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City of Lake Forest

NOISE IMPACT ANALYSIS

ENCANTO RESIDENTIAL

CITY OF LAKE FOREST, CALIFORNIA

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Project No.: P14-038 N

EXECUTIVE SUMMARY

Giroux & Associates, at the request of E|P|D Solutions, Inc., Irvine, California, prepared this noise impact analysis for the proposed Encanto Residential Development Project (project). The project would consist of the subdivision of a 5.75-acre property into 52 residential and five open space lots that includes associated streets, retaining walls, and storm drains in the City of Lake Forest, Orange County, California. The Encanto project is a gated residential community consisting of 52 single-family detached homes.

This project level noise impact study indicates that all noise related impacts are less-than-significant, as follows:

There are no existing residences immediately adjacent to the project site. The closest residential uses would be located approximately 200 feet to the east, across Commercentre Drive[1]. There is a 41 foot elevation differential and a 6-foot wall between the project site and the residential uses across Commercentre Drive. The noise level of up to 59 dB Leq could occur at the nearest residential uses when operating immediately along the site's eastern edge, as scrappers and graders pass by intermittently for a few minutes at a time. Scrapers and graders would only be used during site preparation and grading operations, which are expected to last 40 days. Only a small fraction of site preparation and grading activities would occur immediately along the eastern edge. The majority of construction activities would occur interior to the site and would generate noise of 55 dB or less at the nearest residential uses.

According to the City's Noise Ordinance, construction noise is exempt from noise control standards if it takes place during specified hours. Permissible hours of construction are 7 a.m. to 8 p.m. on weekdays and on Saturdays. Construction is not permitted on any national holiday or on any Sunday. Therefore, compliance with these municipal code provisions will ensure that construction noise does not disturb residents during the times they are most likely to be home, and during hours when ambient noise levels are likely to be lower (i.e., at night). Short-term construction noise would not exceed the City's daytime exterior noise standards outlined in the City's Noise Ordinance, with the exception of the 55 dB noise standard if site preparation and grading activities would occur immediately along the eastern edge of the project site for a cumulative period of more than thirty minutes in any hour. Mitigation measure 1 would ensure that the loudest equipment capable of exceeding the 55 dB noise standard at the nearest residential use (scrapers and graders) would operate for less than 30 minutes in any hour. With incorporation of mitigation measure 1, the project would not violate established standards and construction noise impacts would be less than significant.

Mitigation Measure 1:

During site preparation and grading activities, graders and scrapers shall only be permitted to operate for a cumulative period of less than 30 minutes in any hour, when operating within 200 feet of the nearest residences to the east, if those residences are built and occupied.

[1] The graded but not yet built residential lots are assumed to be occupied for this analysis. However, the area is currently used for construction staging for Baker Ranch and the likelihood that the homes will be built, sold, and occupied before site preparation and grading operations occur on the Encanto project site is uncertain.

The project includes the following Project Design Features (PDFs) which attenuate sound and prevent potential noise impacts:

PDF-1: Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7): Usable outdoor space such as backyards, decks, patios areas are required to be protected by stand-alone sound barriers. Applicant shall provide a minimum 5-foot high sound barrier (minimum 5 dBa) along the perimeter of backyards. The noise barriers must consist of materials with a minimum density of 3.5 pounds per square foot or combination of materials that meet this requirement. Such barrier materials include, but are not limited to, the following: ¼ in tempered glass, ¼ in laminated glass, ¼ in Plexiglass, or masonry.

PDF-2: Southern boundary (Lots 26-34): The applicant shall provide an 8-foot high masonry wall at the top of the slope along the project site's southern boundary between Lot 26 and Lot 34 to serve as a noise barrier/privacy wall between Lots 26 to 34 and the adjacent industrial uses. The noise barrier must consist of materials with a minimum density of 3.5 pounds per square foot.

With construction of the above described 5-foot noise along the rear property lines of the Lots 7-17 and Lots 1-7, all outdoor recreational noise exposures for all units backing up to Alton Parkway and Commercentre Drive will be 65 dBA CNEL or less which is the City of Lake Forest standard for usable outdoor space. Likewise, the project site's topography and construction of an 8-foot high wall at the top of slope along the southern boundary would ensure there are no significant impacts. No mitigation is necessary.

Closure of windows in habitable rooms such as bedrooms and living rooms with a direct line-of-sight of Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7) will be necessary to meet the City's 45 dBA CNEL interior noise standard. The following PDFs will attenuate sound and prevent potential noise impacts:

PDF-3: All rooms shall have windows with Sound Transmission Class (STC)-27 or higher.

PDF -4: Heating, ventilating, and air-conditioning (HVAC) units shall be installed for all residential dwelling units.

PDF-5: Consistent with Meritage Green Standards for new home construction, ½ Pound Open Cell Polyurethane Spray Foam will be applied in walls and attics for all residential units.

As a condition of approval, prior to the issuance of certificates of occupancy, the applicant shall prepare a final acoustical report to demonstrate that the interior noise levels in habitable rooms shall not exceed 45 dBA CNEL, as defined by Title 24, Part 2, of the California Building Code.

The project noise impact study indicates a less-than-significant noise impact from project-related traffic on project vicinity receptors. Project-related traffic will not cause noise standards to be exceeded. With implementation of mitigation measures and project design features, all noise impacts would be less than significant.

PROPOSED PROJECT

The Encanto site is on the southwest corner of the Commercentre Drive and Alton Parkway intersection, in the City of Lake Forest, Orange County, California. The site is across Commercentre Drive from the Baker Ranch Community, Planning Area (PA) 1F, in which single-family homes are currently under construction, and across Alton Parkway from PA 1K, which is planned for Low-Medium Density Residential. The proposed project would place new residential uses adjacent to a parcel zoned for light industrial uses.

The project would consist of the subdivision of a 5.75-acre property into 52 residential and five open space lots that includes a park, associated streets, retaining walls, and storm drains in the City of Lake Forest, Orange County, California. The Encanto project would be a gated residential community consisting of 52 single-family detached homes.

Perimeter walls facing westerly, northerly toward Alton Parkway and easterly toward Commercentre Drive will be 5-foot combination block and glass. Along the southerly boundary adjacent to the existing light industrial use, the perimeter wall will be a solid block 8-foot tall wall to provide privacy and buffer noise. Enhanced landscaping is proposed along the southerly slope and wall for screening. Retaining walls vary in height throughout the site, but are 4-feet or lower along project boundaries facing public streets.

NOISE SETTING

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most commonly associated with sound, “dB” is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called “A-weighting,” written as dBA. Any further reference in this discussion to decibels written as “dBA” should be understood to be A-weighted.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called Leq), or alternately, as a statistical description of the sound pressure level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to quiet time noise levels in a 24-hour noise descriptor called the Ldn (day-night) or the Community Noise Equivalent Level (CNEL). The CNEL metric has gradually replaced the Ldn factor, but the two descriptors are essentially identical with an approximate 1 dB difference.

CNEL-based standards are generally applied to transportation-related sources because local jurisdictions are pre-empted from exercising direct noise control over vehicles on public streets, aircraft, trains, etc. The City of Lake Forest therefore regulates the traffic noise exposure of the receiving property through land use controls.

Noise/land use compatibility standards for various classes of land uses are expressed in the Safety and Noise Element of the General Plan to insure that noise exposure is considered in any development decisions. The City of Lake Forest has guidelines for noise exposure standards which are shown in Table 1. For residential uses such as the Encanto Residential project, the City recommends an exterior noise exposure of 65 dBA CNEL and interior noise exposure of 45 dBA CNEL.

For “stationary” noise sources such as mechanical equipment (pool pumps, air conditioners, etc.) the City does have legal authority to establish noise performance standards designed to not adversely impact adjoining residential uses. These standards are articulated in the jurisdictional Municipal Code and are provided in the next section of this report. These standards recognize the varying noise sensitivity of both transmitting and receiving land uses. The property line noise performance standards are structured according to land use and time of day and are shown in Table 2.

Table 1

City of Lake Forest Interior and Exterior Noise Standards
(General Plan Safety and Noise Element)

Land Use	Noise Standards[1]	
	Interior[2, 3]	Exterior
Residential - Single-family, multi-family, duplex, mobile home	CNEL 45 dB	CNEL 65 dB[4]
Residential - Transient lodging hotels, motels, nursing homes, hospitals	CNEL 45 dB	CNEL 65 dB[4]
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting halls, etc.	Leq(12) 45 dB(A) [(6)2]	—
Schools	Leq(12) 45 dB(A)	CNEL 65dB[(5)]
General offices, reception, clerical, etc.	Leq(12) 50 dB(A)	—
Bank lobby, retail store, restaurant, typing pool, etc.	Leq(12) 55 dB(A)	—
Manufacturing, kitchen, warehousing, etc.	Leq(12) 65dB(A)	—
Parks, playgrounds	—	CNEL 65 dB[(5)]
Golf courses, outdoor spectator sports, amusement parks	—	CNEL 70 dB[(5)]

Notes:

1 CNEL - Community Noise Equivalent Level
Leq(12) - The A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).

2 Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.

3 Indoor environment excluding bathrooms, toilets, closets, and corridors.

4 Outdoor environment limited to rear yard of single-family homes, multi-family patios and balconies (with a depth of 6' or more) and common recreation areas.

5 Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.

6 Religious institutions (Churches, temples, and other places of worship) of a small size (occupancy of 100 persons or less) may occupy existing buildings within areas of exterior noise levels ranging from 65 to 75 dB CNEL without providing additional noise insulation for the building.

Source: City of Lake Forest General Plan, July 11, 1995.

CITY OF LAKE FOREST NOISE STANDARDS

City of Lake Forest Municipal Code Chapter 11.16 (Noise Ordinance) is designed to protect people from non-transportation (stationary) noise. The Noise Ordinance for the City of Lake Forest sets limits on the level and the duration of time a stationary noise source may impact a residential use.

Ordinance limits generally apply to "stationary" sources such as mechanical equipment, or vehicles operating on private property. The City's noise ordinance limits are stated in terms of a 30-minute limit with allowable deviations from this 50th percentile standard. The louder the noise, the shorter the time that it is allowed to occur. Table 2 lists the noise levels and the maximum cumulative period of time that noise level may occur during a 1-hour period.

The Noise Ordinance identifies specific activities that are exempt from the provisions of the noise restrictions. Exempted activities include, but are not limited to, construction, repair, remodeling and grading, provided such activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

The standards in Table 2 apply at any residential property line. This analysis applies the noise standards in Table 2 in considering the potential noise impacts of the proposed project on the existing environment, as well as the impact of the adjacent light industrial/business park uses on the proposed Encanto Residential project.

Table 2 Lake Forest Noise Ordinance Standards

Noise Level[a]		Maximum Cumulative Duration
DAYTIME ORDINANCE (7 a.m. - 10 p.m.)		
Exterior Noise	**Interior Noise**	
75 dBA	65 dBA	Not to be exceeded at any time
70 dBA	60 dBA	1 minute
65 dBA	55 dBA	5 minutes
60 dBA	—	15 minutes
55 dBA	—	30 minutes
NIGHTTIME ORDINANCE (10 p.m. - 7 a.m.)		
70 dBA	55 dBA	Not to be exceeded at any time
65 dBA	50 dBA	1 minute
60 dBA	45 dBA	5 minutes
55 dBA	—	15 minutes
50 dBA	—	30 minutes

Source: City of Lake Forest Municipal Code, Section 11.16, Noise Control.

a. In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the noise levels shall be reduced by 5 dBA.

BASELINE NOISE LEVELS

Noise measurements were made in order to document existing baseline levels in the area. These help to serve as a basis to determine noise exposure from ambient noise activities upon the proposed project. Long term (24-hour) noise measurements were conducted July 17-18, 2014, at two on-site locations. See Figure 1, *Noise Monitoring Locations*.

