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Noise Analysis for the Prospect Estates II Project Santee, California

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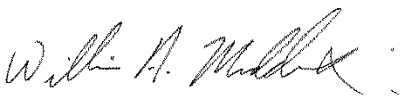

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Acronyms

ADT	average daily trips
City	City of Santee
dB	decibel
dB(A)	A-weighted decibels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
ISO	International Standards Organization
kVA	kilovolt-amps
L_{dn}	day-night average noise level
L_{eq}	one-hour equivalent noise level
$L_{eq(12hr)}$	12-hour equivalent noise level
$L_{eq(8hr)}$	8-hour average equivalent noise level
L_{max}	maximum instantaneous noise level
L_{min}	minimum instantaneous noise level
L_{pw}	sound power level
mph	miles per hour
SANDAG	San Diego Association of Governments

Executive Summary

The Prospect Estates II Project (project) includes the construction of ~~47 detached~~38 attached condominiums and 15 single-family ~~condominiums~~residences at 8600 Prospect Avenue, in Santee, California. Associated site improvements include construction of a ~~bioretention area~~biofiltration basin for stormwater runoff, a park site, ~~one~~ private ~~road and four internal private cul-de-sacs~~streets, and the construction and dedication of the segment of Marrokal Lane adjacent to the project site. This report discusses potential noise impacts from the construction and operation of the project. As part of this assessment, noise levels due to vehicle traffic were calculated and project compatibility with ~~existing and~~ future traffic noise was evaluated using City of Santee's (City) Noise/Compatibility Guide. In addition to compatibility, the potential for construction or operational noise sources to impact adjacent uses was based on compliance with noise level limits established in the City Noise Ordinance. A summary of the findings is provided below.

Construction Noise

The City Noise Ordinance mandates that 8-hour average ($L_{eq(8h)}$) construction noise levels shall not exceed 75 A-weighted decibels (dB[A]) at or within the property lines of any property used for residential purposes. When the loudest pieces of construction equipment are active, unmitigated construction noise levels would reach up to 74 dB(A) $L_{eq(8h)}$ at the property line of residential properties to the southeast of the project site. Thus, project construction would comply with noise levels outlined in Section 8.12.290 of the City Noise Ordinance.

Traffic Noise

On-site Traffic Noise

The project would be exposed to noise from vehicle traffic on nearby roadways. The City Noise/Compatibly Guide indicates that ~~single-family residences are compatible with~~ noise levels up to 65 dB(A) day-night average noise level (L_{dn}~~).~~) are normally acceptable for residential uses. Traffic noise levels associated with Prospect Avenue would only exceed 65 dB(A) L_{dn} within the public right-of-way. Traffic noise levels would reach up to ~~55~~52 dB(A) L_{dn} at the rear and side yards of the proposed ~~condominiums~~residences. The second floor of the proposed ~~condominiums~~residences would be exposed to noise levels of up to ~~60~~50 dB(A) L_{dn}. Therefore, the ~~project would be compatible with~~ traffic noise levels at the project would be acceptable.

Standard modern construction ~~would reduce traffic~~provides a 20 to 25 dB(A) attenuation from exterior to interior locations depending on window type. Therefore, even with windows in an open position, an exterior noise ~~levels to between 35 and 40~~level of 52 L_{dn} at the building façade would be anticipated to attenuate to 42 L_{dn} at all habitable rooms.

~~Therefore, interior~~Interior noise levels would not exceed the State's noise insulation standard of 45 L_{dn}.

Off-site Traffic Noise

The project would increase traffic volumes on local roadways. Noise level increases would be greatest nearest the project site, which would represent the greatest concentration of project-related traffic. Project-generated traffic would result in less than a decibel increase in the noise levels adjacent to the roadways. This increase in noise would be less than perceptible; thus, the project would not contribute to a substantial increase in traffic noise.

On-site Generated Noise

The noise sources on the project site after completion of construction are anticipated to be those that would be typical of any residential complex, such as vehicles arriving and leaving, children at play, landscape maintenance machinery, and heating, ventilating, and air conditioning (HVAC) equipment. With the exception of HVAC units, none of these noise sources would result in noise levels that may violate the noise level limits established in Section 8.12.040 of the City Municipal Code.

The applicable daytime (7:00 a.m. to 7:00 p.m.), evening (7:00 p.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.) noise level limits are 50, 45, and 40 dB(A) L_{eq}, respectively. When the HVAC unit is operated under peak load, unmitigated noise levels would exceed nighttime noise level limit of 40 dB(A) L_{eq} within 52 feet of the unit and therefore would exceed applicable noise level limits at the nearest property line. Mitigation measure NOI-1 proposes construction of walls around any HVAC unit within 52 feet of an adjacent residential property line to shield adjacent properties from HVAC noise. With incorporation of identified mitigation, noise levels would attenuate to 40 dB(A) L_{eq} or less at ~~adjacent~~internal and external property lines. Therefore, the project would comply with noise levels outlined in Section 8.12.040 of the City Noise Ordinance.

With incorporation of mitigation measure NOI-1, noise levels at the project site and adjacent land uses would comply with the noise compatibility criteria from the City General Plan and noise standards established in the City Noise Abatement and Control Ordinance during construction and operation; no further noise reduction measures are required.

1.0 Introduction

This report evaluates the significance of potential noise impacts from the construction and operation of the Prospect Estates II Project (project) in Santee, California. Compatibility of the project with the noise environment is assessed based on the City of Santee's (City) noise compatibility guidelines and noise ordinance.

1.1 Project Description

The project proposes a residential ~~subdivision~~development at 8600 Prospect Avenue, in Santee, California. The 6.8-acre site (project site) is currently undeveloped and is characterized by relatively flat topography and low-lying vegetation. Figures 1 and 2 show the regional location and an aerial photograph of the project vicinity.

The proposed residential development would consist of ~~47 detached~~ 38 attached condominiums and 15 single-family ~~condominiums~~residences, a ~~bioretention area~~biofiltration basin for stormwater runoff, a park site, ~~one~~and private ~~road, and four internal private cul-de-sacs~~streets on a 6.8-acre project site. Proposed attached condominiums would be ~~two-~~three-story ~~and would range from 1,472 square feet to 1,718 square feet. Each condominium~~buildings. Proposed single-family residences would be one- or two-stories (10 one-story residences and 5 two-story residences) and would ~~include~~each have a two-car garage. Internal ~~roads~~streets would ~~have a width~~be constructed based on the following:

- Private Street "A": 30-foot-wide street with a 4-foot-wide sidewalk and parking on the south side of the street.
- Private Street "B": 36 ~~feet within~~-foot-wide street with a ~~48-foot right-~~4-foot-wide sidewalk and parking on both sides of ~~-way that includes~~ the street.
- Private Street "C": 26-foot-wide street with no sidewalks ~~on either side.~~ or parking.

The ~~bioretention area~~biofiltration basin would be landscaped with low-water-use plants such as California meadow sedge (*Carex pansa*) and cork oak (*Quercus suber*). ~~A~~The project would incorporate 6-foot masonry ~~wall would run~~ screening walls, which are proposed along the southern side of the project site ~~boundary. Figure 3 shows~~adjacent to the proposed ~~site plan~~single-family residential development (Figure 3).

Project Location

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FIGURE 1

Regional Location

Image Source: Nearmap (flown January 2017)

Project Boundary

FIGURE 2

Project Location on Aerial Photograph

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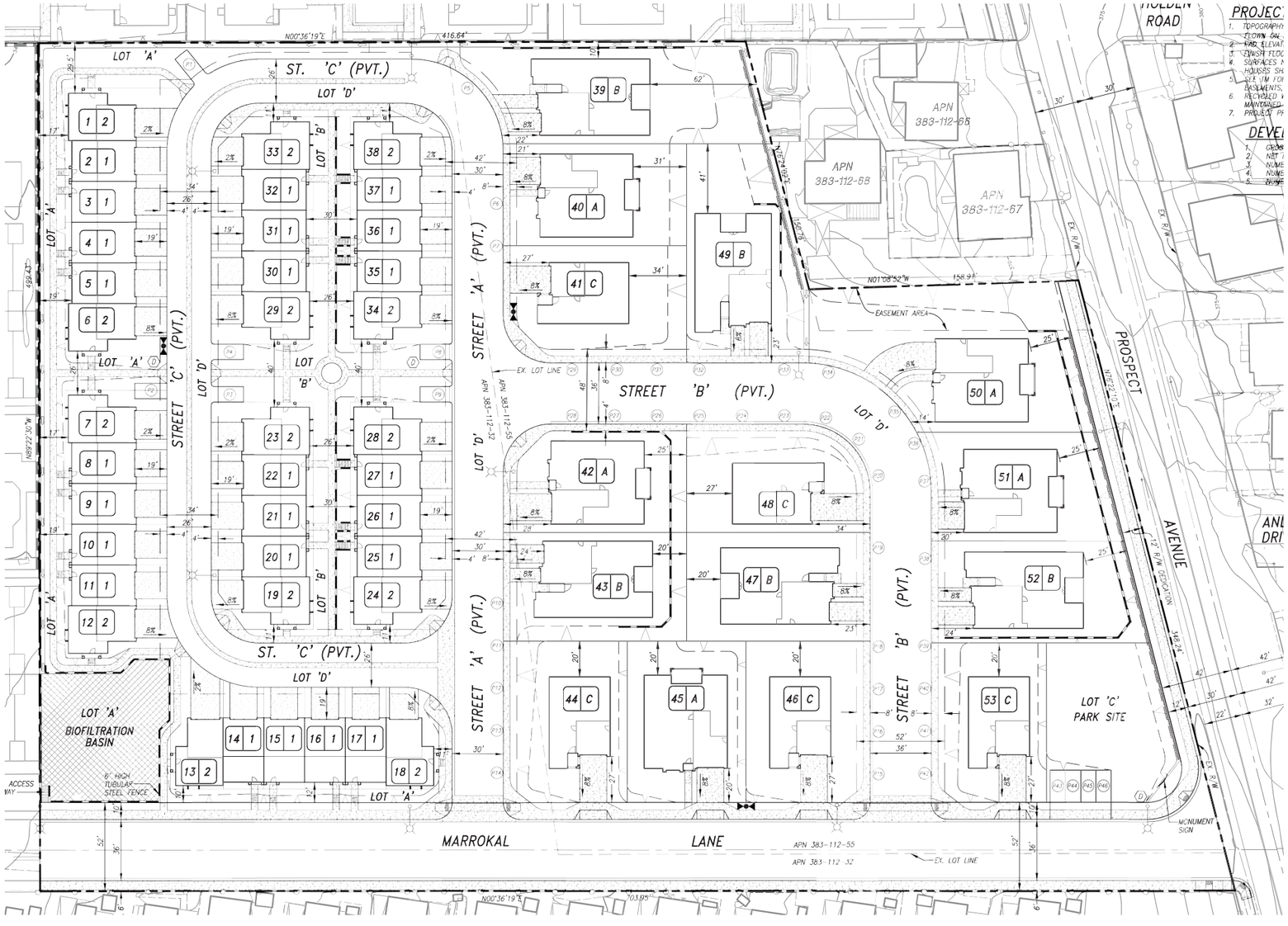
Map Source: Polaris



LEGEND

SYMBOL	DESCRIPTION
	EXISTING RIGHT OF WAY
	EXISTING LOT LINE
	EXISTING EASEMENT
	EXISTING CURB
	EXISTING BUILDING
	EXISTING FENCE
	EXISTING FIRE HYDRANT
	EXISTING POWER POLE
	SUBDIVISION BOUNDARY
	PROPOSED UNIT LINE
	PROPOSED CURB
	PROPOSED EASEMENT LINE
	PROPOSED BUILDING
	PROPOSED CONCRETE PAVING
	PROPOSED BIOFILTRATION AREA
	PROPOSED STREET LIGHT
	PROPOSED FIRE HYDRANT
	PROP. MASONRY RETAINING WALL
	PROP. 6' HIGH MSNRY. SCREEN WALL
	PROPOSED SLOPE (2:1 U.O.N.)
P19	PROP. COMMON USE PARKING STALL
D	PROPOSED DOG WASTE STATION
23 2	BUILDING PLAN TYPE
	UNIT NUMBER

0 Feet 60

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FIGURE 3
Proposed Site Plan

1.2 Fundamentals of Noise

Sound levels are described in units called the decibel (dB). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3 dB decrease.

