EILAR ASSOCIATES, INC.

Acoustical and Environmental Consulting

210 South Juniper Street, Suite 100, Escondido, CA 92025
Phone: 760-738-5570 or 800-439-8205 • Fax: 760-738-5227
www.eilarassociates.com • info@eilarassociates.com

March 22, 2019

Job #B80907N2

Bay Vista Methodist Heights
Attention: Cheryl Lee
140 Escondido Boulevard
Escondido, California 92025

Subject: Response to Comments for Lisbon Heights (City of San Diego Project No. 622368)

This letter is in response to City of San Diego staff review comments for the Lisbon Heights project (City of San Diego Project No. 622368). Comments are found in the letter dated March 8, 2019 and have been addressed in a revised version of the report, dated March 22, 2019, and this letter will reference the location of each comment response or requested changes in the revised report.

Italics are added to indicate City of San Diego staff comments.

City of San Diego Staff Comments:

1. *Section 4.1.2 and 4.1.3 states additional information can be provided on request. Please include this information in the report.*

   RESPONSE: This statement is included to encourage those reviewing the report to contact Eilar Associates with specific questions relating to the noise modeling performed with these software programs for this project, should they arise. It is the opinion of Eilar Associates that the information contained herein is an appropriate summary of the software programs, and for this reason, the statement has been removed from these sections.

2. *According to Table 6, exterior noise levels at Lot 1 are 59.4 CNEL, however section 5.2 states it is above 60 CNEL. Please clarify.*

   RESPONSE: Though the outdoor use receiver at Lot 1 (OU1) is shown to have an exterior noise level of 59.4 CNEL, future noise contours show that noise levels on part of Lot 1 exceed 60 CNEL, and therefore, building facades may be exposed to exterior noise levels exceeding 60 CNEL. Please refer to Figure 6 for a graphical representation of exterior noise contours.

3. *Mitigation for operational uses may not be required if noise levels are analyzed including the barriers. If this is the case, barriers would be included as project features and ensured as a condition of approval instead of mitigation.*

RESPONSE: The language in the report has been revised to consider the barriers to be project design features and not mitigation measures.

4. *Section 5.4 states that limited construction information was available, however, more specific information was provided within other submitted reports. Please include additional information regarding the anticipated construction.*

   RESPONSE: The construction noise analysis has been updated to include the more detailed construction assumptions obtained from the Air Quality Screening Letter prepared for this project, prepared by Ldn Consulting, Inc., dated October 10, 2018. Please refer to Section 3.2.3 and Section 5.4 for additional information.

If you have any questions or require additional information, please feel free to contact Mo Ouwenga at 760-738-5570 or mouwenga@eilarassociates.com.

EILAR ASSOCIATES, INC.

Mo Ouwenga, Acoustical Consultant

Amy Hool, Senior Acoustical Consultant

ACOUSTICAL ANALYSIS REPORT

Lisbon Heights
Lisbon Street
San Diego, California 92114

Prepared For

Bay Vista Methodist Heights
Attention: Cheryl Lee
140 Escondido Boulevard
Escondido, California 92025

Prepared By

Eilar Associates, Inc.
Acoustical & Environmental Consulting
210 South Juniper Street, Suite 100
Escondido, California 92025
www.eilarassociates.com
Phone: 760-738-5570
Fax: 760-738-5227

Job #B80907N1

Original Report: October 10, 2018
Revised: March 22, 2019

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APPENDICES

1.0 EXECUTIVE SUMMARY

The proposed project, Lisbon Heights, consists of the subdivision of a single parcel to contain 24 single-family residential lots. The project site is located on Lisbon Street, to the north and west of the properties located at 7122, 7136, and 7150 Lisbon Street, in the City of San Diego, California.

The current and future noise environment consists primarily of automobile and truck traffic noise from Lisbon Street and Imperial Avenue, with minor noise impacts from the nearby San Diego Metropolitan Transit System Orange Line Trolley. Future combined (traffic and rail) noise levels on site are expected to range from approximately 53 CNEL to approximately 68 CNEL.

As per the City of San Diego Noise Element to the General Plan, outdoor use areas of single-family land uses must maintain noise levels no greater than 65 CNEL. Future combined noise impacts at private outdoor use areas were calculated and show that noise levels will range from approximately 53 CNEL to approximately 59 CNEL. Calculations show that outdoor use areas at all lots are expected to be exposed to transportation noise levels of less than 65 CNEL in the future noise environment, and therefore, are expected to comply with the requirements of the City of San Diego as currently designed.