Long-term noise measurement locations were selected to document the daily trend in noise levels generated by Alton Parkway traffic along the northern project perimeter and existing light industrial/business park uses along the southern project boundary. The adjacent parcel, south of the proposed project site, was a high technology manufacturing and distribution facility (Agilent Technologies) before its recent closure. Agilent Technologies was still in operation when noise measurements were conducted. While the future use of the adjacent industrial/business park site and possible associated noise levels are speculative, it is reasonably foreseeable that the site would be occupied by a similar use. Therefore, the noise levels measured while Agilent Technologies was in operation serve as the existing baseline because they are a reasonable prototype for the type of light industrial noise that might occur when the site is reoccupied, such as noise from vehicle and truck movement, loading/unloading activities, and manufacturing operations. Measurement locations are shown in Figure 1 and the monitoring results are summarized in Table 3. Therefore, an analysis was performed using noise data obtained from short term noise monitoring of the former industrial use.

As shown in Figure 1, meter 1 was placed at the top of slope on the north side of the project to measure the noise levels at future residential lots closest to Alton Parkway. Meter 2 was placed at the south side of the project to measure noise levels at future residential lots closest to existing mechanical equipment at the adjacent light industrial use, Agilent Technologies. Measurements were made with TES1350 digital sound level meters coupled with Onset Industries 32K digital data loggers. Calibration is internal electronic for these meters.

The noise meters yielded noise levels of almost 58 dB CNEL along the northern edge at the proposed lots nearest to Alton Parkway (noise meter 1) and 64 dB CNEL at the southern site perimeter (noise meter 2). At the time of noise monitoring, construction activity on Alton Parkway diverted a portion of normal existing traffic such that the measured levels at noise meter 1 are not representative of existing conditions. Because construction activity slowed the Alton Parkway traffic, it is likely that traffic noise levels under normal operating conditions would be higher. As a result, this analysis of residential traffic noise exposure is based upon future build-out volumes and not upon existing conditions. Traffic noise exposures for homes nearest Alton Parkway are modeled based upon vehicular volumes in the project's traffic report, as forecast using the Lake Forest Traffic Analysis Model (LFTAM) for the build out year of 2030 to represent a worst case and most conservative traffic noise condition.

Measured noise levels at meter 2 at the southern perimeter derives primarily from mechanical equipment such as compressors, condensers, fans, etc., used by the former tenant, Agilent Technologies, located at 25200 Commercentre Drive. The Agilent Technologies equipment operated 24-hours per day, with more intense operation by day and less at night. Although Agilent Technologies is no longer a tenant and the site is vacant, it is reasonably foreseeable that another

noise-generating industrial use that operates 24-hours could occupy the site. Therefore, the measured noise levels at meter 2 are used as the baseline and not the existing vacant condition.

Figure 1

Noise Monitor Locations

Meter Location

Meter 1: Near Alton Parkway boundary

Meter 2: Near Southern project boundary

Table 3A Noise Measurements

Existing Hourly Leq's (dBA)

Time Interval	Leqs Meter 1	Leqs Meter 2
16:00-17:00	52	61
17:00-18:00	52	62
18:00-19:00	50	58
19:00-20:00	49	59
20:00-21:00	49	57
21:00-22:00	49	56
22:00-23:00	50	54
23:00-24:00	48	51
0:00-1:00	49	50
1:00-2:00	49	50
2:00-3:00	49	49
3:00-4:00	50	50
4:00-5:00	51	56
5:00:6:00	53	59
6:00-7:00	54	63
7:00-8:00	53	63
8:00-9:00	53	65
9:00-10:00	53	64
10:00-11:00	53	61
11:00-12:00	52	61
12:00-13:00	53	62
13:00-14:00	52	61
14:00-15:00	53	62
15:00-16:00	52	60

Resultant CNEL (dBA)

Measurement Parameter	Meter 1	Meter 2
24-Hour CNEL	58	64

NOISE IMPACTS

STANDARDS OF SIGNIFICANCE

Traffic Noise. According to the City of Lake Forest CEQA Significance Threshold Guide (2009), a proposed project would normally have a significant off-site traffic noise impact if both of the following criteria are met:

- Long-term project traffic will cause a noise level increase of 3 dBA or more on a roadway segment adjacent to a noise-sensitive land use in the project vicinity. Noise-sensitive land uses include the following: residential (single-family, multifamily, duplex, mobile home); transient lodging (e.g., hotels, motels); nursing homes; hospitals; parks, playgrounds, and recreation areas; and schools.
- The resulting "future with project" noise level exceeds the noise standard for sensitive land uses as identified in the City of Lake Forest General Plan (refer to Table 1 above).

Stationary Noise. The Noise Ordinance for the City of Lake Forest set limits on the level and duration of time a stationary noise source may impact a residential area. The determination that a project has the potential to exceed the City's established noise limits is typically based on a noise technical report prepared by a qualified acoustical consultant. The project would normally have a significant noise impact if it would:

- Exceed the stationary-source noise criteria for the City of Lake Forest as described in the City of Lake Forest Noise Ordinance.

CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. There are existing residences over 450 feet to the east from the proposed project, across Commercentre Drive. There are graded, but not yet built, residential lots approximately 200 feet to the east across Commercentre Drive which are assumed to be occupied for this analysis. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance, the effect on longer term (hourly or daily) ambient noise levels would be small and below the City's Noise Ordinance.

The phase with the highest construction trip generation would be the construction phase, estimated to last 300 working days as shown in Table 4A. During this phase, there would be 72 passenger car equivalent (PCE) construction trips generated on a daily basis with 24 trips occurring during the a.m. peak hour and 24 trips occurring during the p.m. peak hour.

The trip generation was based on an estimate of 20 workers on site each day, as well as 8 round-trips per day for deliveries. Construction workers would arrive and depart during the peak hours, while delivery trucks would arrive and depart throughout the day. It was estimated that 10 percent

of delivery trips would occur during each peak hour. The daily trip generation consists of peak hour trips, as well as trips that occur throughout the day.

Therefore, the estimate of 72 daily trips is made up of 20 workers arriving in the morning and departing during the evening (40 trips total), plus 16 truck trips throughout the day (8 round trips, which is equivalent to 16 trips with a PCE factor of 2.0, for a total of 32 daily truck trips). This would not provide a noticeable increase to the traffic report estimate of 7,000 vehicles per day on Commercentre Drive and 20,000 vehicles per day on Alton Parkway in the existing time frame.

Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impacts would be associated with excavation, grading, and erecting of buildings onsite during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today, but would no longer occur once construction of the project is completed. Although construction noise from the proposed project may be audible at times when these residences are built, traffic noise along Commercentre Drive will help mask much of the noise.

Temporary construction noise impacts will vary markedly because the noise strength of construction equipment ranges widely as a function of the equipment used and its activity level. Short-term construction noise impacts tend to occur in discrete phases dominated initially by large earth-moving sources such as dozers, excavators, graders, loaders and backhoes. As shown on Table 4A, site preparation activities are expected to last 10 days and grading activates are expected to last 30 days. Construction noise is then caused by foundation and paving construction, and finally for finish construction, which is anticipated to last another 320 days.

The FHWA (Federal Highway Administration) has published a national database of construction equipment reference noise levels. The FHWA also provides an acoustical usage factor to estimate the fraction of the time each piece of construction equipment is operating at full power (i.e. its loudest condition) during construction operation. The usage factor is a key input variance that is used to calculate the average Leq noise levels using the Lmax noise levels measured at a distance of 50 feet.

Using this data, the project construction noise levels at a reference noise level of 50 feet are provided in Table 3B. Equipment identified for use in the CalEEMod model were examined.

Table 3B
Construction Noise Impact

Phase Name	Equipment	Usage Factor	Hours of Operation	Reference Noise Level @ 50 feet (dB)	Cumulative Level @ 50 feet (dB)	Modeled Noise Level @ Closest Receptor (dB)*
Grading	Excavator	38%	3.0	81	77	55
	Dozer	40%	3.2	82	77	55
	Grader	41%	3.3	85	81	59
	Scraper	48%	3.8	84	81	59
	Loader/Backhoe	37%	3.0	78	74	52
Construction	Crane	29%	2.3	81	73	51
	Forklift	20%	1.6	75	69	47
	Loader/Backhoe	37%	3.0	80	76	54
	Generator Set	41%	3.3	73	69	47
	Welder	46%	3.7	74	71	49
Paving	Paver	42%	3.4	77	74	52
	Roller	38%	3.0	80	73	51
	Paving Equipment	36%	2.9	77	73	51

*200 feet across Commerce Center Drive
Source FHWA Construction Noise Handbook

There are no existing residences immediately adjacent to the project site. The closest residential uses would be located approximately 200 feet to the east, across Commercentre Drive[2]. There is a 41 foot elevation differential and a 6-foot wall between the project site and the residential uses across Commercentre Drive. As seen in the noise model output, with the grade separation and 6-foot noise wall even the loudest equipment (scrapers and graders) with a 50 feet reference noise level of 81 dB Leq would decay to less than 59 dB Leq at the nearest residential uses when operating immediately along the site's eastern edge, as scrappers and graders pass by intermittently for a few minutes at a time. Scrapers and graders would only be used during site preparation and grading operations, which are expected to last 40 days. Only a small fraction of site preparation and grading activities would occur immediately along the eastern edge. The majority of construction activities would occur interior to the site and would generate noise of 55 dB or less at the nearest residential uses.

According to the City's Noise Ordinance, construction noise is exempt from noise control standards if it takes place during specified hours. Permissible hours of construction are 7 a.m. to 8 p.m. on weekdays and on Saturdays. Construction is not permitted on any national holiday or on any Sunday. Therefore, compliance with these municipal code provisions will ensure that construction noise does not disturb residents during the times they are most likely to be home, and during hours when ambient noise levels are likely to be lower (i.e., at night). As shown in Table 3B, short-term construction noise would not exceed the City's daytime exterior noise standards outlined in the Noise Ordinance, with the exception of the 55 dB noise standard if site preparation and

[2] The graded but not yet built residential lots are assumed to be occupied for this analysis. However, the area is currently used for construction staging for Baker Ranch and the likelihood that the homes will be built, sold, and occupied before site preparation and grading operations occur on the Encanto project site is uncertain.

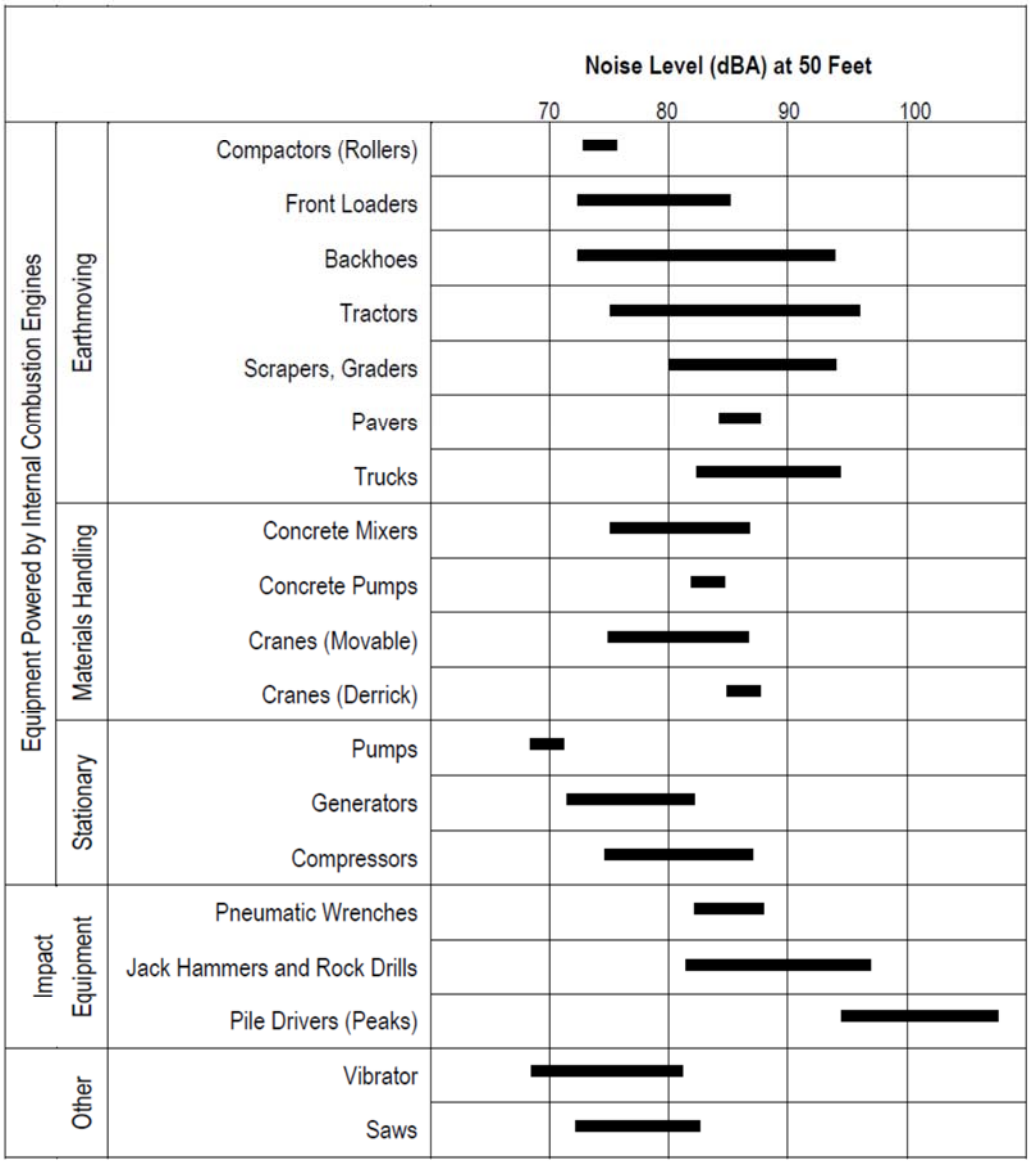
grading activities would occur immediately along the eastern edge of the project site for a cumulative period of more than thirty minutes in any hour (see Table 2). Mitigation measure 1 would ensure that the loudest equipment capable exceeding the 55 dB noise standard at the nearest residential use (scrapers and graders) would operate for less than 30 minutes in any hour. With incorporation of mitigation measure 1, the project would not violate established standards and construction noise impacts would be less than significant.