Additionally, in technical terms, sound levels are described as either a "sound power level" or a "sound pressure level," which while commonly confused are two distinct characteristics of sound. Both share the same unit of measure, the dB. However, sound power, expressed as L_{pw}, is the energy converted into sound by the source. As sound energy travels through the air, it creates a sound wave that exerts pressure on receivers such as an eardrum or microphone, the sound pressure level. Sound measurement instruments only measure sound pressure, and limits used in standards are generally sound pressure levels.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised.

When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale noise levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are designated with the notation dB(A).

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors has been developed. The noise descriptors used for this study are the equivalent noise level (L_{eq}) and the day-night average noise level (L_{dn}).

The L_{eq} is the equivalent steady-state noise level in a stated period of time that is calculated by averaging the acoustic energy over a time period; when no period is specified, a 1-hour period is assumed. For this analysis, construction noise is assessed using an 8-hour $L_{eq(8)}$. The $L_{eq(8)}$ is useful for evaluating construction noise because of equipment operated intermittently with brief periods of maximum power, varying load cycles, and breaks for the operators and non-equipment tasks that occur during a typical construction day (up to 8 hours).

The L_{dn} is a 24-hour equivalent noise level. The L_{dn} calculation applies an additional 10 dB(A) penalty to noise occurring during nighttime hours, between 10:00 p.m. and 7:00 a.m. This increase is intended to account for the added sensitivity of humans to noise during the night.

Noise from a single localized source, such as a stationary piece of machinery, is known as a "point" source. Noise from a point source radiates uniformly outward as it travels away from the source in a spherical pattern, known as geometric spreading. The noise level from a point source decreases, or attenuates, at a rate of 6 dB(A) for each doubling of the distance. If a noise source is narrow in one direction and long in the other compared to the distance to the listener, it is called a "line" source. A line source can be a single source such as a long pipe carrying a turbulent fluid, or it can be composed of many point sources operating simultaneously, such as a stream of vehicles on a busy road. Noise from a line source radiates outward from the source in a cylindrical pattern, The attenuation rate for a line source is 3 dB(A) for each doubling of distance.

The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading of the source. A soft site (such as soft dirt, grass, or scattered bushes and trees) provides an additional ground attenuation value of 1.5 dB(A) per doubling of distance. Thus, a point source over a soft site would attenuate at a rate of 7.5 dB(A) per doubling of distance and a line source would attenuate at a rate of 4.5 dB(A) per doubling of distance.

Human perception of noise has no simple correlation with acoustical energy. A change in noise levels is generally perceived as follows: 3 dB(A) barely perceptible, 5 dB(A) readily perceptible, and 10 dB(A) perceived as a doubling or halving of noise (California Department of Transportation [Caltrans] 2013).

2.0 Existing Conditions

2.1 Adjacent Land Uses

Land uses surrounding the 6.8-acre project site include the Mission Gorge Villa Mobile Home Park to the west and detached single-family residences to the southeast, and south. Immediately north of the project site is vacant land, however it is anticipated to be developed with residential uses. Immediately east of the project site is vacant land, however it is anticipated to be developed with single-family residences (Prospect Estates I Project). Adjacent properties are zoned either R2 – Low-Medium Density Residential (south and west of the project site) or R7 – Medium Density Residential (east and north of the project site).

2.2 Existing Noise

Existing noise levels at the project site were measured on April 27, 2016 between 8:50 a.m. and 9:20 a.m., using a Larson-Davis LxT Sound Expert Sound Level Meter, serial number 3829. The location of the measurement is shown on Figure 4, and the noise measurement data are contained in Attachment 1. The following parameters were used:

Filter:	A-weighted
Response:	Slow
Time History Period:	5 seconds
Height of Instrument:	5 feet above ground level
Meter Calibration:	Before and after measurement

The measurement was located on the project site, 50 feet north of Prospect Avenue and directly north of Anlee Drive. The main source of noise at this location was vehicle traffic on Prospect Avenue. Noise from eleven aircraft overflights contributed to the noise environment, with aircraft overflights resulting in the 66.6 dB(A) maximum noise level (L_{max}) of the measurement. Vehicle traffic on State Route 52 was a lesser, but constant noise source, and contributed to the 42.2 dB(A) minimum noise level (L_{min}) during the measurement. During the measurement, traffic volumes on Prospect Avenue included 55 automobiles and 4 medium trucks. The average measured noise level during Measurement 1 was 54.1 dB(A) L_{eq}.

Image Source: Nearmap (flown January 2017)

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FIGURE 4

Noise Measurement Location

3.0 Applicable Standards

3.1 City Noise Limits

The City's noise standards are outlined in Municipal Code Chapter 8.12 – Noise Abatement and Control.

3.1.1 Construction Noise Limits

Noise level limits for construction activities are established in Section 8.12.290 of the City Municipal Code. These limits state that no equipment may be operated to cause noise at a level in excess of 75 dB for more than eight hours when measured at or within the property lines of any property used for residential purposes. Short-term noise levels in excess of 75 dB must also comply with noise levels limits displayed in Table 1 below.

Table 1
Construction Sound Level Limits

Total Duration in 24 Hours	Decibel Level Allowance	Total Decibel Level
Up to 15 minutes	+15	90
Up to 30 minutes	+12	87
Up to 1 hour	+9	84
Up to 2 hours	+6	81
Up to 4 hours	+3	78
Up to 8 hours	0	75
"+" denotes an allowable increase over 75 dB SOURCE: Table from Santee Municipal Code Section 8.12.290.		

In addition to construction noise level limits outlined in Table 1, Section 8.12.290 also states that no construction is allowed, except under emergency conditions, on Sundays and holidays including January 1, Memorial Day, July 4, the first Monday in September, Thanksgiving, December 25, or any other holiday recognized by the President, Governor, or the City Council.

3.1.2 Operation Noise Limits

Noise level limits for noise sources other than construction are established in Section 8.12.040 of the City Municipal Code. Table 2, below, displays noise level limits as assessed at any point at or within the property lines.

Table 2 Non-construction Sound Level Limits		
Zoning	Period	Applicable Limit One-hour Average Sound Level (dB[A])
A-70, A-72, R-S, R-V, R-R, R-MH, S-87, S-88, S-90	7 a.m. to 7 p.m.	50
	7 p.m. to 10 p.m.	45
	10 p.m. to 7 a.m.	40
R-U, R-C, and C-31	7 a.m. to 7 p.m.	55
	7 p.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
All other commercial zones	7 a.m. to 7 p.m.	60
	7 p.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
M-50, M-52	Anytime	70
All other industrial zones	Anytime	75
The sound level at the location on a boundary between an industrial zone and a residential zone	7 a.m. to 7 p.m.	60
	7 p.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
dB(A) = A-weighted decibels SOURCE: Table 8.12.040(A) of the Santee Municipal Code.		

The zoning designations listed in the Noise Abatement and Control Section 8.12.040 are from the County of San Diego and do not exist within Santee. For the purposes of this analysis, these zoning designations were translated to the nearest equivalent Santee zoning designation. The project site and surrounding parcels are zoned either R2 – Low-Medium Density Residential (south and west of the project site) or R7 – Medium Density Residential (east and north of the project site). Therefore, the most restrictive daytime (7:00 a.m. to 7:00 p.m.), evening (7:00 p.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.) noise level limits of 50, 45, and 40 dB(A) L_{eq}, respectively, were applied.

3.2 City Compatibility Standards

The City General Plan Noise Element, Section 8.1 states that:

The California Environmental Quality Act encourages jurisdictions to establish local thresholds for determining whether a particular impact is significant. Impacts exceeding these thresholds would require that measures be identified to avoid or reduce the severity of the impact. Noise Impacts shall be considered significant if any of the following occur as a result of the proposed development:

1. *If, as a direct result of the proposed development, noise levels for any existing of planned development will exceed the noise levels considered compatible for that use as identified in Figure 7-3, Noise / Compatibility Guide.*

2. *If, as a direct result of the proposed development, noise levels which already exceed the levels considered compatible for that use are increased by 3 or more decibels.*

General Plan Figure 7-3 is summarized in Table 3 below.

Table 3
Noise Compatibility

Land Use Category	Community Noise Exposure L_{dn}, dB						
	55	60	65	70	75	80	
Residential – Low Density Single Family, Duplex, Mobile Homes							
Residential – Multi-family							
Transient Lodging – Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes (See Note #1)							
Auditoriums Concert Halls, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

Notes:
1. Applies to noise sensitive areas which serve a significant function for the use which could be adversely affected by noise such as, outside areas used primarily for instruction, meditation areas, rest and relaxation areas, and other areas where general peace and quiet are important.

	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any building involved are of normal conventional construction, without any special noise insulation requirements.
	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 systems or air conditioning will normally suffice.
	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 and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development should generally not be undertaken.

L_{dn} = day-night average noise level; dB = decibels
SOURCE: City of Santee General Plan Noise Element Figure 7-3 (2003).

The project proposes 38 multi-family residential uses (i.e., attached condominiums) and 15 single-family residential uses. As indicated in Table 3, ~~single-family residential uses are compatible with~~ noise levels up to 65 L_{dn} ~~and conditionally compatible with~~are normally acceptable for both single- and multi-family residential uses and noise levels up to 70 L_{dn} are conditionally acceptable.

3.3 California Sound Transmission Standards

Title 24, Part 2, Chapter 12, Section 1207 of the California Code of Regulations represents the regulatory requirements for interior noise for all new construction in California. Section 1207.4, which states, "interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the L_{dn} or the community noise equivalent level, consistent with the noise element of the local general plan." Thus, for the City of Santee the limit is 45 L_{dn}. Title 24 defines a habitable space as any room used for "living, sleeping, eating or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable spaces."

4.0 Analysis Methodology

4.1 Construction Noise Analysis

Project construction noise would be generated by diesel engine-driven construction equipment used for site preparation and grading, removal of existing structures and pavement, loading, unloading, and placing materials and paving. Diesel engine-driven trucks also would bring materials to the site and remove the soils from excavation. Noise generated by project construction activities was modeled using reference levels from the Federal Highway Administration's (FHWA) *Roadway Construction Noise Model User's Guide* (FHWA 2006) and standard noise propagation algorithms. Table 4 summarizes noise levels associated with common types of construction equipment.

Table 4 Typical Maximum Construction Equipment Noise Levels		
Equipment	L_{MAX} at 50 feet [dB(A)]	Acoustical Use Factor (%)
Auger Drill Rig	85	20%
Backhoe	80	40%
Chain Saw	85	20%
Compactor (ground)	80	20%
Compressor (air)	80	40%
Concrete Mixer Truck	85	40%
Concrete Pump	82	20%
Concrete Saw	90	20%
Crane (mobile or stationary)	85	20%
Dozer	85	40%
Dump Truck	84	40%
Excavator	85	40%
Front End Loader	80	40%
Generator (25 kVA or less)	70	50%
Generator (more than 25 kVA)	82	50%
Grader	85	40%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pneumatic Tools	85	50%
Pumps	77	50%
Rock Drill	85	20%
Roller	80	20%
Scraper	85	40%
Tractor	84	40%
Vacuum Excavator (vac-truck)	85	40%
Vibratory Concrete Mixer	80	20%
SOURCE: Federal Transit Administration 2006. kVA = kilovolt-amps; dB(A) = A-weighted decibel; % = percent Note: The acoustical use factor is a unitless factor that represents the average noise generated by use of a piece of equipment versus its maximum noise level.		