The City of San Diego Noise Element and State of California require interior noise levels of 45 CNEL or less in habitable residential spaces. Calculations show that future noise levels on site are not expected to exceed 60 CNEL at any lots, with the exception of Lot 1. Due to high noise levels at Lot 1, an exterior to interior analysis should be performed when building plans become available, prior to the issuance of building permits. However, the required interior noise levels are feasible and can be achieved with readily available building materials and construction methods.

The City of San Diego requires the assessment of noise impacts from project-related noise sources, such as mechanical equipment, to determine if additional project design features are necessary and feasible to reduce project-related noise impacts to comply with applicable noise limits. Calculations show that, with the project design features contained in Table 8 herein in place, exterior noise impacts from proposed mechanical equipment are expected to meet the applicable noise limits defined by the City of San Diego Municipal Code at all surrounding property lines.

Noise levels from temporary construction activities associated with this project are expected to comply with the applicable City of San Diego construction noise limits at all surrounding property lines with activity limited to the daytime hours of 7 a.m. to 7 p.m. during all phases of construction, as designed. Construction is prohibited between the hours of 7 p.m. and 7 a.m. and on Sundays or legal holidays. It is also recommended that the general good-practice construction noise control methods listed herein be followed, as a courtesy to surrounding properties.

2.0 INTRODUCTION

This acoustical analysis report is submitted to satisfy the acoustical requirements of the City of San Diego Noise Element to the General Plan and Municipal Code, and the State of California Building Code. Its purpose is to assess noise impacts from nearby transportation sources to identify project features or requirements necessary to achieve exterior noise levels of 65 CNEL or less at outdoor use areas, and interior noise levels of 45 CNEL or less in habitable residential space, in compliance with the City of San Diego Noise Element to the General Plan and State of California Building Code noise regulations. This analysis will also address the potential noise impacts caused by the project at

surrounding noise-sensitive receivers, and, if needed, recommend project design features to reduce impacts to be compliant with applicable noise limits.

All noise level or sound level values presented herein are expressed in terms of decibels, with A-weighting to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, for a specified duration. The Community Noise Equivalent Level (CNEL) is a calculated 24-hour weighted average, where sound levels during evening hours of 7 p.m. to 10 p.m. have an added 5 dB weighting, and sound levels during nighttime hours of 10 p.m. to 7 a.m. have an added 10 dB weighting. This is similar to the Day-Night sound level, L_{DN}, which is a 24-hour average with an added 10 dB weighting on the same nighttime hours but no added weighting on the evening hours. For the purposes of this analysis, L_{DN} was considered to be equivalent to CNEL. Sound levels expressed in CNEL are always based on A-weighted decibels. These metrics are used to express noise levels for both measurement and municipal regulations, for land use guidelines, and for enforcement of noise ordinances.

Sound pressure is the actual noise experienced by a human or registered by a sound level instrument. When sound pressure is used to describe a noise source it must specify the distance from the noise source to provide complete information. Sound power, on the other hand, is a specialized analytical metric used to provide information without the distance requirement, and may be used to calculate the sound pressure at any desired distance.

2.1 Project Description

The proposed project, Lisbon Heights, consists of the subdivision of a single parcel to contain 24 single-family residential lots. Additional information is provided in the project plans, included as Appendix A.

2.2 Project Location

The project site is located on Lisbon Street, to the north and west of the properties located at 7122, 7136, and 7150 Lisbon Street, in the City of San Diego, California. The project site has an overall area of approximately 162,000 square feet. The Assessor's Parcel Number (APN) for the property is 581-050-01-00.

The project location is shown on the Vicinity Map, Figure 1, following this report. An Assessor's Parcel Map, Satellite Aerial Photograph, and Topographic Map of this area are also provided as Figures 2 through 4, respectively.

2.3 Applicable Noise Standards

This acoustical analysis report is submitted to satisfy the acoustical requirements of the City of San Diego Noise Element to the General Plan and Municipal Code, and the State of California Building Code. The City of San Diego Noise Element to the General Plan and California Building Code require interior noise levels not exceeding 45 CNEL in habitable residential space. The City of San Diego requires that noise levels at residential outdoor use areas do not exceed 65 CNEL.