Mitigation Measure 1:

During site preparation and grading activities, graders and scrapers shall only be permitted to operate for a cumulative period of less than 30 minutes in any hour, when operating within 200 feet of the nearest residences to the east, if those residences are built and occupied.

Figure 2

Typical Construction Equipment Noise Generation Levels



Source: EPA PB 206717, Environmental Protection Agency, December 31, 1971, "Noise from Construction Equipment and Operations."

CONSTRUCTION ACTIVITY VIBRATION

Typical background vibration levels in residential areas are usually 50 VdB or lower, below the threshold of human perception. Perceptible vibration levels inside residences are typically attributed to the operation of heating and air conditioning systems, door slams or street traffic. Construction activities and street traffic are some of the most common external sources of vibration that can be perceptible inside residences.

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the "soft" sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (Federal Transit Association (FTA) 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels. The range of vibration decibels (VdB) is as follows:

65 VdB	-	threshold of human perception
72 VdB	-	annoyance due to frequent events
80 VdB	-	annoyance due to infrequent events
94-98 VdB	-	minor cosmetic damage

The proposed construction equipment fleet and schedule for the project is indicated in Table 4A.

Table 4A
Construction Activity Equipment Fleet

Phase Name and Duration	**Equipment**
Site Prep (10 day)	3 Dozers
	4 Loader/Backhoes
Grading (30 days)	1 Dozer
	2 Excavators
	1 Grader
	2 Scrapers
	2 Loader/Backhoes
Construction (300 days)	1 Crane

	3 Forklifts
	1 Generator Set
	1 Welder
	3 Loader/Backhoes
Paving (20 days)	2 Pavers
	2 Paving Equipment
	2 Rollers
Architectural Coating	1 Air Compressor

To determine potential impacts of the project's construction activities, estimates of vibration levels induced by the construction equipment at various distances are presented in Table 4.

Table 4B
Approximate Vibration Levels Induced by Construction Equipment

	Approximate Vibration Levels (VdB)*			
Equipment	**25 feet**	**50 feet**	**100 feet**	**200 feet**
Large Bulldozer	87	81	75	69
Loaded Truck	86	80	74	68
Jackhammer	79	73	67	61
Small Bulldozer	58	52	46	40

* (FTA Transit Noise & Vibration Assessment, Chapter 12, Construction, 2006)

The construction equipment that is anticipated to create the maximum potential vibration is a large bulldozer. The stated vibration source level in the FTA Handbook for a large bulldozer is 81 VdB at 50 feet from the source. At 200 feet from the source, the vibration level dissipates to 69 VdB, which is above the threshold of human perception, but below the threshold of annoyance. The nearest residential receptor is approximately 200 feet east of the project boundary, across Commercentre Drive. Residents across Commercentre Drive would experience perceptible vibration impacts only when a large bulldozer is used alongside the eastern project boundary abutting Commercentre Drive; this would occur during a fraction of the time that site preparation activities (10 days) and grading activities (30 days) are happening because the majority of construction activities would be on the interior of the site. Vibration from construction activities more than 200-feet away from the residential receptors would be below the threshold of human perception. Therefore, vibration impacts from construction activity would be less-than-significant.

PROJECT-RELATED VEHICULAR NOISE IMPACTS

Long-term noise impacts from the proposed project are primarily from mobile source emissions on project area roadways. Noise impacts were addressed using the California specific vehicle noise curves (CALVENO) in the federal roadway noise model (the FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108). The model calculates the Leq noise level for a particular reference set of input conditions, and then makes a series of adjustments for site-specific traffic volumes, distances, roadway speeds, or noise barriers. The typical Orange County day-night travel percentages and auto-truck vehicle mixes is then applied to convert one-hour Leq levels to a weighted 24-hour CNEL.

Table 5A summarizes the calculated 24-hour CNEL level at 50 feet from the roadway centerline along project adjacent roadway segments. Two timeframes were evaluated; existing conditions with and without project and build-out year 2030 with and without project. The noise analysis utilized data from the project's traffic analysis, prepared by Transpo Group. Traffic speeds along the area roadways were obtained from the traffic analysis.

As shown in Table 5B, the project itself will not cause any roadway segment to exceed the +3 dBA CNEL threshold. The largest project related noise increases from traffic would occur on Commercentre Drive between Alton and Bake Parkways. This noise increase from traffic will not exceed +0.2 dB CNEL. The sensitive uses closest to this roadway segment are approximately 150 feet from the roadway centerline.

CUMULATIVE IMPACTS

Cumulative impacts are those resulting from all past, present and future projects. Every development has a unique traffic pattern. Future development traffic patterns have not yet been studied as a basis for determining cumulative volumes. General plan build-out volumes are therefore the assumed baseline as a basis for conducting a cumulative impact analysis. Table 5A shows substantial cumulative noise impacts along Alton Parkway and Artic Ocean Drive. The project contribution to these impacts is negligible.

Past, present, and future projects have been and will continue to be required to comply with the City Noise Ordinance and the City's General Plan Interior and Exterior Noise Standards. Therefore, cumulative noise impacts from past, present, and future projects would be less than significant. Thus, because the project would not result in any significant noise impacts and cumulative noise impacts are less than significant, the project's incremental contribution would not be cumulatively considerable.

Table 5A
Traffic Noise Impact Analysis
(CNEL in dBA at 50 feet from Centerline)

Roadway Segment		***Existing w/o Project***	***Existing + Project***	***2030 w/o Project***	***2030 + Project***
Alton Pkwy/	W of Commercentre Dr.	73.2	73.2	77.1	77.1
Alton Pkwy/	E of Commercentre	71.7	71.8	76.6	76.7
Commercentre Dr/	Alton-Site Access	66.3	66.4	68.1	68.1
Commercentre Dr/	Site Access- Arctic	66.3	66.5	68.0	68.0
Commercentre Dr/	Artic-Bake	66.4	66.5	67.7	67.8
Commercentre Dr/	S of Bake	67.6	67.6	69.0	69.0
Bake Pkwy/	W of Commercentre	74.7	74.7	75.5	75.5
Bake Pkwy/	E of Commercentre	74.1	74.1	74.7	74.7
Arctic Ocean Dr/	W of Commercentre	59.3	59.3	65.2	65.2
Arctic Ocean Dr/	E of Commercentre	57.4	57.4	62.3	62.3

Table 5B
Project-Related Noise Impact
(CNEL in dBA at 50 feet from Centerline)

Roadway Segment		***Project Only Existing***	***Project Only 2030***	***Cumulative Impacts (2030 W Project – Existing)***
Alton Pkwy/	W of Commercentre Dr.	0.0	0.0	3.9
Alton Pkwy/	E of Commercentre	0.0	0.1	5.0
Commercentre Dr/	Alton-Site Access	0.1	0.0	1.7
Commercentre Dr/	Site Access- Arctic	0.2	0.0	1.7
Commercentre Dr/	Artic-Bake	0.1	0.0	1.4
Commercentre Dr/	S of Bake	0.0	0.0	1.4
Bake Pkwy/	W of Commercentre	0.0	0.0	0.8
Bake Pkwy/	E of Commercentre	0.0	0.0	0.7
Arctic Ocean Dr/	W of Commercentre	0.0	0.0	5.9
Arctic Ocean Dr/	E of Commercentre	0.0	0.0	4.9

ON-SITE NOISE EXPOSURE

Two potential noise sources acting upon the project are evaluated in this report. At the north end of the site, noise from Alton Parkway could exceed the City's recommended exterior recreational compatibility threshold of 65 dB CNEL as a result of traffic. At the southern boundary, noise from the adjacent light industrial use could exceed noise standards for residences along the shared property line.

Exterior Noise

Alton Adjacent:
As shown in Table 5(a), roadway noise from Alton Parkway could be as high as 77 dB CNEL at 50 feet from roadway centerline by 2030. The project includes 5-foot high plexiglass noise/privacy walls along the rear yards of all the residential lots, including those along Alton Parkway, as shown on Figure 3. The walls were evaluated to determine if their 5-foot height effectively reduces noise levels for recreational users in rear yards nearest the roadway to meet the 65 dB CNEL compatibility threshold.

As shown on Figure 4, *Alton Parkway Separation Distances*, Lots 7-15 are sited nearest Alton Parkway. At the eastern end of the site, with a separation distance of 147 feet from the roadway centerline, Lot 7 is closest to Alton Parkway. The distance to roadway centerline increases from east to west so that at Lot 15 there is 203 feet separation distance between the property line and the roadway centerline. The project site is situated at a higher elevation than the Alton Parkway grade level, which will assist in noise attenuation. As shown on the project's grading plan, elevation differentials vary from +24 feet at Lot 7 to +43 feet at Lot 15.

For purposes of noise modeling, a recreational receiver was analyzed at 10 feet within the property line of the residential lots identified in Table 6 with a receiver's ear level at 5 feet high to represent a standing adult. Table 6 provides the distances and elevation differentials (i.e., difference between the building pad elevations and the Alton Parkway roadway elevations) for Lots 7-10 and Lot 15, which were modeled because they represent the worst case scenario being closest to the roadway. Also provided is the resultant noise level with a 5-foot high noise wall. For the purposes of this analysis, a noise wall is defined as a solid barrier with a minimum area density of 3.5 lbs/square foot (either a block wall, continuous glass, or continuous plexiglass shield) assumed to be situated at the rear property line of each lot. Noise modeling output files are provided in the Appendix A.

Table 6
Exterior Recreational Use at Rear Yards
Noise Modeling Input and Results for Lots Backing Up to Alton Parkway

Lot	Relative to Alton Parkway Centerline			Resultant Noise Level with 5'Wall (dB CNEL)
	Distance to Wall (feet)	Distance to Receiver (feet)	Elevation Change (feet)	
7	147	157	+24	65
8	152	162	+26	65
9	153	163	+29	65
10	156	166	+32	65
15	203	213	+43	64

Therefore, the 5-foot noise/privacy walls provided as a project design feature (PDF) at the rear property line of Lots 7-15 would provide the needed mitigation to ensure that recreational users in yards with a direct view of Alton Parkway would not experience noise levels exceeding 65 dB CNEL, even at area build-out in 2030. Although not all the lots were modeled, the five that were selected are a representative sample, with Lots 7-10 representing the worst case noise loading (lots closest to Alton Parkway) and Lot 15 representative of one of the lots afforded a greater setback. The proposed project's solid continuous noise wall, shown in Figure 3, would provide the necessary shielding for all northern project lots (7-15).