As shown, construction equipment with a diesel engine typically generates maximum noise levels from 80 to 90 dB(A) L_{max} at a distance of 50 feet (FTA 2006). During construction, equipment goes through varying load cycles and there are breaks for the operators and for non-equipment tasks, such as measurement. Variation in power imposes additional complexity in characterizing the noise source level from construction equipment. The acoustical use factor is a unitless factor (usually expressed as a percentage) that represents the average noise generated by use of a piece of equipment versus its maximum noise level. Power variation is accounted for by describing the noise from the equipment operating at full power and adjusting it based on the acoustical use factor of the equipment to determine the average noise level of the operation. Although maximum construction equipment noise levels typically range from 80 to 90 dB(A) at a distance of 50 feet, hourly average noise levels generated by individual pieces of equipment typically range from 75 to 82 dB(A) L_{eq}.

Grading typically includes the most pieces of heavy equipment and results in the highest noise levels at adjacent receivers. Based on previous projects with similar scope and magnitude, grading activities are anticipated to include two excavators, a grader, two loaders, a dozer, and a scraper. As equipment typically moves around, construction noise during grading generally can be treated as a point source at the center of the site. Due to the size of the project site, it was assumed that up to three pieces of equipment may be active simultaneously. When the three loudest pieces of grading equipment are active at the same time, the cumulative noise generated by construction equipment would equate to 86 dB(A) L_{eq} at 50 feet. As the site would be scraped of vegetation and compacted during grading, construction noise would attenuate at approximately 6 dB(A) for every doubling of distance.

4.2 Traffic Noise Analysis

Noise generated by future traffic was modeled using SoundPLAN~~.~~ Essential Version 4.1. The SoundPLAN program (Navcon Engineering ~~2015~~2018) uses the FHWA's Traffic Noise Model algorithms and reference levels to calculate noise levels at selected receiver locations. The model uses various input parameters, such as traffic volumes; vehicle mix, distribution, and speed; roadway lengths and gradients; distances between sources, barriers, and receivers; and shielding provided by intervening terrain, barriers, and structures. Topography, roadways, and receivers were input into the model using three-dimensional coordinates.

The main source of traffic noise at the project site is vehicle traffic on Prospect Avenue. The segment of Prospect Avenue adjacent to the project site is a collector street with a speed limit of 35 miles per hour (mph). Based on information from the project Trip Generation Analysis, the project-generated traffic is anticipated to account for an additional ~~470~~454 average daily trips (ADT) on Prospect Avenue (Darnell & Associates, Inc. 2018). Future traffic volumes on Prospect Avenue were obtained from San Diego Association of Governments (SANDAG) traffic projections. SANDAG traffic projections indicate that traffic on Prospect Avenue will increase from 2,900 ADT in 2012 to 3,300 ADT in 2020 and then decline to 3,200 ADT in 2035. Traffic on Prospect Avenue is estimated by adding project-generated traffic (~~470~~454 ADT) to the highest forecasted traffic volume (3,300 ADT in 2020).

Traffic noise levels were calculated based on the peak traffic hour volumes, which were assumed to be 10 percent of the total ADT. Typically, the predicted L_{dn} and the maximum hourly L_{eq} calculated are equal. A vehicle classification mix of 94.5 percent automobiles, 3 percent medium trucks, 1 percent heavy trucks, 1 percent buses, and 0.5 percent motorcycles was modeled. Based on the field traffic counts, this is a conservative vehicle mix.

Ground-floor traffic noise contours were developed using the SoundPLAN program. Specific receiver locations were also modeled at exterior use areas such as the rear and side yards of proposed residences. Modeling accounts for existing and proposed structures, site topography, and the 6-foot masonry wall along the southern side of the project site.

4.3 On-site Noise Sources

The project includes construction of single-family residences in a residential neighborhood. Project noise sources after completion of construction are anticipated to be those that would be typical of residential uses in the vicinity of the project, such as vehicles arriving and leaving, children at play, landscape maintenance machinery, and heating, ventilation, and cooling (HVAC) units. With the exception of HVAC units, none of these noise sources would have the potential to produce noise in excess of Noise Ordinance limits or result in a substantial permanent increase in existing noise levels.

It is not known at this time which manufacturer, brand, or model of unit or units would be selected for use in the project, or the specific location units would be placed. Exterior HVAC units with exterior condensers may be located on the ground or roof-mounted. Based on review of various manufacturer specifications, a representative sound power level of 72 dB(A) unit for each residence was selected for analysis (Carrier 2015; Attachment 2). This sound power level corresponds to the Carrier 25HHA4 Series, with sizes ranging from 1.5 to 5 nominal tons. Noise levels due to HVAC units were calculated using standard noise propagation formulas identified in International Organization for Standardization (abbreviated as "ISO") method *ISO 9613-2 – Acoustics, Attenuation of Sound during Propagation Outdoors*.

5.0 Acoustical Environment and Impacts

5.1 Construction Noise

As discussed previously, grading typically results in the highest noise levels at adjacent receivers and may include up to three loudest pieces of grading equipment active at the same time. This would result in noise levels of up to 86 dB(A) at 50 feet. As the site would be scraped of vegetation and compacted during grading, construction noise would attenuate at approximately 6 dB(A) for every doubling of distance.

Noise level limits for construction activities are established in Section 8.12.290 of the City Municipal Code. These noise level limits are assessed at or within the property lines of any property used for residential purposes. Properties to the north, south, east and west are or are planned to be used for residential purposes. The center of grading area is approximately 305 feet from the northern property line, 380 feet from the property lines to the south (across Prospect Avenue), 225 feet from the western property line, and 190 feet from the nearest eastern property line (Assessor Parcel Number 383-112-68). Thus, construction noise during grading would attenuate to approximately 70 dB(A) $L_{eq(8h)}$ at the northern property line, 68 dB(A) $L_{eq(8h)}$ at the southern property lines, 73 dB(A) $L_{eq(8h)}$ at the western property line, and 74 dB(A) $L_{eq(8h)}$ at the nearest eastern property line. As construction noise levels at the eastern project site boundary would not exceed 75 dB(A) $L_{eq(8h)}$, construction would comply with noise levels outlined in Section 8.12.290 of the City's Noise Abatement and Control Ordinance. Impacts would be less than significant.

5.2 Traffic Noise

5.2.1 Compatibility

The project would be subject to noise from traffic on local roadways. Using the traffic parameters discussed in Section 4.1, future ground-floor contours were calculated across the project site. Future traffic noise contours are shown on Figure 5. As shown ~~n~~in Figure 5, noise levels in excess of applicable the compatibility criteria of 65 L_{dn} do not extend beyond ~~Noise levels were also modeled for a series of 19 specific receiver locations to evaluate noise at the exterior use areas (i.e., backyards and side yards).~~ the public right-of-way. Noise levels were also modeled for a series of specific receiver locations to evaluate noise at the exterior use areas (i.e., single-family backyards and side yards and attached condominium porches).

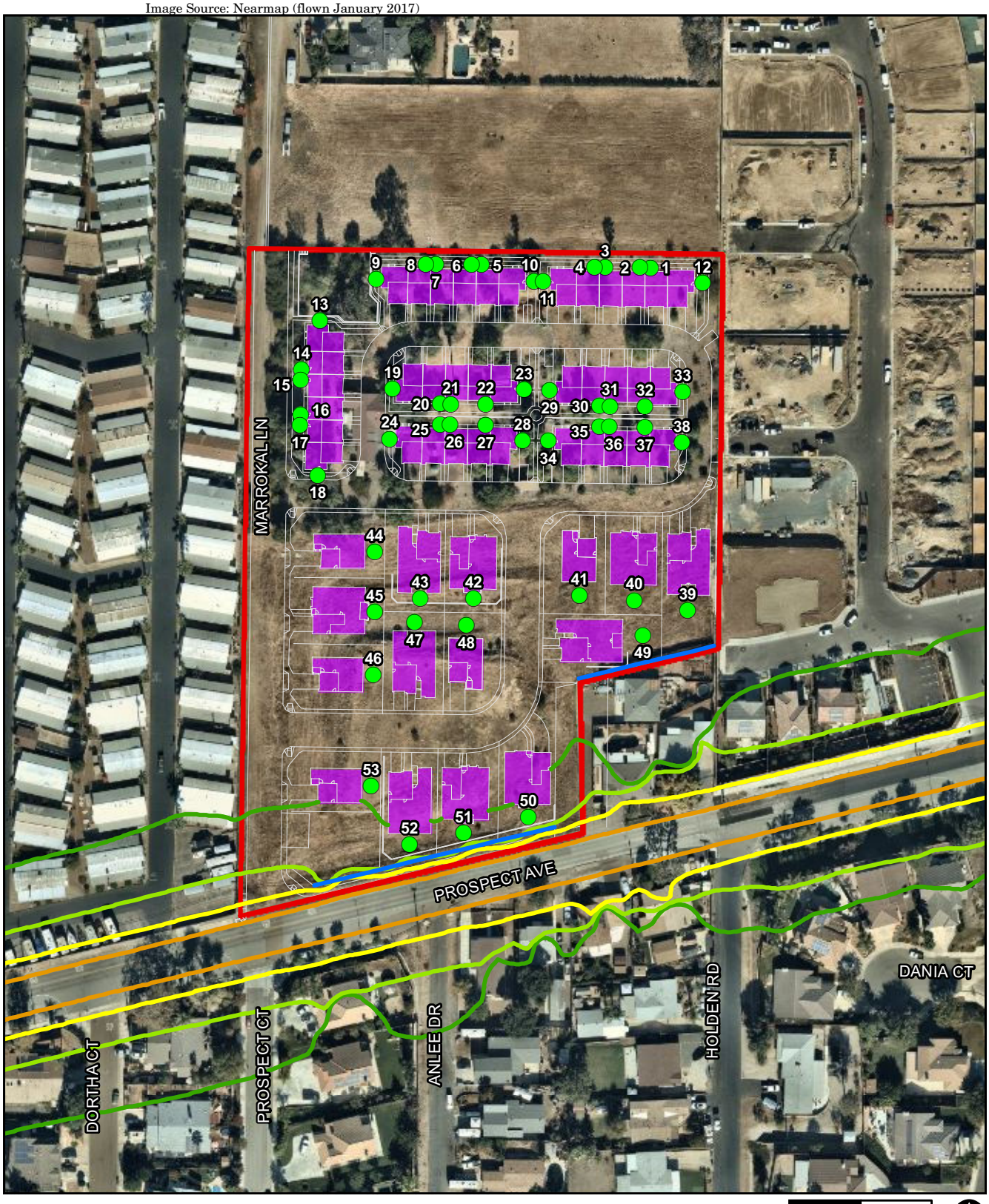
Receiver locations were selected to include receivers at all of the proposed exterior areas nearest to Prospect Avenue and to include several receivers further into the proposed development. Receiver locations are shown on Figure 5. Table 5 summarizes the projected future noise levels at modeled receivers. See Attachment 3 for detailed modeling parameters and results.