The City of San Diego Municipal Code, Section 59.5.0401 specifies noise limits based on the land use of the properties in question. As the City of San Diego Municipal Code states that noise limits apply "on the boundaries of the property," noise levels have been evaluated at the adjacent property lines. The most restrictive nighttime noise limits at surrounding land uses are 40 dBA for single-family residential properties.

In addition, Section 59.5.0404 of the City of San Diego Municipal Code states that construction activity is prohibited between the hours of 7 p.m. and 7 a.m. and on Sundays or legal holidays. During permissible hours of operation, noise levels from construction activity must be limited to a twelve-hour average of no greater than 75 dBA at any property line zoned for residential use. As this project is not anticipated to generate any significant vibration due to construction equipment, no vibration impacts are expected.

Please refer to Appendix B for pertinent sections of the City of San Diego Noise Element to the General Plan, City of San Diego Municipal Code, and California Building Code.

3.0 ENVIRONMENTAL SETTING

3.1 Existing Noise Environment

The primary noise sources in the vicinity of the project site include automobile and truck traffic noise from Lisbon Street and Imperial Avenue, with minor noise impacts from the nearby San Diego Metropolitan Transit System Orange Line Trolley. No other noise source is considered significant.

3.1.1 Railway Noise Sources

The San Diego Metropolitan Transit System Orange Line Trolley system is located approximately 970 feet to the northwest (1320 feet to the west) of the project site. Based on current schedules, it has been determined that 144 trolleys pass this site each day, with approximately 22 percent of operations occurring during the nighttime hours of 10 p.m. to 7 a.m. Calculations were performed using the CREATE Railway Noise and Vibration Model (see reference) to determine the noise impacts from trolley traffic on the project site. With the current peak volume of 144 trolleys each day, with approximately 22 percent of operations occurring during the nighttime hours, the railway noise level was calculated to be approximately 45 L_{DN} near the southwest corner of the project site, without considering any shielding provided by intervening structures. L_{DN} was considered equivalent to CNEL for the purposes of this analysis.

A Cadna noise model was calibrated using the results of the CREATE model to evaluate railway noise impacts to the project site. Calculations were performed with Cadna, without shielding taken into account, and the noise impact near the southwest corner of the project site in the Cadna model was found to be 45 dB (CNEL). Combined railway and traffic noise contours without considering intervening structures were calculated for the site, and are shown graphically in Figure 5. Detailed calculations of railway noise have been performed for the determination of combined future noise impacts on site, and are addressed in Section 5.1 of this report. Please refer to Appendix C for additional information.

3.1.2 Roadway Traffic Noise

Current and future (2035) traffic volumes are given based on information from the San Diego Association of Governments (SANDAG) Transportation Data, and the Series 12 Transportation Forecast Information Center, respectively.

Lisbon Street is a two-lane, two-way Collector running east-west along the south boundary of the project site. The posted speed limit is 35 mph. In the vicinity of the project site, Lisbon Street currently carries a traffic volume of approximately 9,400 Average Daily Trips (ADT), according to the SANDAG 2015 traffic volumes.

Imperial Avenue is a four-lane, two-way Major Arterial running generally north-south to the west of the project site. The posted speed limit is 50 mph north of Lisbon Street and 40 mph south of Lisbon Street. In the vicinity of the project site, Imperial Avenue currently carries a traffic volume of approximately 9,100 ADT north of Lisbon Street and approximately 18,800 ADT south of Lisbon Street, according to the SANDAG 2015 traffic volumes.

No current or future truck percentages were available for Lisbon Street or Imperial Avenue; however, based on neighboring and surrounding land use, roadway classification, professional experience, and on-site observations, a truck percentage mix of 2% medium trucks and 2% heavy trucks was used for both roadways.

Current and future traffic volumes and vehicle mixes for roadway sections near the project site are shown in Table 1. For more information, please refer to Appendix D.