Commercentre Drive

As seen in Table 5A, future noise levels along Commercentre Drive could be as high as 68 dB CNEL at 48 feet from roadway centerline. The closest lot along Commercentre Drive has a 48 foot setback from roadway centerline. The 5-foot noise wall along the residential yards facing Commercentre would reduce noise by at least 5 dBA and reduce noise to within the recommended guideline for any lots with a direct line-of-sight to the roadway (Lots 1-7).

Interior Noise

Interior noise was also examined. Along Alton Parkway, the closest residential building façade is setback 15 feet from the rear residential property line and the farthest is setback 23 feet. For modeling purposes, it was conservatively assumed that all homes would be setback 15 feet from the rear property line. Noise loadings (i.e., noise acting upon a structure) for Lot 7 was selected for modeling because this lot is both closest to the roadway and has the smallest elevation

differential from the roadway and is therefore considered the most impacted lot for homes near Alton Parkway.

As shown in Table 7, the project's proposed 5-foot noise wall (defined as solid barrier with a minimum area density of 3.5 lbs/square foot; either a block wall or continuous glass or plexiglass shield), would reduce the Alton Parkway traffic noise loading at the first story Lot 7 façade to 64 dB CNEL. However, the noise loading for second story use, assumed to be 15 feet from ground level, is calculated to be as high as 72 dB CNEL because the 5-foot noise wall only provides shielding for first story receptors. Therefore, a minimum exterior to interior noise attenuation of 27 dB CNEL is needed to ensure the recommended interior noise level of 45 dB CNEL is met.

Table 7
Noise Loading at Façade of Lot 7
Modeling Input and Results

Lot	Relative to Alton Parkway Centerline			Exterior Noise Loading @ 1st Story (dB CNEL)	Exterior Noise Loading @ 2nd Story (dB CNEL)
	Distance to Wall at rear PL (feet)	Distance to Facade (feet)	Elevation Change (feet)		
7	147	164	+24	64.2	71.8

The proposed project would be built using wood-framed construction. For wood-framed construction with stucco and gypsum board wall assemblies, the exterior to interior noise level reduction is as follows:

Partly open windows (open less than 50%) – 12 dB

Closed single-paned windows – 20 dB

Closed dual-paned windows – 30 dB

The City's interior noise standard is with windows closed. Use of dual-paned windows is required by the California Building Code (CBC) for energy conservation in new residential construction. Interior standards will be met as long as residents with a line-of-sight to Alton Parkway have the option to close their windows. The proposed rear yard noise wall and site topography would reduce exterior noise loadings at the ground level and would therefore provide for the interior threshold to be met with an even greater margin of safety.

When window closure is a necessary condition to meet the interior standard, the building code requires provision of supplemental mechanical ventilation (typically air conditioning). Mechanical ventilation shall be provided per CBC requirements to provide a habitable environment. Indoor environment excludes bathrooms, toilets, closets, and corridors. PDF-4 ensures that heating, ventilating, and air-conditioning (HVAC) units shall be installed for all residential dwelling units. The project also includes PDF-5, which provides additional sound

attenuation by ensuring that ½ Pound Open Cell Polyurethane Spray Foam will be applied in walls and attics for all residential units.

As a condition of approval, the City of Lake Forest will require that a final acoustical analysis is be submitted prior to the issuance of certificates of occupancy for residences adjacent to any noise generating roadway adjacent to the project site to verify that adequate structural noise protection exists in perimeter residences to meet the 45 dB CNEL interior standard. The final acoustical study will be prepared to verify that Sound Transmission Class (STC) ratings on the structural components adequately meet the City's interior standard. The project is required to meet the interior noise standard of 45 dB CNEL and to provide structural components with higher STC ratings if needed. A certificate of occupancy will not be issued until the requirement is met. The City of Lake Forest condition of approval requires the following:

- Prior to the issuance of certificates of occupancy, the applicant shall prepare a final acoustical report to demonstrate that the interior noise levels in habitable rooms shall not exceed 45 dBA CNEL, as defined by Title 24, Part 2, of the California Building Code.

The applicant has incorporated the following Project Design Features (PDFs) which attenuate sound and prevent potential noise impacts:

PDF-1: Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7): Usable outdoor space such as backyards, decks, patios areas are required to be protected by stand-alone sound barriers. Applicant shall provide a minimum 5-foot high sound barrier (minimum 5 dBa) along the perimeter of backyards. The noise barriers must consist of materials with a minimum density of 3.5 pounds per square foot or combination of materials that meet this requirement. Such barrier materials include, but are not limited to, the following: ¼ in tempered glass, ¼ in laminated glass, ¼ in plexiglaass, or masonry.

PDF-2: Southern boundary (Lots 26-34): The applicant shall provide an 8-foot high masonry wall at the top of the slope along the project site's southern boundary between Lot 26 and Lot 34 to serve as a noise barrier/privacy wall between Lots 26 to 34 and the adjacent industrial uses. The noise barrier must consist of materials with a minimum density of 3.5 pounds per square foot.

With construction of a 5-foot noise wall along the rear property lines of Lots 7-17 and the rear property lines of Lots 1-7, all outdoor recreational noise exposures for all units backing up to Alton Parkway and Commercentre Drive will be 65 dBA CNEL or less which is the City of Lake Forest standard for usable outdoor space. Likewise, the project site's topography construction of an 8-foot high wall at the top of slope along the southern boundary would ensure there are no significant impacts. No mitigation is necessary.

Closure of windows in habitable rooms such as bedrooms and living rooms with a direct line-of-sight of Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7) will be necessary to meet

the City's 45 dBA CNEL interior noise standard. The following PDFs will attenuate sound and prevent potential noise impacts:

PDF-3: All rooms shall have windows with Sound Transmission Class (STC)-27 or higher.

PDF -4: Heating, ventilating, and air-conditioning (HVAC) units shall be installed for all residential dwelling units.

PDF-5: Consistent with Meritage Green Standards for new home construction, ½ Pound Open Cell Polyurethane Spray Foam will be applied in walls and attics for all residential units.

The project is anticipated to create 496 trips per day. This translates to less than 52 dB CNEL at 50 feet from centerline for an associated travel speed of 30 mph. Noise on project internal roadways would not exceed the 65 dB CNEL recommended exterior noise compatibility standard.

Figure 3

Noise Wall Locations

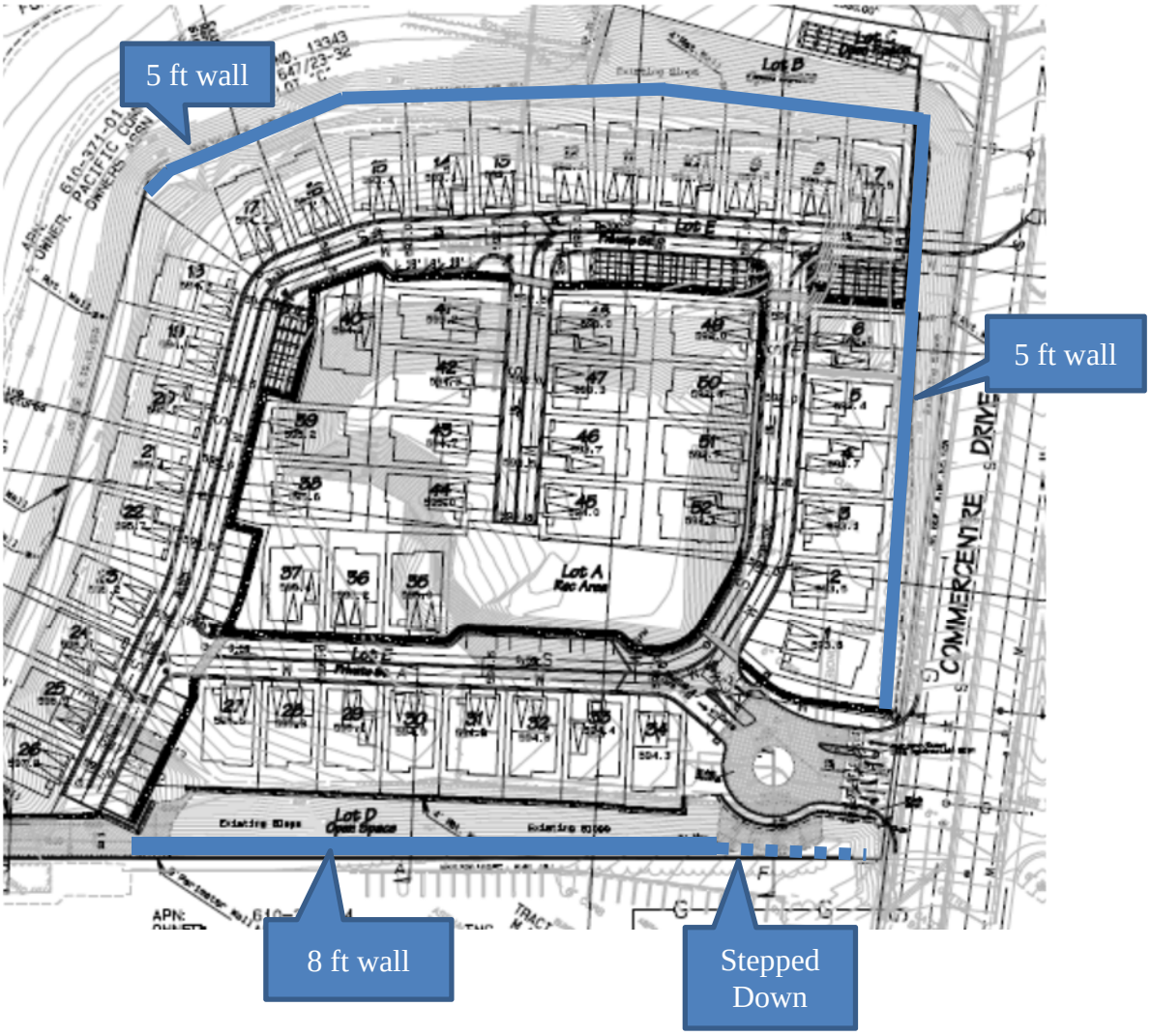
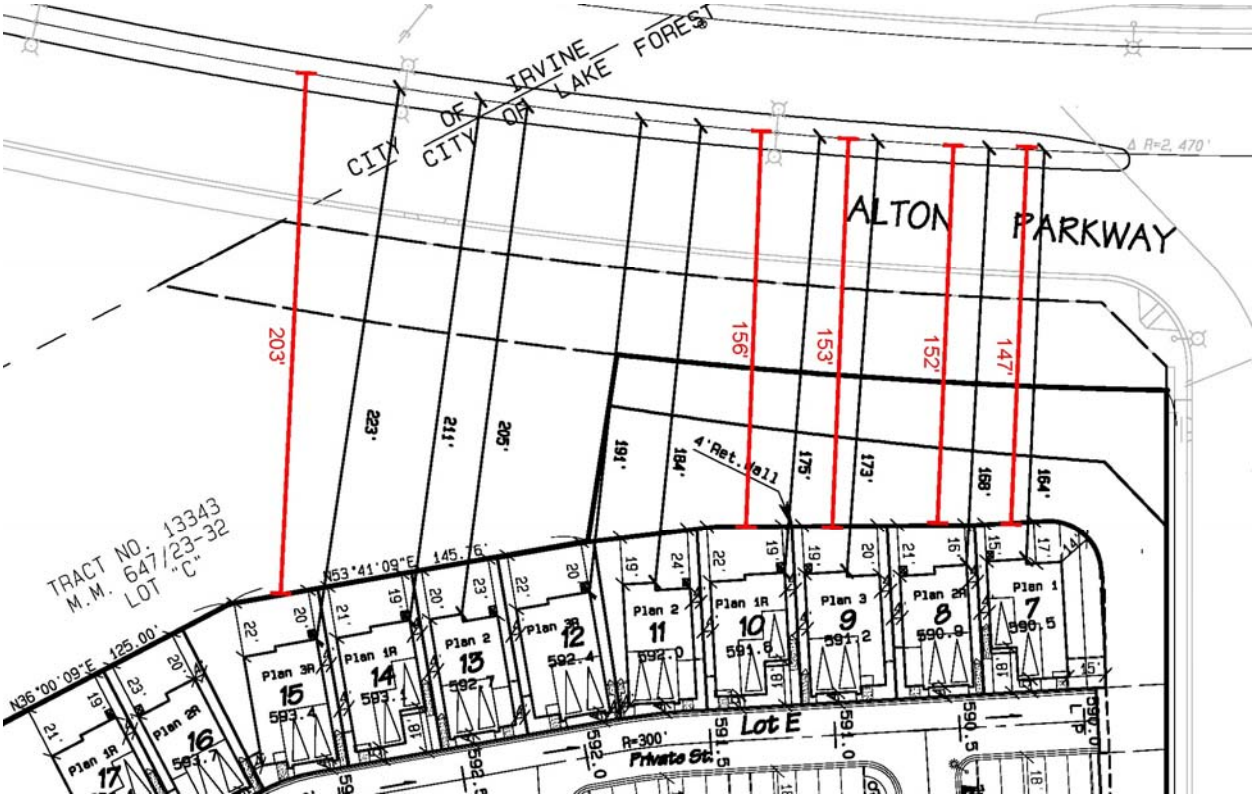