Table 5
Traffic Noise Levels

Receivers		Noise Level (L_{dn})		
		First Floor	Second Floor	Third Floor
1-38	Attached condominiums	19-41	23-43	34-43
39	Single-Family Residence	41	-	-
40	Single-Family Residence	40	-	-
41	Single-Family Residence	37	39	-
42	Single-Family Residence	37	-	-
43	Single-Family Residence	33	-	-
44	Single-Family Residence	33	37	-
45	Single-Family Residence	35	-	-
46	Single-Family Residence	37	40	-
47	Single-Family Residence	33	-	-
48	Single-Family Residence	37	38	-
49	Single-Family Residence	41	-	-
50	Single-Family Residence	51	-	-
51	Single-Family Residence	51	-	-
52	Single-Family Residence	52	-	-
53	Single-Family Residence	47	50	-

L_{dn} = day-night average noise level

Image Source: Nearmap (flown January 2017)



RECON

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FIGURE 5

Future Traffic Noise Contours

~~Table 5~~
~~Traffic Noise Levels~~

~~Receiver~~		~~Noise Level (L_{dn})~~	
		~~First Floor~~	~~Second Floor~~
~~1~~	~~Proposed Side yard~~	~~55~~	~~60~~
~~2~~	~~Proposed Backyard~~	~~54~~	~~59~~
~~3~~	~~Proposed Backyard~~	~~54~~	~~60~~
~~4~~	~~Proposed Backyard~~	~~54~~	~~60~~
~~5~~	~~Proposed Backyard~~	~~53~~	~~60~~
~~6~~	~~Proposed Backyard~~	~~42~~	~~45~~
~~7~~	~~Proposed Backyard~~	~~40~~	~~42~~
~~8~~	~~Proposed Backyard~~	~~36~~	~~38~~
~~9~~	~~Proposed Backyard~~	~~34~~	~~37~~
~~10~~	~~Proposed Backyard~~	~~37~~	~~39~~
~~11~~	~~Proposed Backyard~~	~~37~~	~~39~~
~~12~~	~~Proposed Backyard~~	~~37~~	~~39~~
~~13~~	~~Proposed Backyard~~	~~39~~	~~42~~
~~14~~	~~Proposed Backyard~~	~~41~~	~~46~~
~~15~~	~~Proposed Backyard~~	~~42~~	~~47~~
~~16~~	~~Proposed Backyard~~	~~44~~	~~49~~
~~17~~	~~Proposed Backyard~~	~~32~~	~~35~~
~~18~~	~~Proposed Backyard~~	~~36~~	~~40~~
~~19~~	~~Proposed Side yard~~	~~37~~	~~39~~
~~L_{dn} = day-night average noise level~~			

The proposed attached condominiums would be located farther from Prospect Avenue than proposed single-family residences. As shown in Table 5, traffic noise levels at the front of proposed attached condominiums would reach up to 43 L_{dn}.

The 6-foot masonry wall along the southern side of the project site would shield the backyards and side yards of residences along Prospect Avenue. As shown in Table 5, traffic noise levels at ground-floor elevations reach up to 52 L_{dn} and noise levels at second-floor elevations would reach up to 50 L_{dn}.

Modeled noise levels at the ~~rear and side yards~~exterior use areas of proposed attached condominiums and single-family residences are assessed against the noise compatibility criteria for ~~single family~~ residential~~. Single-family residential units would be compatible with noise levels~~ uses. Noise levels up to 65 L_{dn} ~~and conditionally compatible with~~ are normally acceptable for residential uses and noise levels up to 70 L_{dn}~~. As shown in Table 5~~ are conditionally acceptable. Traffic noise levels would not exceed 65 L_{dn}; therefore, traffic noise levels ~~would reach up to 55 dB(A) L_{dn} in~~at the ~~rear and side yards of proposed residences and the second story of the proposed residences~~project would be ~~exposed to noise levels of up to 60 dB(A) L_{dn}. Therefore, the project would be compatible with traffic noise levels~~acceptable.

According to the FHWA, typical modern residential construction with windows in an open position provides a 10 dB(A) reduction, and typical modern residential construction provides a 20 to 25 dB(A) attenuation from exterior to interior locations depending on window type (FHWA 2011). Thus, even with windows in an open position, an exterior noise level of ~~61~~52 L_{dn} at the building façade would be anticipated to attenuate to ~~35 to 40~~42 L_{dn} at all habitable rooms. Therefore, interior noise levels would not exceed the State's noise insulation standard of 45 L_{dn}.

5.2.2 Off-Site Noise Increase

The project would increase traffic volumes on local roadways. The project would not substantially alter the vehicle classifications mix on local or regional roadways, nor would the project alter the speed on an existing roadway or create a new roadway; thus, the primary factor affecting off-site noise levels would be increased traffic volumes. While changes in noise levels would occur along any roadway where project related traffic occurs, for noise assessment purposes, noise level increases are assumed to be greatest nearest the project site, as this location would represent the greatest concentration of project-related traffic. Additionally, surrounding streets affected by the project carry greater volumes of traffic and the relative increase would be less along those segments. The increase in noise due to the addition of project traffic was calculated by comparing the existing to the existing plus project traffic volumes. The results are shown in Table 6.

Table 6
Project Traffic Noise Level Increase

Roadway	Year	Traffic (ADT)		Noise Level Increase (dB[A])
		No Project	With Project	
Prospect Avenue	~~2017~~2018*	3,150	3,~~620~~604	0.6
	2020	3,300	3,~~770~~754	0.6
	2035	3,200	3,~~670~~654	0.6

ADT = average daily trips; dB(A) = A-weighted decibels
*~~2017 traffic~~Traffic volumes linearly interpolated from 2012 and 2020 traffic forecast.

As shown in Table 6, the project-generated traffic would result in less than a decibel increase in traffic noise associated with Prospect Avenue. While the noise levels shown in Table 6 provide the estimated noise level increases to tenths of a decibel, noise prediction models are not accurate the to the tenth and reported noise levels are typically rounded to the nearest whole decibel. The level of detail shown in Table 6 is provided to allow a greater understanding of the magnitude of noise level changes from project traffic. A change in noise level of 3 dB(A) is considered barely perceptible (Caltrans 2013). Thus, the project would result in a less than perceptible change in vehicle traffic noise levels.

5.3 On-site Generated Noise

As discussed in Section 4.3, noise sources on the project site after completion of construction such as vehicles arriving and leaving, children at play, and landscape maintenance machinery, would be similar to noise sources from residences to the north and west of the project site. With the exception of HVAC units, none of these noise sources would have the

potential to produce noise in excess of Noise Ordinance limits or result in a substantial permanent increase in existing noise levels.

The applicable daytime (7:00 a.m. to 7:00 p.m.), evening (7:00 p.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.) noise level limits are 50, 45, and 40 dB(A) L_{eq}, respectively. Project HVAC units are anticipated to generate a sound power level of 72 dB(A) per unit. Thus, noise levels would attenuate to less than the nighttime noise level limit of 40 dB(A) L_{eq} within 52 feet of the unit. Under certain circumstances HVAC units may operate continuously during nighttime hours, therefore the project would result in noise levels that exceed the City's noise level limits if an unenclosed HVAC unit is located within 52 feet of ~~an adjacent residential property line. The HVAC units for~~a property line. Due to the lot dimensions, HVAC units for proposed single-family residences are anticipated to be sited within 52 feet of the nearest property line. Additionally, HVAC units for the proposed attached condominiums along the northern and eastern edges of the project site are anticipated to be sited within 52 feet of the nearest property line of parcels adjacent to the project site~~, thus~~. Therefore, noise enclosures or barriers would be required for individual HVAC units. Mitigation measure NOI-1 would address HVAC noise.

NOI-1 The Project Applicant or agent thereof, shall construct a sound wall around any HVAC unit located within 52 feet of ~~the~~a property line~~ of an adjacent residential property~~. Where HVAC units would be located at least 10 feet from the nearest property line the height of the sound wall height shall be at least 4 feet above grade; where HVAC units would be located between 7 and 10 feet from the nearest property line the height of the sound wall shall be at least 5 feet above grade; where HVAC units would be between 6 and 7 feet from the nearest property line the height of the sound wall shall be at least 6 feet above grade; HVAC units shall not be located at or within 5 feet of the nearest property line. Sound walls shall be constructed of a material with a minimum weight of two pounds per square foot and shall be free from gaps or perforations. Prior to issuance of a Permit to Occupy proposed residences, the Project Applicant shall demonstrate to the City staff that sound walls meeting the criteria stated above have been constructed.

If available, a sound enclosure may be substituted for sound walls if the sound power level of the HVAC units with the enclosure is 63 dB(A) or less (equates to a sound pressure level of 55 dB(A) at 1 meter [3.3 feet]) and the HVAC units is located beyond 20 feet of the nearest property line.

Noise levels at the property line were modeled with incorporation of NOI-1. Manufacturers specify a minimum clearance between HVAC units and obstructions so that air intake is not blocked. For example, the Carrier 25HHA4 Series has minimum clearance of 20 inches between the air intake and the nearest wall. Modeling assumes that sound walls are approximately two feet from the HVAC unit. Modeling results are included in Attachment-_4. While attenuation provided by a noise wall would vary depending on orientation, all orientations result in noise levels below 40 dB(A) L_{eq} at adjacent property

lines. After implementation of mitigation measure NOI-1, noise levels would comply with noise level limits established in the City Noise Ordinance.

6.0 Conclusions

6.1 Construction Noise

The City Noise Ordinance mandates that construction noise levels shall not exceed 75 dB(A) $L_{eq(8h)}$ at or within the property lines of any property used for residential purposes. When three loudest pieces of grading equipment are active, construction noise levels reach up to 74 dB(A) $L_{eq(8h)}$ at the property lines of the nearest residential properties. Project construction would comply with noise levels outlined in Section 8.12.290 of the City Noise Ordinance.

6.2 Vehicle Traffic Noise

As shown in Figure 5, noise levels in excess of applicable the compatibility criteria of 65 L_{dn} do not extend beyond the public right-of-way. Traffic noise levels would reach up to ~~55~~52 dB(A) L_{dn} in the rear and side yards of proposed ~~condominiums~~residences and the second story of the proposed ~~condominiums~~residences would be exposed to noise levels of up to ~~60~~50 dB(A) L_{dn}. Therefore, traffic noise levels at the project would be ~~compatible with traffic noise levels~~acceptable.

Standard modern construction ~~would reduce traffic~~provides a 20 to 25 dB(A) attenuation from exterior to interior locations depending on window type. Therefore, even with windows in an open position, an exterior noise ~~levels to between 35 and 40~~level of 52 L_{dn} at the building façade would be anticipated to attenuate to 42 L_{dn} at all habitable rooms. ~~Therefore, interior~~Interior noise levels would not exceed the State's noise insulation standard of 45 L_{dn}.

The project would increase traffic volumes on local roadways. Noise level increases would be greatest nearest the project site, which would represent the greatest concentration of project-related traffic. As shown in Table 6, the project traffic would contribute to less than a decibel increase in the noise levels of adjacent roadways. As noise level increases would be less than perceptible, the project would not contribute to a substantial increase in traffic noise.

6.3 On-site Generated Noise

As discussed in Section 4.3, noise sources on the project site after completion of construction such as vehicles arriving and leaving, children at play, and landscape maintenance machinery, would be similar to noise sources from residences to the north and west of the project site. With the exception of HVAC units, none of these noise sources would have the

potential to produce noise in excess of Noise Ordinance limits or result in a substantial permanent increase in existing noise levels.