Table 1. Overall Roadway Traffic Information

Roadway Name	Speed Limit (mph)	Vehicle Mix (%)		Current Traffic ADT (2015)	Future Traffic ADT (2035)
		Medium Trucks	Heavy Trucks		
Lisbon Street	35	2.0	2.0	9,400	11,300 / 13,700[1]
Imperial Avenue (North of Lisbon Street)	50	2.0	2.0	9,100	10,200
Imperial Avenue (South of Lisbon Street)	40	2.0	2.0	18,800	29,300

[1]Future traffic volumes of Lisbon Street are given for roadway segments east and west of 71st Street, respectively.

Without existing or proposed on-site structures, the current combined (traffic and rail) noise contours calculated at ground level showed that traffic noise impacts to the project site are between 52 and 67 CNEL. Additional information is provided in Appendix D. For a graphical representation of current combined noise contours, please refer to Figure 5: Site Plan Showing Current Combined CNEL Contours.

3.1.3 Measured Noise Level

An on-site inspection and traffic noise measurement were made on the afternoon of Friday, September 28, 2018. The noise measurement was made using the methodology described in Section 4.1, along Lisbon Street, approximately 26 feet north of the Lisbon Street centerline and approximately 220 feet east of the 71st Street centerline. The microphone was placed at approximately five feet above the existing grade. Traffic volumes for Lisbon Street were recorded for automobiles, medium-size trucks, and large trucks during the measurement period. After a 15-minute traffic noise measurement (paused for extraneous non-traffic noise events such as aircraft or trolleys), no changes in the L_{EQ} were observable and results were recorded. The measured noise level and related weather conditions are found in Table 2. Additional information is provided in Appendix D.

Table 2. On-Site Noise Measurement Conditions and Results	
Date	Friday, September 28, 2018
Time	1:32 p.m. – 1:58 p.m.
Conditions	Sunny skies, winds at 6-9 mph, temperature in the high 70s with moderate humidity
Measured Noise Level	67.7 dBA L_{EQ}

3.1.4 Calculated Traffic Noise Level

Traffic noise levels were calculated for the site using the methodology described in Section 4.1 for the location, conditions, and traffic volumes counted during the noise measurements. The calculated roadway traffic noise levels (L_{EQ}) were compared with the measured on-site noise level to determine if adjustments or corrections (calibration) should be applied to the traffic noise prediction model in the Traffic Noise Model software (TNM). Adjustments are intended to account for site-specific variances in overall reflectivity or absorption, which may not be accurately represented by the default settings in the model.

The measured noise level of 67.7 dBA L_{EQ} approximately 26 feet north of the Lisbon Street centerline and approximately 220 feet east of the 71st Street centerline was compared to the calculated (modeled) noise level of 67.5 dBA L_{EQ}, for the same weather conditions and traffic flow. According to the Federal Highway Administration's Highway Traffic Noise: Analysis and Abatement Guide (see reference), a traffic noise model is considered validated if the measured and calculated noise impacts differ by three decibels or less. No adjustment was deemed necessary to model future noise levels for this noise model as the difference between the measured and calculated levels was found to be less than three decibels. The Traffic Noise Model is assumed to be representative of actual traffic noise that is experienced on site. This information is presented in Table 3.

Table 3. Calculated versus Measured Traffic Noise Data				
Calibration Receiver Position	**Calculated**	**Measured**	**Difference**	**Correction**
26 feet north of Lisbon Street C.L. and 220 feet east of 71st Street C.L.	67.5 dBA L_{EQ}	67.7 dBA L_{EQ}	0.2 dB	None applied

3.2 Future Noise Environment

3.2.1 Future Transportation Noise

The future on-site noise environment will be the result of the same noise sources. Future trolley noise is not expected to change significantly, and therefore, was modeled as described above. The future (year 2035) traffic volumes for surrounding roadways were provided by SANDAG Series 12.

By the year 2035, the traffic volume of Lisbon Street is expected to increase to approximately 11,300 ADT and 13,700 ADT east and west of 71st Street, respectively. By the year 2035, the traffic volume of Imperial Avenue is expected to increase to approximately 10,200 ADT and 29,300 ADT north and south of Lisbon Street, respectively.

The same truck percentages from the current traffic volumes were used for future traffic volume modeling. For further roadway details and projected future ADT traffic volumes, please refer to Appendix D.

Future combined (traffic and rail) noise contours were calculated at ground level without considering shielding from proposed project buildings, and showed that future combined noise impacts to the project site are expected to be between 53 and 68 CNEL. Additional information is provided in Appendix D. For a graphical representation of these contours, please refer to Figure 6: Site Plan Showing Future Combined CNEL Contours.

