off-Site Transportation Noise Findings

The project does not create a direct noise increase of more than 3 dBA CNEL along Base Line Street and local area roadways. Therefore, the 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. No mitigation is required.

- Construction Noise Findings

Section 15.48.030 of the Highland Municipal Code prohibits construction activities to commence any earlier than one-half hour before sunrise or to terminate no later than one-half hour after sunset Monday through Sunday. As a condition of approval, non-emergency construction activities adjacent to existing noise sensitive uses should be

limited to daylight hours between 7:00 a.m. and 6:00 p.m. Construction on weekends or holidays are to be discouraged except in the case of construction proximate to schools where these operations could disturb the classroom environment.