When the an HVAC unit is operated under peak load, unmitigated noise levels would exceed nighttime noise level limit of 40 dB(A) L_{eq} within 52 feet of the unit and therefore would exceed applicable noise level limits at the nearest property line. Mitigation measure NOI-1 proposes construction of sound walls to shield adjacent properties from HVAC noise. With incorporation of identified mitigation noise levels would generally attenuate to 40 dB(A) L_{eq} or less at ~~adjacent~~internal and external property lines, and would therefore comply with noise levels outlined in Section 8.12.040 of the City Noise Ordinance.

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ATTACHMENT 1

Noise Measurements

Summary

Filename	LxT_Data.119
Serial Number	3829
Model	SoundExpert™ LxT
Firmware Version	2.206
User	
Location	
Job Description	
Note	
Measurement Description	
Start	2016/04/27 8:50:40
Stop	2016/04/27 9:20:43
Duration	0:30:02.6
Run Time	0:30:02.6
Pause	0:00:00.0
Pre Calibration	2016/04/27 8:50:21
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRMLxT1L
Microphone Correction	Off
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	At Lmax
Overload	122.1 dB

	A	C	Z
Under Range Peak	**78.2**	75.2	80.2 dB
Under Range Limit	**26.1**	25.3	32.1 dB
Noise Floor	16.3	16.1	22.0 dB

Results

LAeq	54.1 dB	
LAE	86.7 dB	
EA	51.659 µPa²h	
LApeak (max)	2016/04/27 9:20:40	86.3 dB
LASmax	2016/04/27 9:02:33	66.6 dB
LASmin	2016/04/27 9:06:16	42.2 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**
	54.1
LCeq	67.0 dB
LAeq	54.1 dB
LCeq - LAeq	12.8 dB
LAleq	55.7 dB
LAeq	54.1 dB
LAleq - LAeq	1.6 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	60.7 dB
LAS10.00	57.7 dB
LAS33.30	52.4 dB
LAS50.00	50.1 dB
LAS66.60	48.3 dB
LAS90.00	45.7 dB

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
PRMLxT1L	2016/04/27 8:50:21	-28.2
PRMLxT1L	2016/04/27 8:38:58	-28.2
PRMLxT1L	2016/04/14 12:08:05	-28.2
PRMLxT1L	2016/04/14 11:49:53	-28.2
PRMLxT1L	2016/04/14 11:33:38	-28.2
PRMLxT1L	2016/04/14 11:17:14	-28.1
PRMLxT1L	2016/04/14 11:07:16	-28.3
PRMLxT1L	2016/04/14 10:49:20	-28.2
PRMLxT1L	2016/04/14 10:06:09	-28.3
PRMLxT1L	2016/04/14 9:47:42	-28.3
PRMLxT1L	2016/04/13 14:58:39	-28.3

ATTACHMENT 2

HVAC Specifications

25HHA4
Performance™ Series Heat Pump with Puron® Refrigerant 1–1/2 to 5 Nominal Tons

Carrier
turn to the experts

Product Data

Puron

Performance SERIES

Carrier Heat Pumps with Puron® refrigerant provide a collection of features unmatched by any other family of equipment. The 25HHA4 has been designed utilizing Carrier's Puron refrigerant. This environmentally sound refrigerant allows you to make a responsible decision in the protection of the earth's ozone layer.

NOTE: Ratings contained in this document are subject to change at any time. Always refer to the AHRI directory (www.ahridirectory.org) for the most up-to-date ratings information.

INDUSTRY LEADING FEATURES / BENEFITS

Energy Efficiency

- 14 - 15 SEER/11.5 - 12.5 EER/8.2 - 8.5 HSPF (Based on tested combinations)

Sound

- Levels as low as 69 dBA

Design Features

- Small footprint
- WeatherArmor™ cabinet
  - — All steel cabinet construction
  - — Mesh coil guard

Reliability, Quality and Toughness

- Scroll compressor
- Factory-supplied filter drier
- High pressure switch
- Low pressure switch
- Accumulator
- Line lengths up to 250' (76.2 m)
- Low ambient operation (down to -20°F/-28.9°C with low ambient accessories)

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12	13
N	N	A	A	A/N	N	N	N	A/N	A/N	A/N	N	N
2	5	H	H	A	4	1	8	A	0	0	3	0
Product Series		Product Family	Product Type	Major Series	SEER	Cooling Capacity		Variations	Open	Open	Voltage	Minor Series
25=HP		H = HP	H = Horizontal Discharge		4 = 14 SEER			A=Standard	0=Not Defined	0=Not Defined	3=208/230–1 5=208/230–3 6=460/3	0, 1, 2...

Puron

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Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

c UL US

PHYSICAL DATA

UNIT SIZE – SERIES	18–30	24–30	30–30	36–30, 50, 60	48–30, 50, 60	60–30, 50, 60
COMPRESSOR TYPE	Scroll					
REFRIGERANT	Puron® (R–410A)					
Control	TXV (Puron Hard Shutoff)					
Charge lb (kg)	6.72 (3.05)	7.67 (3.48)	12.07 (5.47)	12.32 (5.59)	10.95 (4.97)	11.82 (5.36)
COND FAN	Propeller Type, Direct Drive					
Air Discharge	Horizontal					
Air Qty (CFM)	1285	1285	2615	2615	2785	2785
Motor HP	1/12	1/12	1/4	1/4	1/4	1/4
Motor RPM	800	800	800	800	800	800
COND COIL						
Face Area (Sq ft)	5.8	7.3	12.1	12.1	14.1	14.1
Fins per In.	20	20	20	20	20	20
Rows	2	2	2	2	2	2
Circuits	3	3	6	5	6	6
VALVE CONNECT. (In. ID)						
Vapor	5/8	3/4	3/4	7/8	7/8	7/8
Liquid	3/8					
REFRIGERANT TUBES* (In. OD)						
Rated Vapor*	5/8	3/4	3/4	7/8	7/8	1 1/8
Max Liquid Line†	3/8					

* Units are rated with 25 ft (7.6 m) of lineset length. See Vapor Line Sizing and Cooling Capacity Loss table when using other sizes and lengths of lineset.
Note: See unit Installation Instruction for proper installation.

† See *Liquid Line Sizing For Cooling Only Systems with Puron Refrigerant* tables.

ELECTRICAL DATA

UNIT SIZE – voltage,series	V/PH	OPER VOLTS*		COMPR		FAN	MCA	MAX FUSE** or CKT BRK AMPS
		MAX	MIN	LRA	RLA	FLA		
18–30	208/230/1	253	197	48.0	9.0	0.50	11.8	20
24–30				58.3	12.8	0.50	16.5	25
30–30				64.0	12.8	1.20	17.2	30
36–30				77.0	14.2	1.20	19.0	30
48–30				117.0	21.8	1.45	28.8	50
60–30				144.2	25.5	1.45	33.4	50
36–50	208/230/3	253	197	71.0	9.3	1.20	12.8	20
48–50				83.1	13.7	1.45	18.6	30
60–50				110.0	17.1	1.45	22.9	40
36–60	460/3	506	414	38.0	5.6	0.60	7.6	15
48–60				41.0	6.2	0.80	8.6	15
60–60				52.0	7.8	0.80	10.6	15

LEGEND:

FLA – Full Load Amps

HACR – Heating, Air Conditioning, Refrigeration

LRA – Locked Rotor Amps

NEC – National Electrical Code

RLA – Rated Load Amps (compressor)

* Permissible limits of the voltage range at which the unit will operate satisfactorily

** Time–Delay fuse.

Complies with 2007 requirements of ASHRAE Standards 90.1

A-WEIGHTED SOUND POWER (dBA)

Unit Size	Standard Rating (dBA)	Typical Octave Band Spectrum (dBA, without tone adjustment)						
		125	250	500	1000	2000	4000	8000
18	70	53.5	59.5	61.5	65.5	59.5	55.5	46.0
24	69	53.0	63.0	63.0	62.5	59.0	54.0	50.5
30	72	58.0	61.0	64.0	66.5	64.0	63.5	57.0
36	71	60.5	60.5	64.0	65.5	64.0	62.0	56.5
48	73	60.0	59.0	65.0	68.0	64.0	61.0	55.5
60	74	70.0	62.0	65.0	66.0	64.5	64.0	57.5

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

A-WEIGHTED SOUND POWER (dBA) WITH ACCESSORY SOUND SHIELD

Unit Size	Standard Rating (dBA)	Typical Octave Band Spectrum (dBA, without tone adjustment)						
		125	250	500	1000	2000	4000	8000
18	N/A	–	–	–	–	–	–	–
24	N/A	–	–	–	–	–	–	–
30	71	57.5	61.0	63.5	65.5	63.0	63.5	57.0
36	70	59.5	60.5	63.0	64.5	63.0	61.5	56.0
48	72	56.5	59.5	63.5	67.5	64.0	60.5	55.0
60	72	62.0	60.5	64.5	65.0	64.0	63.5	54.5

NOTES:

Tested in accordance with AHRI Standard 270–08 (not listed in AHRI).

Accessory sound shield will not accommodate unit sizes 18 and 24.

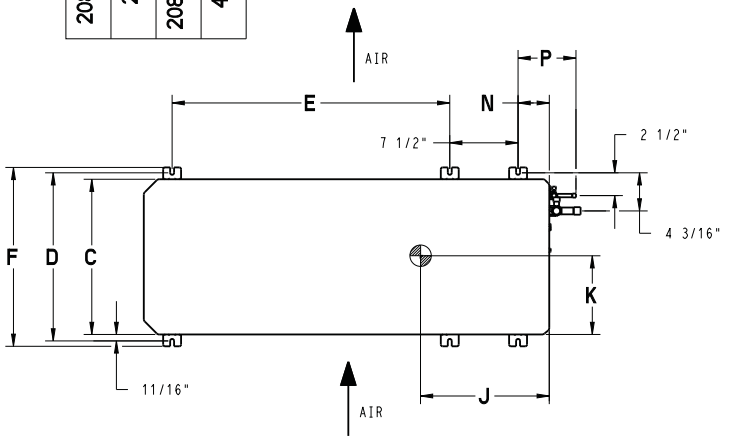
CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

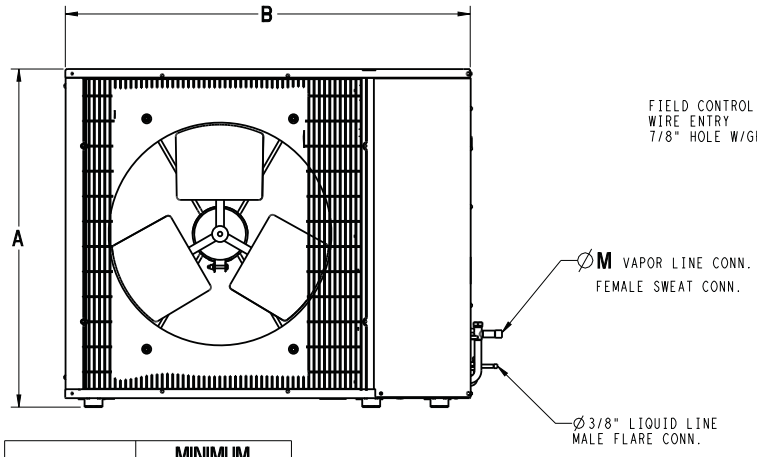
UNIT SIZE–SERIES	REQUIRED SUBCOOLING °F (°C)
18	12 (6.7)
24	14 (7.8))
30	11 (6.1)
36	14 (7.8)
48	11 (6.1)
60	12 (6.7)