Figure 4

Alton Parkway Separation Distances



ON-SITE NOISE IMPACTS FROM ADJACENT LIGHT INDUSTRIAL USE

The adjacent parcel, south of the proposed project site, was a high technology manufacturing and distribution facility (Agilent Technologies) before its closure. Agilent Technologies was still in operation when noise measurements were conducted. While the future use of the adjacent industrial/business park site and possible associated noise levels are speculative, it is reasonably foreseeable that the site would be occupied by a similar use. Therefore, the noise levels measured while Agilent Technologies was in operation serve as the existing baseline because they are a reasonable prototype for the type of light industrial noise that might occur when the site is reoccupied, such as noise from vehicle and truck movement, loading/unloading activities, and manufacturing operations. Measurement locations are shown in Figure 1 and the monitoring results are summarized in Table 3. Therefore, an analysis was performed using noise data obtained from short term noise monitoring of the former industrial use.

To obtain a baseline noise level representative of the adjacent light industrial/business park use, noise readings were taken at the proposed 8-foot property line wall as shown in Figure 5, below. Measurements were made with a modified Larson-Davis Model 700 B digital sound level meter.

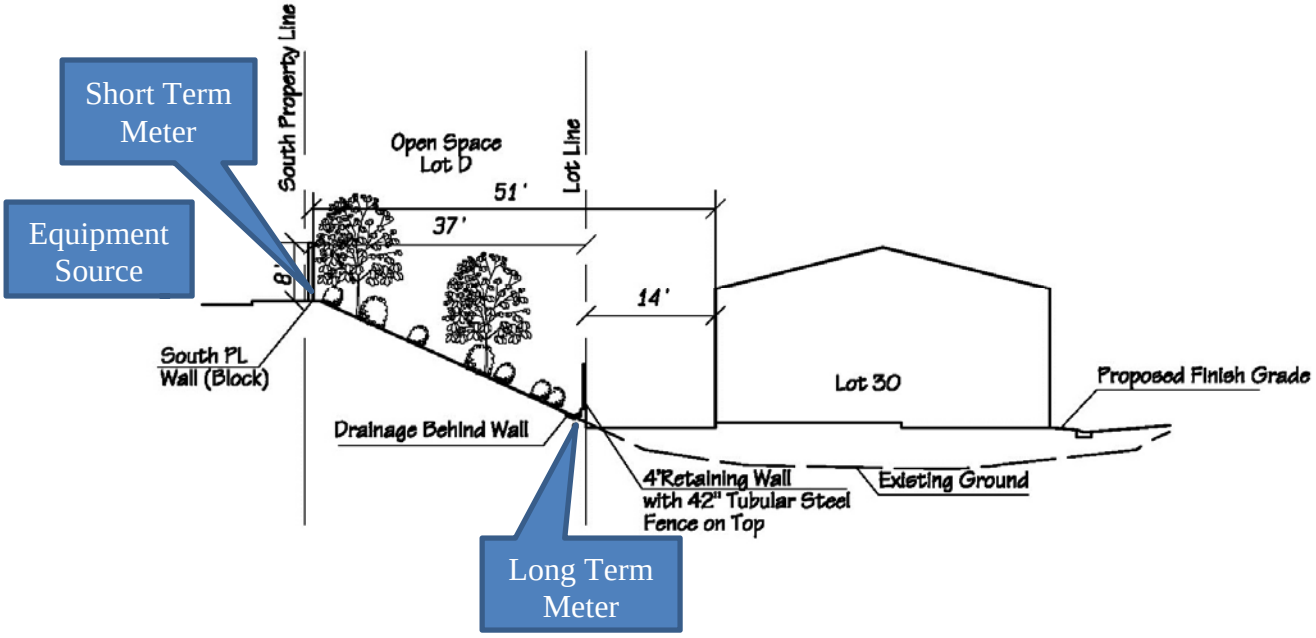
The meter was modified with the installation of a pre-amp and ½ inch microphone to convert the meter rating from Type 2 to Type 1. Calibration was performed with a General Radio 114 dB Model 1567 sound level calibration.

The noise meter was located in the north end of the Agilent Technologies parking lot and was at approximately the same elevation as the bottom of the 8-foot wall at the property line. This location was selected in order to capture of noise emanating from the parking area between the existing industrial building and the proposed residential property line, including the mechanical equipment, and typical parking area noise such as truck traffic, car doors slamming, conversations, etc. The distance from the mechanical equipment to the project's property line/proposed 8-foot wall is about 52 feet. From the 8-foot wall there is a 51-foot separation distance to residential structure (37 feet to the bottom of the slope and then an additional 14 feet to the closest residential façade).

The ambient noise survey captured noise from the Agilent Technologies parking lot and the outdoor light industrial equipment (e.g., compressors, condensers and fans), located on a pad along the northern building perimeter.

Figure 5

Southern Boundary Noise Meter Location and Separation Distance



The maximum observed daytime noise levels of 68 dB Leq (with all the outdoor equipment operational), was used in modeling to determine residual impact from the adjacent industrial use at the closest Encanto residence (Lot 30). Table 8 provides the distances and elevation changes that were used to calculate the noise impact for Lot 30.

Table 8
Noise Modeling Data for Lot 30

Distance To:	Distance From Noise	Elevation Change from Measurement Site
Project Property Line (8 ft wall)	52 ft	0 ft
Residential Lot 30 Property Line (4 ft retaining wall with 42 inch Tubular Steel Fence Top)	89 ft	-17 ft
Receiver	99 ft	-17 ft
Home	103 ft	-17 ft
Receiver Elevations From Ground Level of Lot 30		
Height of Ground Floor Receiver	5 ft	-
Height of 2nd Story Receiver	15 ft	-

Using this data, the following noise levels are modeled. The modeling output is shown in the Appendix A and is summarized below:

- Noise Level at 1st Floor Façade 44.8 dB
- Noise Level at 2nd Floor Façade 49.5 dB
- Noise Level at Rear Residential Lot Line 44.5 dB[3]

The project site's topography and construction of an 8-foot high wall at the top of slope, as shown in Figure 3, is demonstrated to reduce noise from a noisy array of mechanical equipment, to within City standards at the closest residence.

Noise along the southern project boundary as generated from Agilent Technologies, the former tenant, is held to the noise standards shown in Table 2. The daytime noise standard is 55 dB Leq (for the 30-minute criterion) and the nocturnal standard is 50 dB Leq. The entire City of Lake Forest is designated as "Noise Zone 1". It is a violation of the Municipal Code to cause noise levels exceeding 55 dB by day or 50 dB at night (50th percentile level). The future tenant could generate noise from vehicle and truck movement, loading/unloading activities, and manufacturing operations.

[3] The modeled noise level at the rear lot line is slightly lower than the noise level at the first floor façade because of the adjacent hillside; the receptor is modeled behind the rear yard wall and is closer to the hillside, resulting in slightly lower noise levels at the rear property line.

It is not known if a similarly noise-generating use will occupy the adjacent site in the future. However, there are parking spaces and loading/unloading areas at the industrial site. It is likely that in addition to manufacturing operations, the future light industrial future tenant could generate noise from vehicle and truck movement, and loading/unloading activities. Typical parking lot noises include car-door slams, car horns, car audio systems, people talking, vehicle pass-bys, engine idling, and car beeps. Noise from truck loading/unloading activities would be primarily from the back-up warning bells and truck engine noise. Each of these individual noise sources lasts for short duration and their occurrences would be infrequent. The majority of noise associated with delivery activities would be from engine idling, because trucks would back into the loading dock into an area enclosed within the industrial structure. Medium-duty trucks can generate noise levels of 68 dBA Leq at a distance of 50 feet while idling (FHWA 1998).

The nearest noise-sensitive residences to the open-air surface parking spaces would be separated by an 8-foot wall at the property line. From the 8-foot wall there is a separation distance of 37-feet to the bottom of the slope and then an additional 14 feet to the closest residential façade. The use of the 68 dB (L_{50}) reference noise level measured at the property line during Agilent's operations is very probably a worst-case condition relative to any future site uses. Parking lot activities or truck traffic in the driveway between the existing industrial building and the property line wall has a substantially reduced noise signature than the continuously loud measured equipment noise. In addition, because truck idling and parking lot noise would be brief in duration and would not generate noise levels that exceed the City's daytime noise limit (55 dBA Leq) and nocturnal standard (50 dB Leq), noise impacts from truck loading/unloading activities would be less than significant.

The applicant has incorporated the following PDF which attenuates sound and prevent potential noise impacts:

PDF-2: Southern boundary (Lots 26-34): The applicant shall provide an 8-foot high masonry wall at the top of the slope along the project site's southern boundary between Lot 26 and Lot 34 to serve as a noise barrier/privacy wall between Lots 26 to 34 and the adjacent industrial uses. The noise barrier must consist of materials with a minimum density of 3.5 pounds per square foot.

PDF-2 ensures that an 8-foot high block wall will be built by the applicant. The 8-foot wall and separation distance provide noise attenuation and will also ensure that future residential uses do not create unacceptable noise restrictions upon future industrial tenants at 25200 Commercentre Drive.

NOISE IMPACT MITIGATION

According to the City's Noise Ordinance, construction noise is exempt from noise control standards if it takes place during specified hours. Permissible hours of construction are 7 a.m. to 8 p.m. on weekdays and on Saturdays. Construction is not permitted on any national holiday or on any Sunday. Therefore, compliance with these municipal code provisions will ensure that construction noise does not disturb residents during the times they are most likely to be home, and

during hours when ambient noise levels are likely to be lower (i.e., at night). Short-term construction noise would not exceed the City's daytime exterior noise standards outlined in the City's Noise Ordinance, with the exception of the 55 dB noise standard if site preparation and grading activities would occur immediately along the eastern edge of the project site for a cumulative period of more than thirty minutes in any hour. Mitigation measure 1 would ensure that the loudest equipment capable exceeding the 55 dB noise standard at the nearest residential use (scrapers and graders) would operate for less than 30 minutes in any hour. With incorporation of mitigation measure 1, the project would not violate established standards and construction noise impacts would be less than significant.

Mitigation Measure 1:

During site preparation and grading activities, graders and scrapers shall only be permitted to operate for a cumulative period of less than 30 minutes in any hour, when operating within 200 feet of the nearest residences to the east, if those residences are built and occupied.

PROJECT DESIGN FEATURES

The applicant has incorporated the following Project Design Features (PDFs) which attenuate sound and prevent potential noise impacts:

PDF-1: Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7): Usable outdoor space such as backyards, decks, patios areas are required to be protected by stand-alone sound barriers. Applicant shall provide a minimum 5-foot high sound barrier (minimum 5 dBa) along the perimeter of backyards. The noise barriers must consist of materials with a minimum density of 3.5 pounds per square foot or combination of materials that meet this requirement. Such barrier materials include, but are not limited to, the following: ¼ in tempered glass, ¼ in laminated glass, ¼ in Plexglas, or masonry.

PDF-2: Southern boundary (Lots 26-34): The applicant shall provide an 8-foot high masonry wall at the top of the slope along the project site's southern boundary between Lot 26 and Lot 34 to serve as a noise barrier between Lots 26 to 34 and the adjacent industrial uses. The noise barrier must consist of materials with a minimum density of 3.5 pounds per square foot.