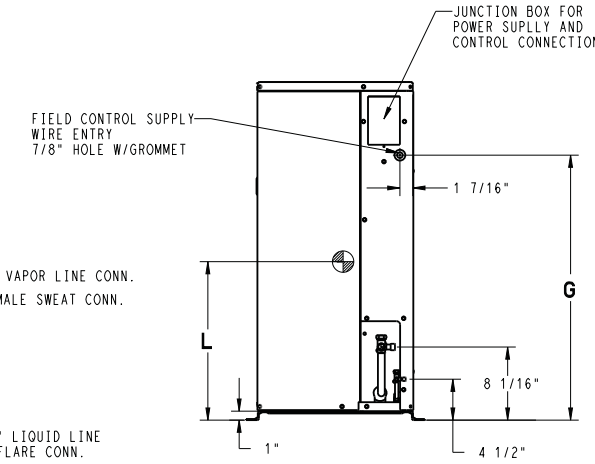
DIMENSIONS - ENGLISH

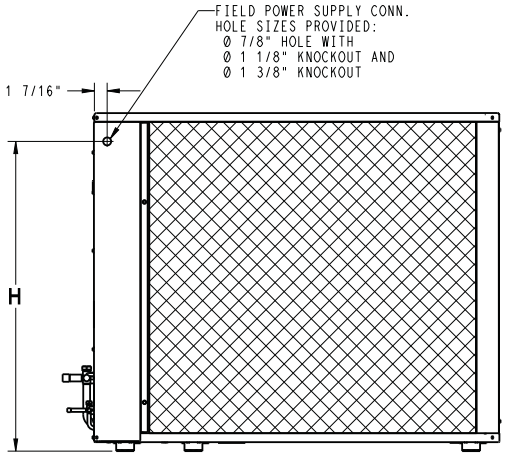
UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	H	J	K	L	M	N	P	OPERATING WEIGHT(lbs)	SHIPPING WEIGHT(lbs)	SHIPPING DIMENSIONS (L x W x H)
25HHA418	0	X	0	0	0	25 1/8"	36 15/16"	14 9/16"	16"	23 7/16"	17 3/16"	17 1/8"	22 1/16"	13"	6 5/8"	11 1/4"	5/8"	2 7/8"	4 15/16"	150	170	42 15/16" X 18" X 28 1/8"
25HHA424	0	X	0	0	0	31 1/8"	36 15/16"	14 9/16"	16"	23 7/16"	17 3/16"	23 1/8"	28 1/16"	14"	6 3/4"	11 5/8"	3/4"	2 7/8"	4 15/16"	161	181	42 15/16" X 18" X 34 1/8"
25HHA430	0	X	0	0	0	37 1/8"	44 1/2"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	29 1/8"	34 1/16"	13 11/16"	8 1/8"	15 7/8"	3/4"	3 3/8"	5 1/2"	196	226	50 1/2" X 20 1/2" X 40 1/8"
25HHA436	0	X	0	X	X	37 1/8"	44 1/2"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	29 1/8"	34 1/16"	13 11/16"	8 1/8"	15 7/8"	7/8"	3 3/8"	5 1/2"	197	227	50 1/2" X 20 1/2" X 40 1/8"
25HHA448	0	X	0	X	X	43 1/8"	44 1/2"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	35 1/8"	40 1/16"	14 1/2"	8 1/2"	18 7/8"	7/8"	3 3/8"	5 1/2"	246	276	50 1/2" X 20 1/2" X 46 1/8"
25HHA460	0	X	0	X	X	43 1/8"	44 1/2"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	35 1/8"	40 1/16"	14 1/2"	8 1/2"	18 7/8"	7/8"	3 3/8"	5 1/2"	258	288	50 1/2" X 20 1/2" X 46 1/8"
		208-230-1-60	230-1-60	208/230-3-60	460-3-60																	

X = YES
O = NO









UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
18,24	23" X 42"
30,36,48,60	24" X 50"

1. CLEARANCE REQUIREMENTS: SINGLE UNIT APPLICATIONS: WITH COIL FACING WALL: ALLOW 6 IN. MINIMUM CLEARANCE ON COIL SIDE AND COIL END AND 20 IN. MINIMUM CLEARANCE ON FAN SIDE. WITH FAN FACING WALL: ALLOW 8 IN. MINIMUM CLEARANCE ON FAN SIDE AND 6 IN. ON COIL END AND 20 IN. MINIMUM CLEARANCE ON COIL SIDE. MULTI-UNIT APPLICATIONS: ALLOW 24 IN. MINIMUM CLEARANCE BETWEEN FAN AND COIL SIDES OF MULTIPLE UNITS. ARRANGE UNITS SO DISCHARGE OF ONE DOES NOT ENTER INLET OF ANOTHER.WHEN TWO UNITS ARE INSTALLED END TO END WITH THE COIL ENDS FACING EACH OTHER ALLOW 12 IN. MINIMUM CLEARANCE BETWEEN UNITS. COMPRESSOR END SERVICE CLEARANCE: ALLOW 24 IN. MINIMUM CLEARANCE ON COMPRESSOR END WHEN UNITS ARE STACKED OR THERE IS LESS THAN 40 IN. OF CLEARANCE ABOVE THE TOP OF THE UNIT. IF THERE IS 40 IN. CLEARANCE ABOVE UNIT AND THE TOP PANEL IS ACCESSIBLE FOR REMOVAL ALLOW 8 IN. MINIMUM CLEARANCE ON COMPRESSOR END FOR SERVICE.

   IMPORTANT: WHEN INSTALLING SINGLE OR MULTIPLE UNITS IN AN ALCOVE, ROOF WELL, OR PARTIALLY ENCLOSED AREA, ENSURE THERE IS ADEQUATE VENTILATION TO PREVENT RECIRCULATION OF DISCHARGE AIR.

2. MINIMUM OUTDOOR OPERATING AMBIENT IN COOLING MODE IS 55°F, MAX. 125°F.

3. SERIES DESIGNATION IS THE 13TH POSITION OF THE UNIT MODEL NUMBER.

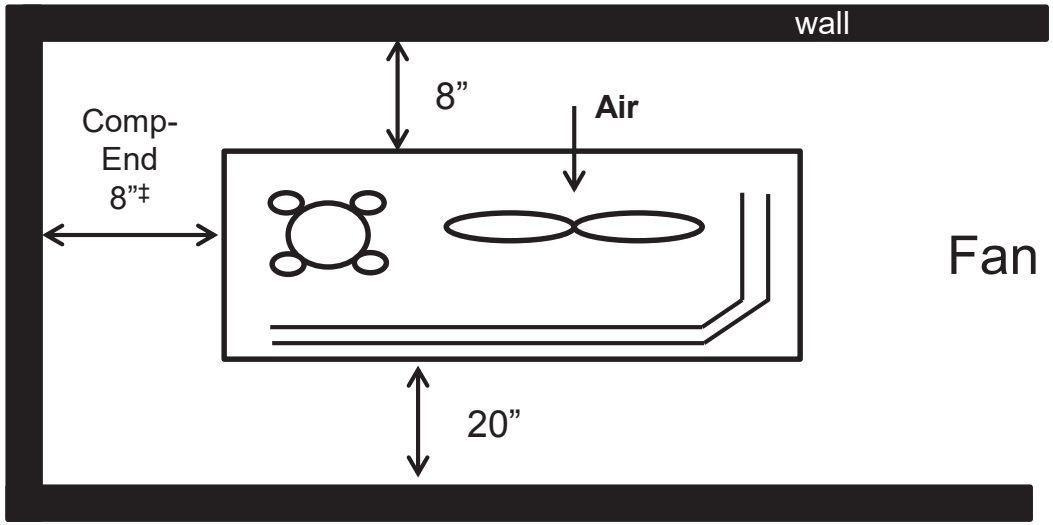
4. CENTER OF GRAVITY

5. ALL DIMENSIONS ARE IN "INCHES" UNLESS NOTED.

CLEARANCE - WALLS

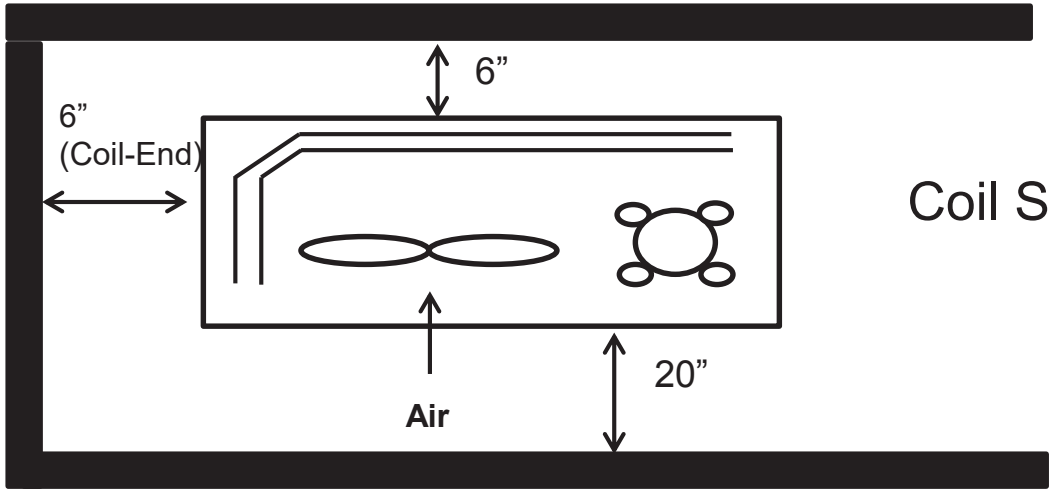
hello tomorrow

expect the unexpected



Fan Side Closest to Wall

‡ If there is 40” clearance above unit and the top panel is accessible for removal allow 8” minimum clearance on compressor end for service; otherwise minimum clearance on compressor end is 24”.



Coil Side Closest to Wall

Carrier

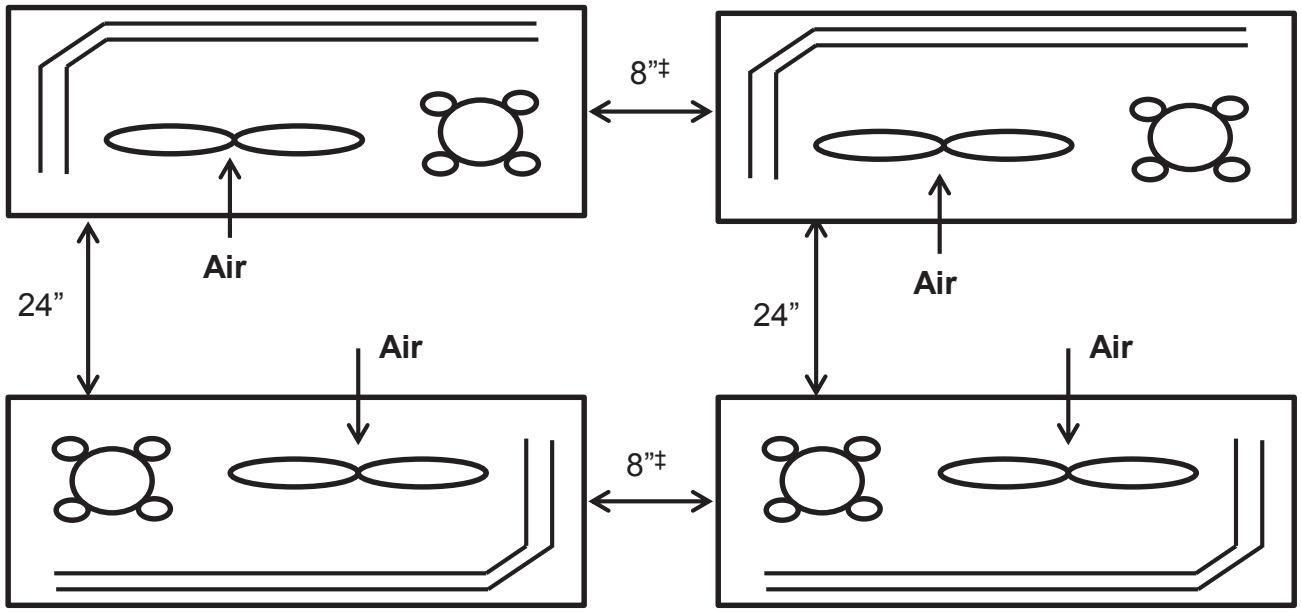
turn to the experts

CLEARANCE - MULTIPLE UNITS

hello tomorrow

expect the unexpected

Orientation: Fan Sides Facing Other Unit



‡ If there is 40” clearance above unit and the top panel is accessible for removal allow 8” minimum clearance on compressor end for service; otherwise minimum clearance on compressor end is 24”.