With construction of a 5-foot noise wall along the rear property lines of the Lots 7-17 and Lots 1-7, all outdoor recreational noise exposures for all units backing up to Alton Parkway and Commercentre Drive will be 65 dBA CNEL or less which is the City of Lake Forest standard for usable outdoor space. Likewise, the project site's topography and the construction of an 8-foot high wall at the top of slope along the southern boundary would ensure there are no significant impacts. No mitigation is necessary.

Closure of windows in habitable rooms such as bedrooms and living rooms with a direct line-of-sight of Alton Parkway (Lots 7-17) and Commercentre Drive (Lots 1-7) will be necessary to meet

the City's 45 dBA CNEL interior noise standard. The following PDFs will attenuate sound and prevent potential noise impacts:

PDF-3: All rooms shall have windows with Sound Transmission Class (STC)-27 or higher.

PDF -4: Heating, ventilating, and air-conditioning (HVAC) units shall be installed for all residential dwelling units.

PDF-5: Consistent with Meritage Green Standards for new home construction, ½ Pound Open Cell Polyurethane Spray Foam will be applied in walls and attics for all residential units.

As a condition of approval, prior to the issuance of certificates of occupancy, the applicant shall prepare a final acoustical report to demonstrate that the interior noise levels in habitable rooms shall not exceed 45 dBA CNEL, as defined by Title 24, Part 2, of the California Building Code.

The project noise impact study indicates a less-than-significant noise impact from project-related traffic on project vicinity receptors. Project-related traffic will not cause noise standards to be exceeded. With implementation of PDFs, all noise impacts would be less than significant. No mitigation is needed.

Appendix A – Noise Modeling Output Files

- **Noise Modeling For Alton Parkway Traffic Noise**

- **Noise Modeling Along Southern Perimeter for Industrial Use Noise**

Alton Parkway Lot 7

Target 24-hour CNEL	65
Distance to Receiver	157
Distance to Wall	147
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	27.15	25.00	19.66
Effective Wall Height	29.00	26.70	21.00

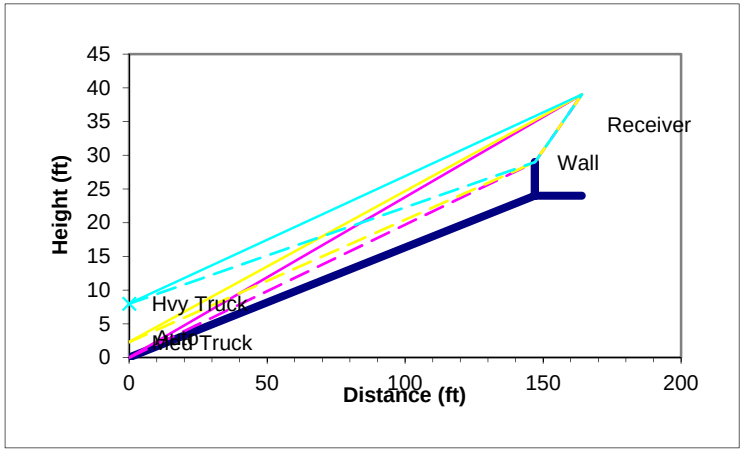
Attenuated SPL

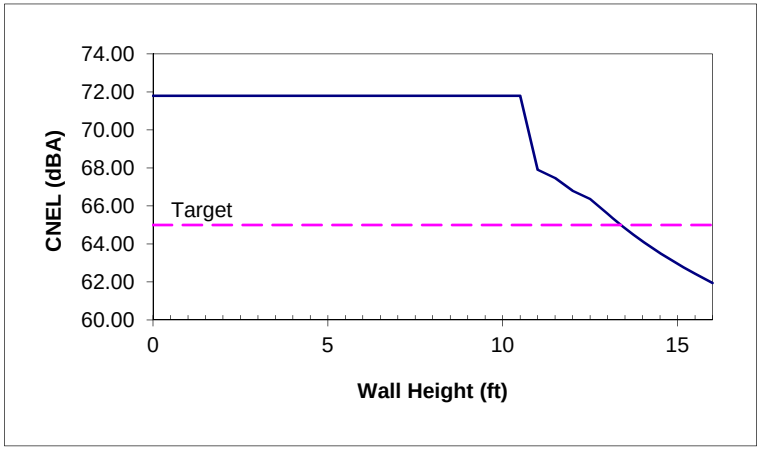
Type	Day	Evening	Night	CNEL
Auto	69.90	68.13	62.07	71.30
Medium Trucks	60.16	53.79	52.26	60.95
Heavy Trucks	60.21	51.21	52.43	60.91
	70.74	68.37	62.91	72.03

	Auto	Med Truck	Hvy Truck
Direct Distance (CD)	159.66	159.25	158.40
Indirect Distance (CI)	159.83	159.41	158.49
Difference (D)	0.177	0.151	0.094
Fresnel Adjusted	0.174	0.148	0.092
Reduction (NLR)	6.90	6.62	5.88

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	64.40	54.33	55.03	65.24





Alton Parkway - Encanto Lot 8

Target 24-hour CNEL	65
Distance to Receiver	162
Distance to Wall	152
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

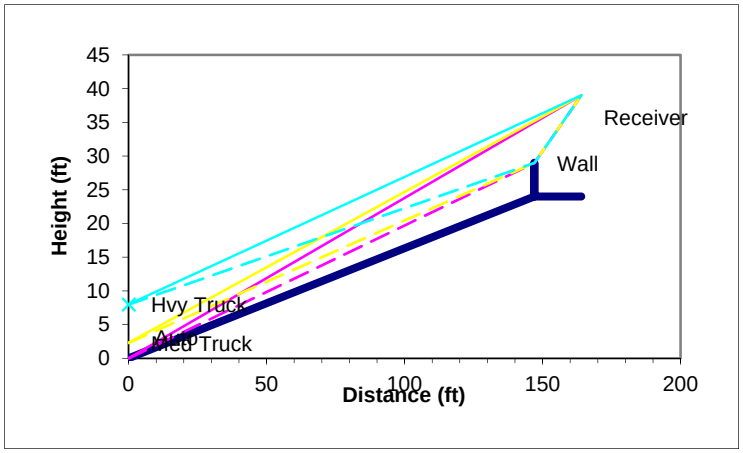
	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	27.21	25.05	19.70
Effective Wall Height	29.00	26.70	21.00
Direct Distance (CD)	164.58	164.19	163.36
Indirect Distance (CI)	164.74	164.33	163.44
Difference (D)	0.167	0.142	0.088
Fresnel Adjusted	0.163	0.139	0.086
Reduction (NLR)	6.79	6.52	5.78

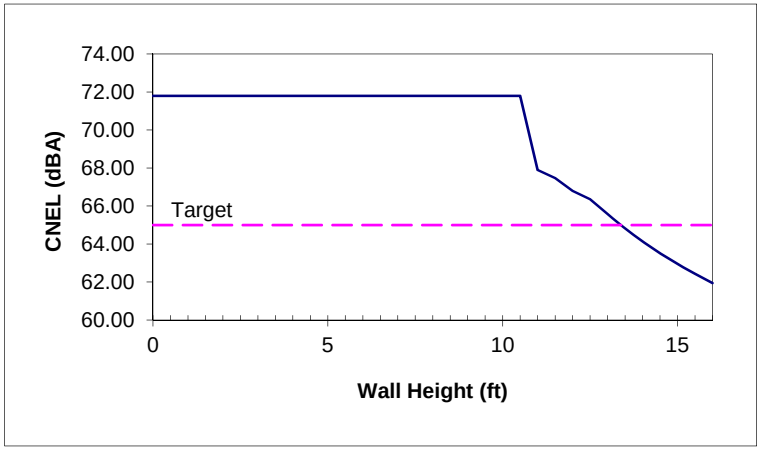
Attenuated SPL

Type	Day	Evening	Night	CNEL
Auto	69.77	68.00	61.94	71.17
Medium Trucks	60.03	53.66	52.13	60.82
Heavy Trucks	60.08	51.08	52.30	60.78
	70.61	68.24	62.78	71.90

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	64.38	54.30	55.00	65.22





Alton Parkway - Encanto Lot 9

Target 24-hour CNEL	65
Distance to Receiver	163
Distance to Wall	153
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

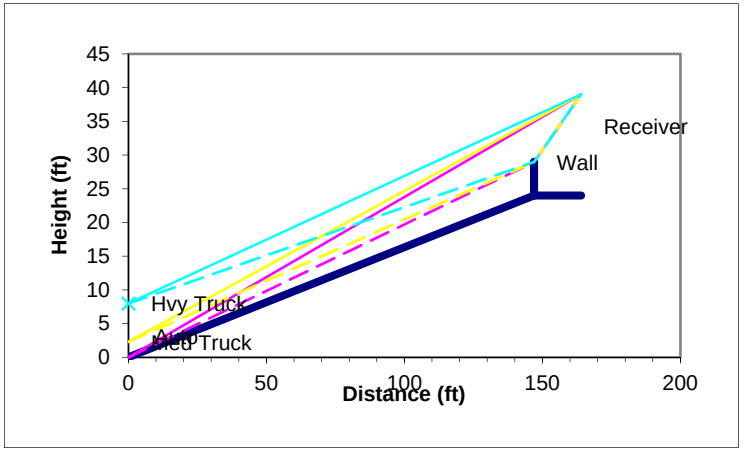
	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	27.22	25.06	19.71
Effective Wall Height	29.00	26.70	21.00
Direct Distance (CD)	165.56	165.17	164.35
Indirect Distance (CI)	165.72	165.31	164.43
Difference (D)	0.164	0.140	0.087
Fresnel Adjusted	0.161	0.137	0.085
Reduction (NLR)	6.77	6.50	5.76

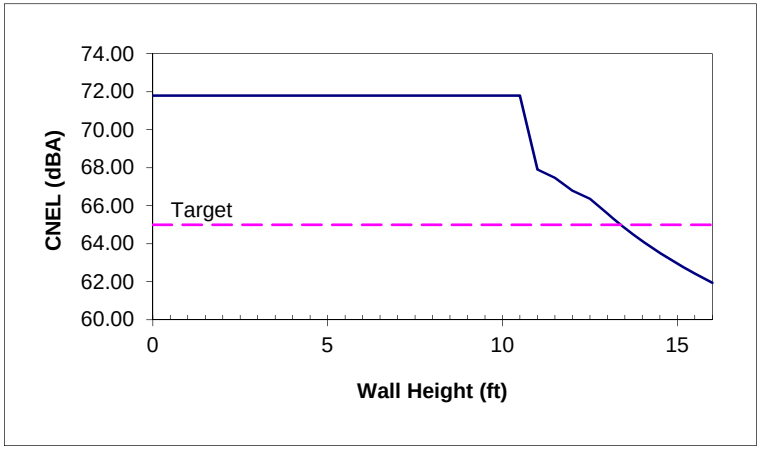
Attenuated SPL

Type	Day	Evening	Night	CNEL
Auto	69.74	67.97	61.91	71.14
Medium Trucks	60.00	53.63	52.10	60.79
Heavy Trucks	60.05	51.05	52.27	60.75
	70.58	68.21	62.75	71.87

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	64.37	54.29	54.99	65.21





Alton Parkway - Encanto Lot 10

Target 24-hour CNEL	65
Distance to Receiver	166
Distance to Wall	156
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	27.25	25.09	19.73
Effective Wall Height	29.00	26.70	21.00