Carrier

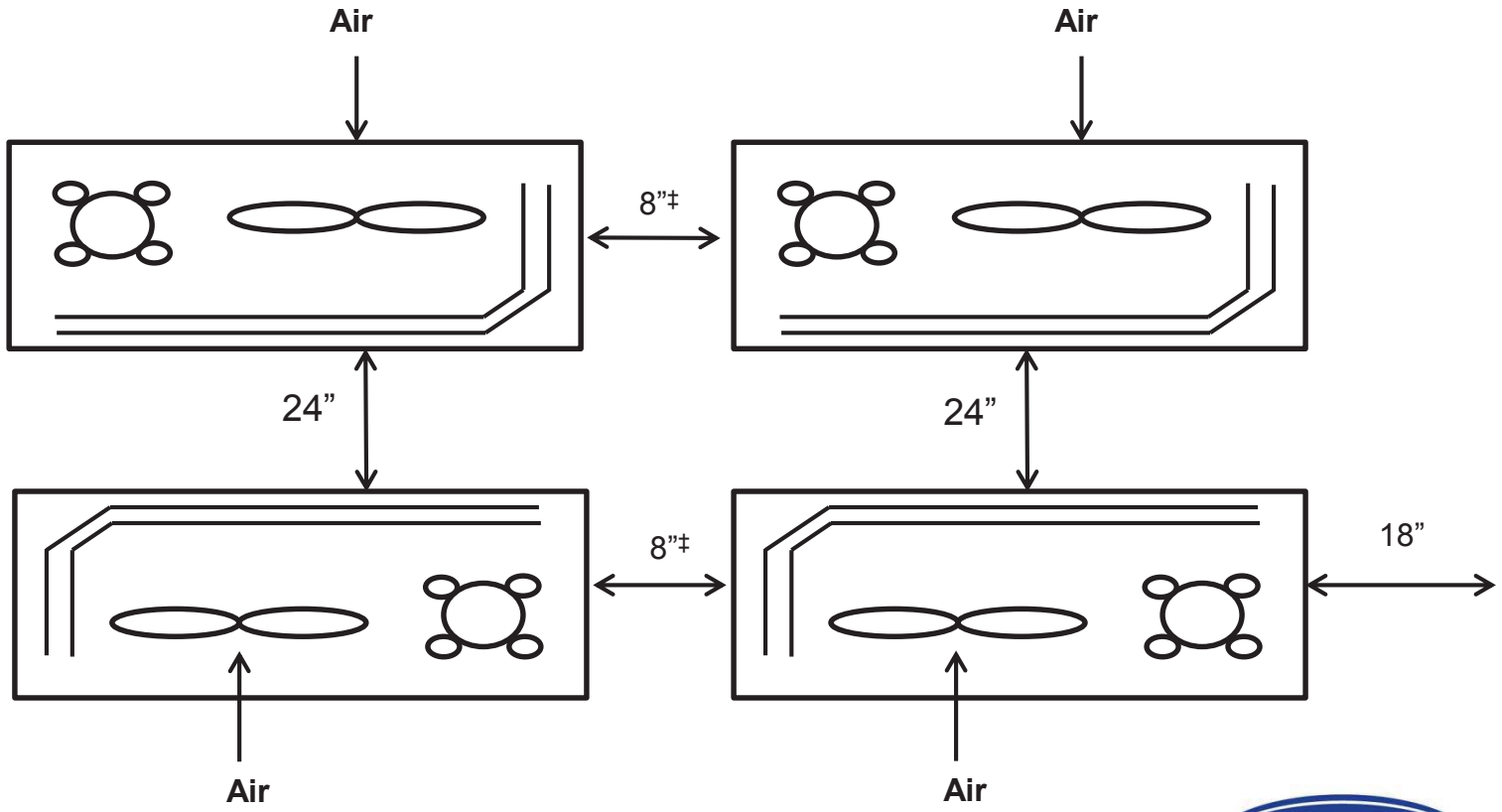
turn to the experts

CLEARANCE - MULTIPLE UNITS

hello tomorrow

expect the unexpected

Orientation: Coil Sides Facing Other Unit



‡ If there is 40” clearance above unit and the top panel is accessible for removal allow 8” minimum clearance on compressor end for service; otherwise minimum clearance on compressor end is 24”.

Carrier

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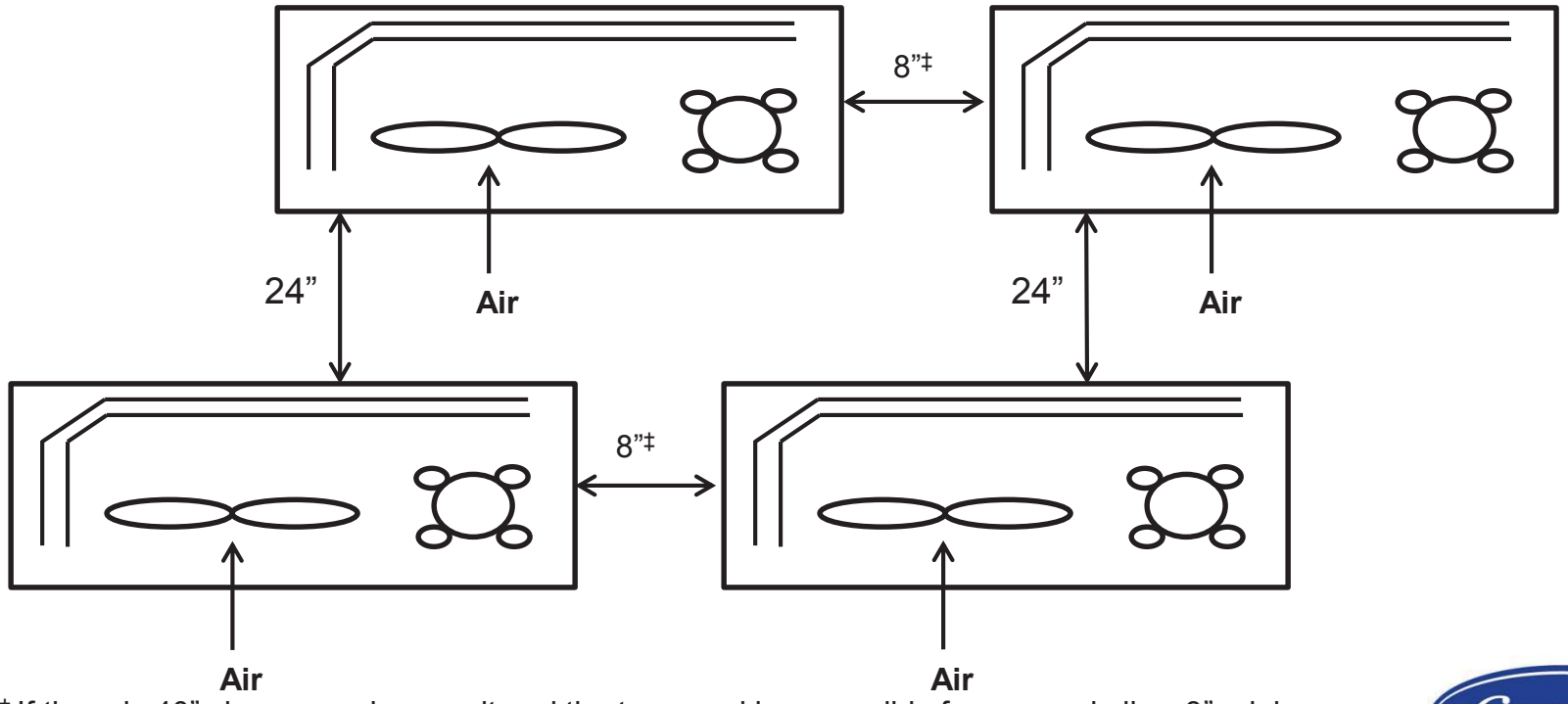
CLEARANCE - MULTIPLE UNITS

hello tomorrow

expect the unexpected

Orientation: Coil Side Facing Fan Side of Other Unit

Arrange units so discharge of one does not enter inlet of another



‡ If there is 40” clearance above unit and the top panel is accessible for removal allow 8” minimum clearance on compressor end for service; otherwise minimum clearance on compressor end is 24”.

Carrier

turn to the experts

ATTACHMENT 3

Noise Modeling Data

Equipment Noise Levels

Total Equipment

Phase	Piece	Number
Grading	Excavators	2
	Graders	1
	Rubber Tired Dozer	1
	Scrapers	2
	Loaders	2

Maximum Simultaneously Active Equipment

Phase	Piece	Number	Individual Noise Level (dB[A] at 50 feet)	Acoustical Usage Factor	Sound Power Level	Cumulative Noise Level (dB[A] at 50 feet)
Grading	Excavators	1	85	0.4	126491106	85.8
	Graders	1	85	0.4	126491106	
	Rubber Tired Dozer	1	85	0.4	126491106	
	Scrapers	0	85	0.4	0	
	Loaders	0	80	0.4	0	

Type	Ground Type	Reference Leq (dBA)	Reference Distance (Feet)	Directionality Factor (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room)	Sound Power Level SPL (dBA)
Point	Hard	85.8	50	2	117.4

Sound Power Level SPL (dBA)	Property Line to the	Distance (feet)	Cumulative Noise Level (dB[A] at 50 feet)
117.4	North	305	70
	South	380	68
	East	190	74
	West	225	73

Emissions Traffic Noise

Stationing (km)	ADT (Veh/24h)	Traffic values Vehicles type	Vehicle name	day (Veh/h)	Speed (km/h)	Control device	Constr. Speed (km/h)	Affect. veh. (%)	Road surface	Gradient Min / Max (%)
Prospect Avenue - East of Dove Hill Road		Traffic direction:	In entry direction							
0+000	9010	Total	-	375	-	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Automobiles	-	355	56	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Medium trucks	-	11	56	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Heavy trucks	-	4	56	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Buses	-	4	56	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Motorcycles	-	2	56	none	-	-	Average (of DGAC and PCC)	1.556
0+000	9010	Auxiliary vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	1.556
0+099	-	-	-	-	-	-				
Prospect Avenue - Dortha Court to Holden		Traffic direction:	In entry direction							
0+000	9010	Total	-	375	-	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Automobiles	-	355	56	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Medium trucks	-	11	56	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Heavy trucks	-	4	56	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Buses	-	4	56	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Motorcycles	-	2	56	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+000	9010	Auxiliary vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	0.0 / 1.1
0+206	-	-	-	-	-	-				
Prospect Avenue - West of Dortha Court		Traffic direction:	In entry direction							
0+000	9010	Total	-	375	-	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Automobiles	-	355	56	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Medium trucks	-	11	56	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Heavy trucks	-	4	56	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Buses	-	4	56	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Motorcycles	-	2	56	none	-	-	Average (of DGAC and PCC)	4.500
0+000	9010	Auxiliary vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	4.500
0+221	-	-	-	-	-	-				
Prospect Avenue - Holden Road to Dove Hi		Traffic direction:	In entry direction							
0+000	9010	Total	-	375	-	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Automobiles	-	355	56	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Medium trucks	-	11	56	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Heavy trucks	-	4	56	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Buses	-	4	56	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Motorcycles	-	2	56	none	-	-	Average (of DGAC and PCC)	-1.000
0+000	9010	Auxiliary vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.000
0+197	-	-	-	-	-	-				