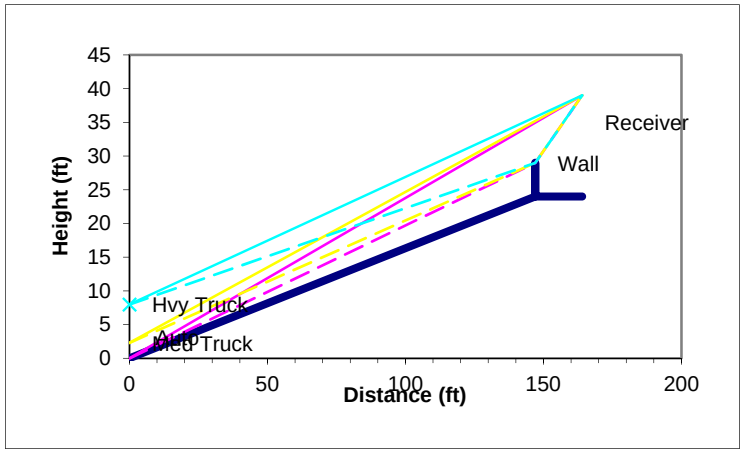
Attenuated SPL

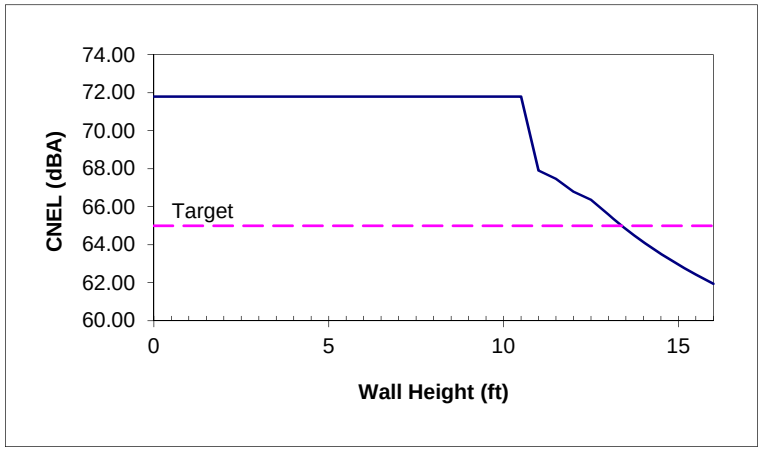
Type	Day	Evening	Night	CNEL
Auto	69.66	67.89	61.83	71.06
Medium Trucks	59.92	53.55	52.02	60.71
Heavy Trucks	59.97	50.97	52.19	60.67
	70.50	68.13	62.67	71.80

	Auto	Med Truck	Hvy Truck
Direct Distance (CD)	168.51	168.13	167.32
Indirect Distance (CI)	168.67	168.27	167.41
Difference (D)	0.159	0.135	0.084
Fresnel Adjusted	0.155	0.132	0.082
Reduction (NLR)	6.70	6.44	5.71

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	64.36	54.28	54.96	65.20





Alton Parkway - Encanto Lot 15

Target 24-hour CNEL	65
Distance to Receiver	213
Distance to Wall	203
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	27.64	25.45	20.01
Effective Wall Height	29.00	26.70	21.00

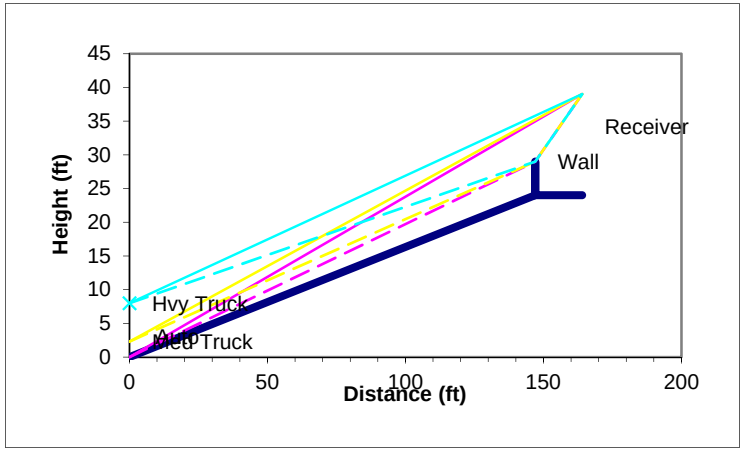
Attenuated SPL

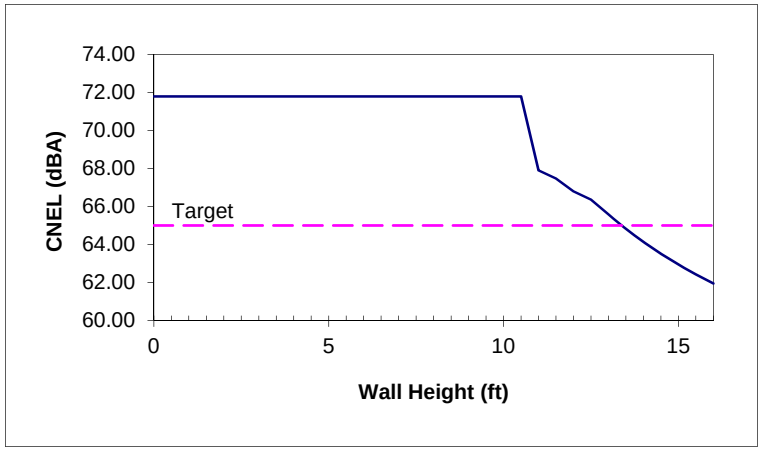
Type	Day	Evening	Night	CNEL
Auto	68.61	66.84	60.78	70.01
Medium Trucks	58.86	52.49	50.96	59.65
Heavy Trucks	58.90	49.90	51.12	59.60
	69.45	67.08	61.61	70.74

	Auto	Med Truck	Hvy Truck
Direct Distance (CD)	214.97	214.67	214.03
Indirect Distance (CI)	215.06	214.75	214.08
Difference (D)	0.096	0.081	0.051
Fresnel Adjusted	0.094	0.080	0.050
Reduction (NLR)	5.90	5.66	5.03

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	64.10	53.99	54.58	64.93





Interior Traffic Noise Lot 7 – 1st Floor

Target 24-hour CNEL	65
Distance to Receiver	164
Distance to Wall	147
Elevation Change	24
Height of Receiver	5
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	29	26.7	21
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	25.99	23.93	18.82
Effective Wall Height	29.00	26.70	21.00

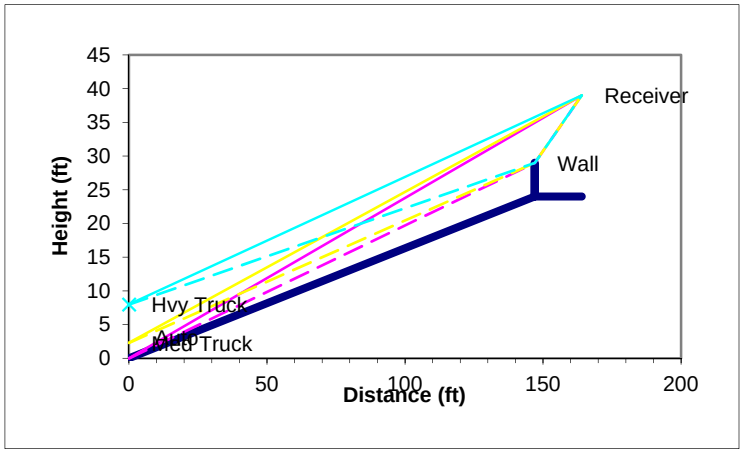
Attenuated SPL

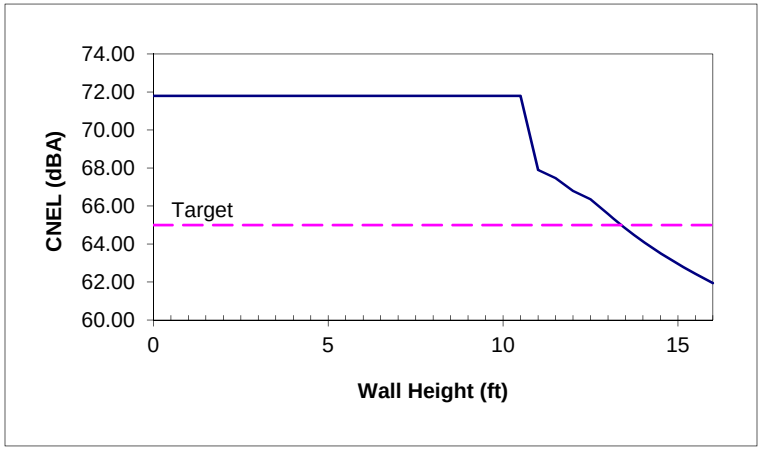
Type	Day	Evening	Night	CNEL
Auto	69.71	67.94	61.88	71.11
Medium Trucks	59.97	53.60	52.07	60.76
Heavy Trucks	60.03	51.03	52.25	60.73
	70.56	68.19	62.72	71.85

Direct Distance (CD)	166.54	166.16	165.34
Indirect Distance (CI)	166.83	166.41	165.49
Difference (D)	0.289	0.246	0.153
Fresnel Adjusted	0.283	0.241	0.150
Reduction (NLR)	7.78	7.48	6.65

Resulting Noise Levels

	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	63.33	53.28	54.08	64.19





Interior Traffic Noise Lot 7 – 2nd Floor

Target 24-hour CNEL	65
Distance to Receiver	164
Distance to Wall	147
Elevation Change	24
Height of Receiver	15
Hard or Soft Site	Hard
Height of Wall	5

50 ft Reference SPL

Type	Day	Evening	Night	CNEL
Auto	74.94	73.17	67.11	76.34
Medium Trucks	65.19	58.82	57.29	65.98
Heavy Trucks	65.22	56.22	57.44	65.92
	75.78	73.41	67.94	77.07

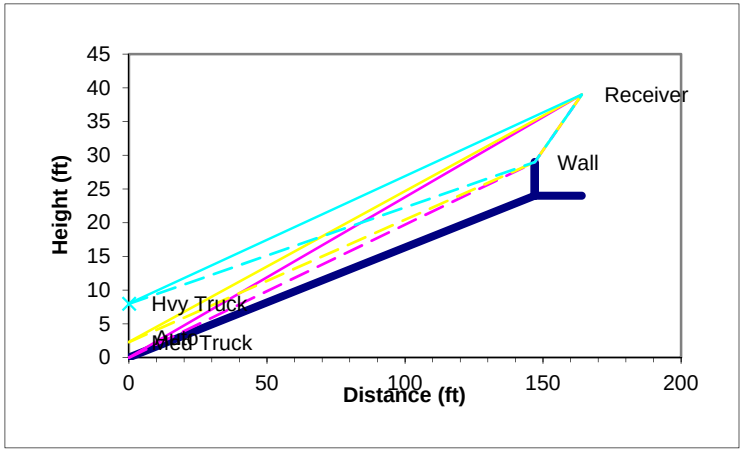
	Auto	Med Truck	Hvy Truck
Vehicle Height	0	2.3	8
Net Receiver Height	39	36.7	31
Net Wall Height	29.00	26.70	21.00
Direct LOS Height	34.96	32.90	27.79
Effective Wall Height	34.96	32.90	27.79
Direct Distance (CD)	168.57	168.06	166.90
Indirect Distance (CI)	168.57	168.06	166.90
Difference (D)	0.000	0.000	0.000
Fresnel Adjusted	0.000	0.000	0.000
Reduction (NLR)	0.00	0.00	0.00

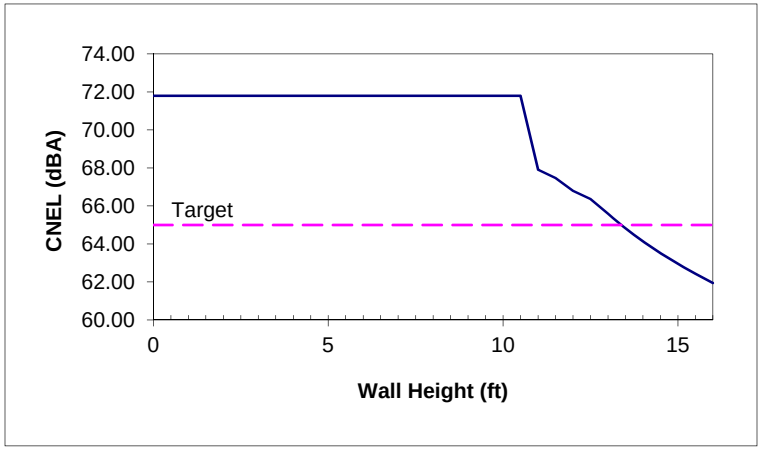
Attenuated SPL

Type	Day	Evening	Night	CNEL
Auto	69.66	67.89	61.83	71.06
Medium Trucks	59.93	53.56	52.03	60.72
Heavy Trucks	59.99	50.99	52.21	60.69
	70.50	68.13	62.67	71.80