Modeling Results Table - Traffic Noise

Receiver	Land Use	Location		Noise Level dB(A)		
		Latitude	Longitude	First Floor	Second Floor	Third Floor
1	Condominiums	499,137.51	3,632,852.63	20	23	39
2	Condominiums	499,134.16	3,632,852.65	20	23	39
3	Condominiums	499,122.89	3,632,852.71	19	23	38
4	Condominiums	499,119.54	3,632,852.73	19	23	38
5	Condominiums	499,083.28	3,632,853.24	19	23	35
6	Condominiums	499,079.93	3,632,853.26	19	23	35
7	Condominiums	499,068.66	3,632,853.32	19	23	35
8	Condominiums	499,065.31	3,632,853.34	19	23	35
9	Condominiums	499,049.28	3,632,848.40	27	30	35
10	Condominiums	499,100.16	3,632,848.12	29	32	37
11	Condominiums	499,103.21	3,632,848.10	29	32	37
12	Condominiums	499,154.40	3,632,847.82	40	41	41
13	Condominiums	499,031.38	3,632,834.94	20	23	35
14	Condominiums	499,025.66	3,632,819.29	30	33	37
15	Condominiums	499,025.34	3,632,815.94	32	34	37
16	Condominiums	499,025.58	3,632,804.66	32	35	38
17	Condominiums	499,025.25	3,632,801.31	32	35	38
18	Condominiums	499,031.11	3,632,785.28	34	37	38
19	Condominiums	499,054.88	3,632,813.33	29	32	36
20	Condominiums	499,070.18	3,632,808.52	25	28	34
21	Condominiums	499,073.63	3,632,808.50	25	28	34
22	Condominiums	499,084.87	3,632,808.44	25	28	34
23	Condominiums	499,097.16	3,632,813.07	33	35	36
24	Condominiums	499,054.18	3,632,797.19	31	33	37
25	Condominiums	499,070.20	3,632,801.82	28	31	37
26	Condominiums	499,073.55	3,632,801.80	29	31	38
27	Condominiums	499,084.82	3,632,801.74	29	31	38
28	Condominiums	499,096.83	3,632,796.95	34	36	39
29	Condominiums	499,105.45	3,632,813.05	31	34	37
30	Condominiums	499,121.51	3,632,808.24	30	32	37
31	Condominiums	499,124.82	3,632,808.22	31	34	37
32	Condominiums	499,136.02	3,632,808.15	35	39	39
33	Condominiums	499,148.11	3,632,812.81	40	43	42
34	Condominiums	499,105.06	3,632,796.90	34	37	39
35	Condominiums	499,121.38	3,632,801.53	31	35	39
36	Condominiums	499,124.74	3,632,801.51	33	35	40
37	Condominiums	499,136.01	3,632,801.45	34	36	41
38	Condominiums	499,147.95	3,632,796.63	41	43	43
39	Single Family Residences	499,150.29	3,632,742.75	41	-	-
40	Single Family Residences	499,133.05	3,632,745.88	40	-	-
41	Single Family Residences	499,115.55	3,632,747.33	37	39	-
42	Single Family Residences	499,081.39	3,632,746.06	37	-	-
43	Single Family Residences	499,064.23	3,632,745.94	33	-	-
44	Single Family Residences	499,049.55	3,632,760.80	33	37	-
45	Single Family Residences	499,049.62	3,632,741.44	35	-	-
46	Single Family Residences	499,049.33	3,632,721.22	37	40	-
47	Single Family Residences	499,062.63	3,632,738.11	33	-	-
48	Single Family Residences	499,079.13	3,632,737.33	37	38	-
49	Single Family Residences	499,135.81	3,632,734.64	41	-	-
50	Single Family Residences	499,099.58	3,632,675.87	51	-	-
51	Single Family Residences	499,078.88	3,632,670.65	51	-	-
52	Single Family Residences	499,061.43	3,632,666.90	52	-	-
53	Single Family Residences	499,048.98	3,632,685.55	47	50	-

ATTACHMENT 4

Mitigation Modeling

Noise Calculations

Reference Sound Pressure Level (dBA)	72
Factor: (1 = in air) (2 = over flat plane) (4 = against	2
Ground Condition	Hard

	Physical Geometry, Height of:				Physical Geometry, Horizontal distance from:		
Orientation	Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
1	24	2	4	5	2	3	5
2						4	4
3						5	5
4						6	6
5						7	7
6						8	8
7						9	9
8						10	10
9						11	11
10						12	12
11						13	13
12						14	14
13						15	15
14						16	16

	Physical Geometry, Path Length:				Noise Level			
Orientation	Without Barrier (feet)	With Barrier (feet)	Difference (feet)	Fresnel Number	Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	Exceeds Standards?
1	5.8	6.0	0.160	0.147	7.2	59.0	52	Yes
2	5.0	6.1	1.123	1.034	13.2	60.4	47	Yes
3	5.8	7.1	1.268	1.167	13.7	59.0	45	Yes
4	6.7	8.1	1.375	1.265	14.1	57.8	44	Yes
5	7.6	9.1	1.455	1.339	14.3	56.7	42	Yes
6	8.5	10.1	1.518	1.397	14.5	55.7	41	Yes
7	9.5	11.1	1.569	1.444	14.6	54.8	40	Yes
8	10.4	12.0	1.610	1.481	14.7	54.0	39	No
9	11.4	13.0	1.644	1.513	14.8	53.2	38	No
10	12.4	14.0	1.672	1.539	14.9	52.5	38	No
11	13.3	15.0	1.697	1.562	15.0	51.8	37	No
12	14.3	16.0	1.718	1.581	15.0	51.2	36	No
13	15.3	17.0	1.736	1.598	15.0	50.6	36	No
14	16.3	18.0	1.752	1.613	15.1	50.1	35	No

Noise Calculations

Reference Sound Pressure Level (dBA)	72
Factor: (1 = in air) (2 = over flat plane) (4 = against	2
Ground Condition	Hard

Orientation	Physical Geometry, Height of: Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Physical Geometry, Horizontal distance from: Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
15	24	2	5	5	2	3	5
16						4	4
17						5	5
18						6	6
19						7	7
20						8	8
21						9	9
22						10	10
23						11	11
24						12	12
25						13	13
26						14	14
27						15	15
28						16	16

Orientation	Physical Geometry, Path Length: Without Barrier (feet)	With Barrier (feet)	Difference (feet)	Fresnel Number	Noise Level Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	Exceeds Standards?
15	5.8	6.6	0.775	0.713	11.8	59.0	47	**Yes**
16	5.0	7.6	2.606	2.398	16.8	60.4	44	**Yes**
17	5.8	8.6	2.775	2.553	17.1	59.0	42	**Yes**
18	6.7	9.6	2.897	2.666	17.2	57.8	41	**Yes**
19	7.6	10.6	2.990	2.751	17.4	56.7	39	**No**
20	8.5	11.6	3.062	2.818	17.5	55.7	38	**No**
21	9.5	12.6	3.119	2.870	17.6	54.8	37	**No**
22	10.4	13.6	3.165	2.913	17.6	54.0	36	**No**
23	11.4	14.6	3.204	2.948	17.7	53.2	36	**No**
24	12.4	15.6	3.236	2.978	17.7	52.5	35	**No**
25	13.3	16.6	3.264	3.004	17.8	51.8	34	**No**
26	14.3	17.6	3.288	3.026	17.8	51.2	33	**No**
27	15.3	18.6	3.308	3.045	17.8	50.6	33	**No**
28	16.3	19.6	3.327	3.062	17.8	50.1	32	**No**

Noise Calculations

Reference Sound Pressure Level (dBA)	72
Factor: (1 = in air) (2 = over flat plane) (4 = against	2
Ground Condition	Hard

	Physical Geometry, Height of:				Physical Geometry, Horizontal distance from:		
Orientation	Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
29	24	2	6	5	2	3	5
30						4	4
31						5	5
32						6	6
33						7	7
34						8	8
35						9	9
36						10	10
37						11	11
38						12	12
39						13	13
40						14	14
41						15	15
42						16	16

	Physical Geometry, Path Length:			Fresnel Number	Noise Level			Exceeds Standards?
Orientation	Without Barrier (feet)	With Barrier (feet)	Difference (feet)		Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	
29	5.8	7.6	1.803	1.660	15.2	59.0	44	**Yes**
30	5.0	8.6	3.595	3.309	18.2	60.4	42	**Yes**
31	5.8	9.6	3.740	3.442	18.4	59.0	41	**Yes**
32	6.7	10.6	3.847	3.540	18.5	57.8	39	**No**
33	7.6	11.5	3.927	3.614	18.6	56.7	38	**No**
34	8.5	12.5	3.990	3.672	18.6	55.7	37	**No**
35	9.5	13.5	4.041	3.719	18.7	54.8	36	**No**
36	10.4	14.5	4.082	3.756	18.7	54.0	35	**No**
37	11.4	15.5	4.116	3.788	18.8	53.2	34	**No**
38	12.4	16.5	4.144	3.814	18.8	52.5	34	**No**
39	13.3	17.5	4.169	3.837	18.8	51.8	33	**No**
40	14.3	18.5	4.190	3.856	18.8	51.2	32	**No**
41	15.3	19.5	4.208	3.873	18.9	50.6	32	**No**
42	16.3	20.5	4.225	3.888	18.9	50.1	31	**No**

Noise Calculations

Reference Sound Pressure Level (dBA)	72
Factor: (1 = in air) (2 = over flat plane) (4 = against	2
Ground Condition	Hard

Orientation	Physical Geometry, Height of: Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Physical Geometry, Horizontal distance from: Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
43	24	2	**7**	5	2	3	5
44						4	4
45						5	5
46						6	6
47						7	7
48						8	8
49						9	9
50						10	10
51						11	11
52						12	12
53						13	13
54						14	14
55						15	15
56						16	16

Orientation	Physical Geometry, Path Length: Without Barrier (feet)	With Barrier (feet)	Difference (feet)	Fresnel Number	Noise Level Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	Exceeds Standards?
43	5.8	9.0	3.160	2.908	17.6	59.0	41	**Yes**
44	5.0	9.9	4.857	4.470	19.5	60.4	41	**Yes**
45	5.8	10.8	4.939	4.546	19.6	59.0	39	**No**
46	6.7	11.7	5.002	4.603	19.6	57.8	38	**No**
47	7.6	12.7	5.050	4.647	19.7	56.7	37	**No**
48	8.5	13.6	5.087	4.682	19.7	55.7	36	**No**
49	9.5	14.6	5.118	4.710	19.7	54.8	35	**No**
50	10.4	15.6	5.143	4.733	19.7	54.0	34	**No**
51	11.4	16.6	5.164	4.752	19.8	53.2	33	**No**
52	12.4	17.6	5.181	4.768	19.8	52.5	33	**No**
53	13.3	18.5	5.196	4.782	19.8	51.8	32	**No**
54	14.3	19.5	5.209	4.794	19.8	51.2	31	**No**
55	15.3	20.5	5.221	4.805	19.8	50.6	31	**No**
56	16.3	21.5	5.231	4.814	19.8	50.1	30	**No**