Resulting Noise Levels

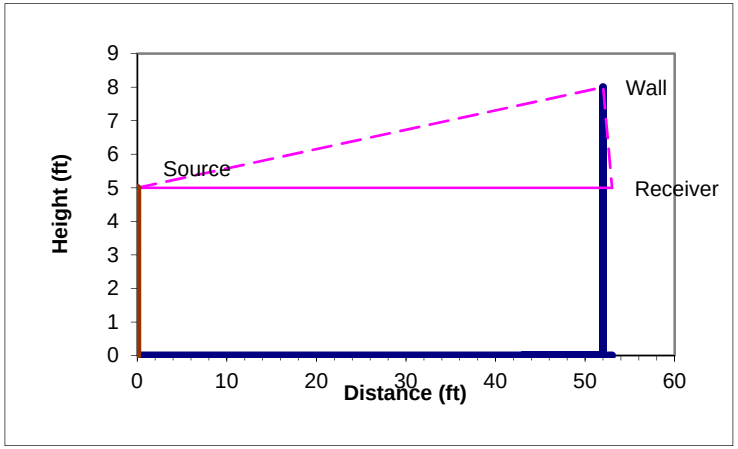
	Auto	Medium Truck	Heavy Truck	24-hour CNEL
Total Attenuated Noise	71.06	60.72	60.69	71.80

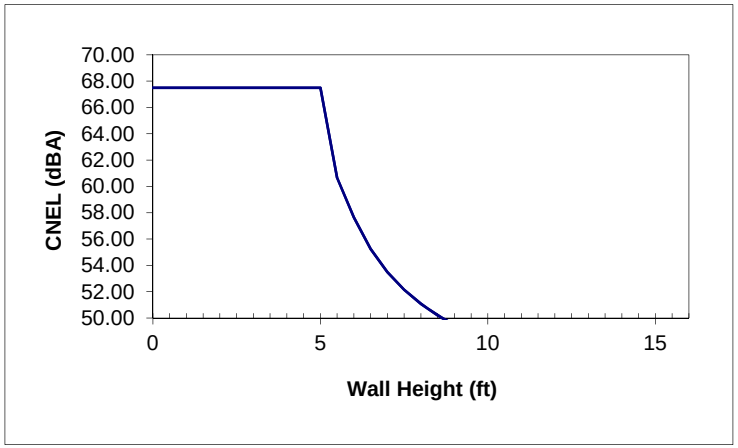




Encanto Exterior Residential South Side 1st Story

Distance to Receiver	103
Wall or Berm	wall
Distance to wall	52
wall Base Height	0
Height of wall	8
Receiver Pad Height	-17
Height of Receiver	5
Hard or Soft Site	hard
Equipment Base Height	0
Equipment Source Height	5
Source Frequency	550
Net Receiver Height	-17
Net Wall Height	3.00
Net Source Height	5
Direct LOS Height	-8.58
Effective Wall Height	3.00
Direct Distance (CD)	104.39
Indirect Distance (CI)	106.87
Difference (Δ)	2.474
Fresnel Adjusted	2.419
Reduction (NLR)	16.83
50 ft Reference SPL	68.00
Attenuatd SPL	61.61
Resulting Noise Level	44.78





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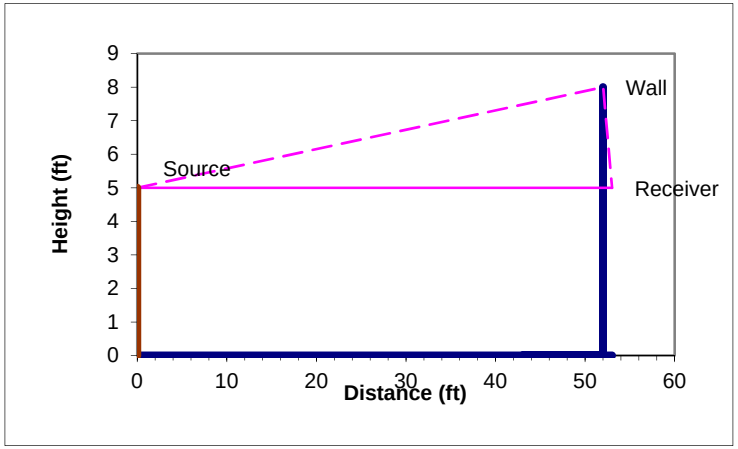
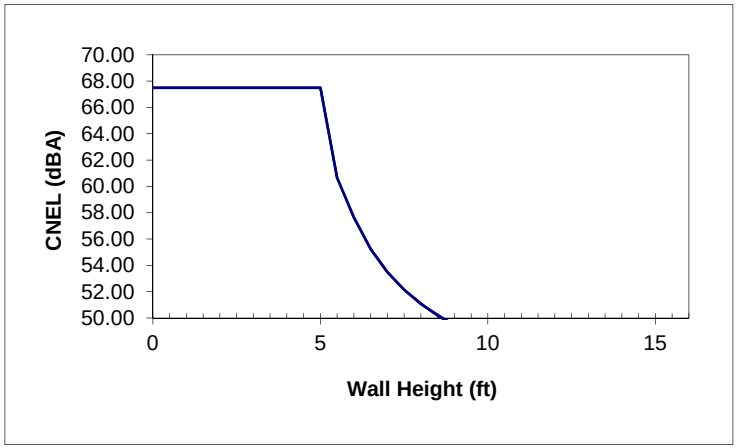
Encanto Exterior Residential South Side 2nd Story

Distance to Receiver	103
Wall or Berm	wall
Distance to wall	52
wall Base Height	0
Height of wall	8
Receiver Pad Height	-17
Height of Receiver	15
Hard or Soft Site	hard
Equipment Base Height	0
Equipment Source Height	5
Source Frequency	550
Net Receiver Height	-7
Net Wall Height	3.00
Net Source Height	5
Direct LOS Height	-3.53
Effective Wall Height	3.00
Direct Distance (CD)	103.24
Indirect Distance (CI)	104.06
Difference (Δ)	0.820
Fresnel Adjusted	0.802
Reduction (NLR)	12.22
50 ft Reference SPL	68.00
Attenuatd SPL	61.70
Resulting Noise Level	49.49





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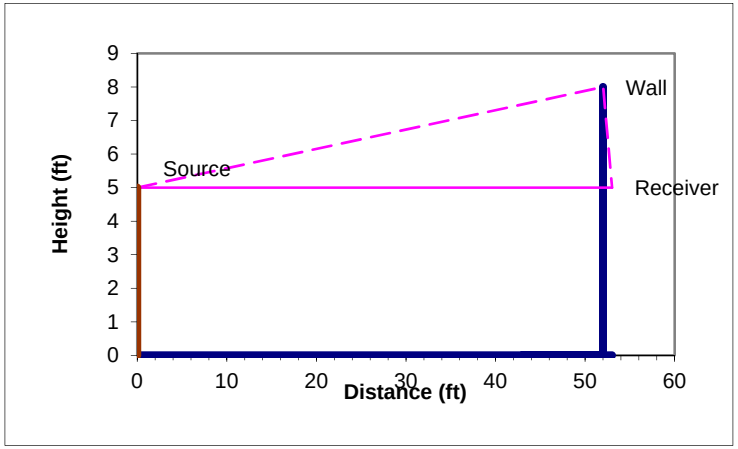
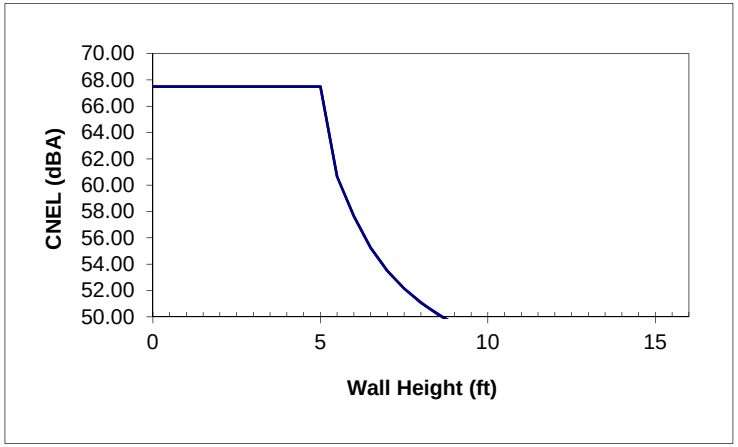
South Side at Bottom of Slope (89 feet)

Distance to Receiver	89
Wall or Berm	wall
Distance to wall	52
wall Base Height	0
Height of wall	8
Receiver Pad Height	-17
Height of Receiver	5
Hard or Soft Site	hard
Equipment Base Height	0
Equipment Source Height	5
Source Frequency	550
Net Receiver Height	-17
Net Wall Height	3.00
Net Source Height	5
Direct LOS Height	-9.93
Effective Wall Height	3.00
Direct Distance (CD)	90.61
Indirect Distance (CI)	94.15
Difference (Δ)	3.537
Fresnel Adjusted	3.458
Reduction (NLR)	18.37
50 ft Reference SPL	68.00
Attenuatd SPL	62.84
Resulting Noise Level	44.46





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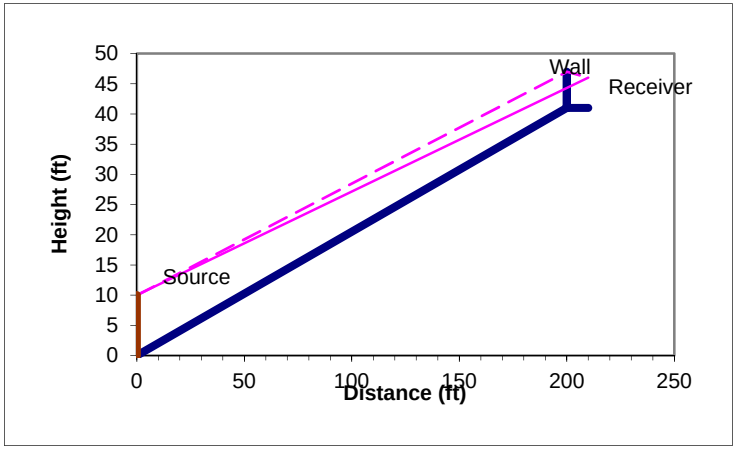
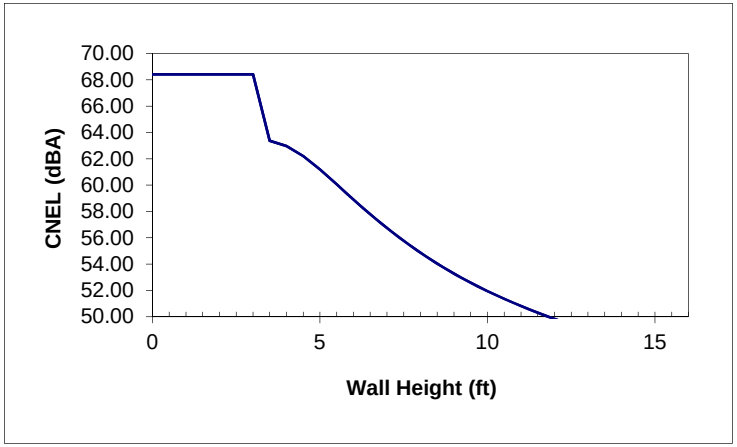
Construction Noise Across Commerce Center Drive
Scraper

Distance to Receiver	210
Wall or Berm	wall
Distance to wall	200
wall Base Height	41
Height of wall	6
Receiver Pad Height	41
Height of Receiver	5
Hard or Soft Site	hard
Equipment Base Height	0
Equipment Source Height	10
Source Frequency	550
Net Receiver Height	36
Net Wall Height	37.00
Net Source Height	10
Direct LOS Height	34.29
Effective Wall Height	37.00
Direct Distance (CD)	213.06
Indirect Distance (CI)	213.44
Difference (D)	0.380
Fresnel Adjusted	0.372
Reduction (NLR)	9.50
50 ft Reference SPL	81.00
Attenuatd SPL	68.41
Resulting Noise Level	58.91





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June 5, 2015