3.2.2 Permanent Project-Related Mechanical Equipment Noise

Air conditioning units will be provided for each residence at the proposed project site. The air conditioning unit type is not yet proposed; therefore a typical air conditioning unit was used. All air conditioning units on site were evaluated as Carrier 24ACC6 five-ton units. Sound power levels for a single Carrier 24ACC6 five-ton unit were provided by the manufacturer. Table 4 shows the sound power level and spectrum data of the proposed air conditioner unit. Manufacturer data sheets are provided in Appendix E.

Table 4. Sound Power Level and Spectrum of Proposed Air Conditioning Units

Unit	Sound Power Level at Octave Band Frequency (dBA)							Total (dBA)
	125	250	500	1K	2K	4K	8K	
Carrier 24ACC6 (5 tons)	56.5	62.5	66.5	68.0	63.0	59.5	51.5	74

The noise levels shown in Table 4 were incorporated into the permanent project-related noise analysis for the surrounding site, provided in Section 5.3.

3.2.3 Temporary Construction Equipment

Detailed construction assumptions were obtained from the Air Quality Screening Letter prepared for this project, prepared by Ldn Consulting, Inc. (see reference). Construction equipment noise levels were obtained from the Department for Environment, Food & Rural Affairs (DEFRA) and duty cycles were obtained from the Federal Highway Administration (see references). Noise levels are shown in Table 5.

Table 5. Typical Construction Equipment Noise Levels

Noise Source	Duty Cycle (%)	Noise Level at 50 feet (dBA)
Tractor / Loader / Backhoe	40	72
Grader	40	82
Rubber Tired Dozer	40	75
Cement and Mortar Mixer	40	76
Paver	50	73
Paving Equipment	20	74
Roller	20	69
Forklift	40	67

Table 5. Typical Construction Equipment Noise Levels		
Noise Source	**Duty Cycle (%)**	**Noise Level at 50 feet (dBA)**
Generator Set	50	57
Welder	40	69
Crane	16	74
Air Compressor	40	61

These noise levels were incorporated into the temporary construction noise analysis for the site, provided in Section 5.4.

4.0 METHODOLOGY AND EQUIPMENT

4.1 Methodology

4.1.1 Field Measurement

Typically, a "one-hour" equivalent sound level measurement (L_{EQ}, A-Weighted) is recorded for at least one noise-sensitive location on the site. During the on-site noise measurement, start and end times are recorded, vehicle counts are made for cars, medium trucks (double-tires/two axles), and heavy trucks (three or more axles) for the corresponding road segment(s). Supplemental sound measurements of one hour or less in duration are often made to further describe the noise environment of the site.

For measurements of less than one hour in duration, the measurement time is long enough for a representative traffic volume to occur and the noise level (L_{EQ}) to stabilize. The vehicle counts are then converted to one-hour equivalent volumes by applying an appropriate factor. Other field data gathered include measuring or estimating distances, angles-of-view, slopes, elevations, roadway grades, and vehicle speeds. This information is subsequently verified using available maps and records.

4.1.2 Roadway Noise Calculation

The Traffic Noise Model (TNM) calculation protocol in Cadna Version 2018 (based on the methodology used in TNM Version 2.5, released in February 2004 by the U.S. Department of Transportation) was used for all traffic modeling in the preparation of this report. Using the TNM protocol, the CNEL is calculated as 0.092 times the ADT for surrounding roadways, based on the studies made by Wyle Laboratories (see reference). Future CNEL is calculated for desired receptor locations using future road alignment, elevations, lane configurations, projected traffic volumes, estimated truck mixes, and vehicle speeds. Noise attenuation methods may be analyzed, tested, and planned with TNM, as required.

In order to determine the estimated traffic volume during the traffic noise measurement made on site for model calibration, the approximate percentage of the Average Daily Trips (ADT) value for the time period in which the measurement is made is incorporated into the traffic model. These percentages have been established in a study performed by Katz-Okitsu and Associates, Traffic Engineers (see reference). For purposes of calibrating the Cadna TNM, 6.5% of the ADT values for the current environment were used in calculations (for roadways that were not manually counted) to account for traffic between the hours of 1 p.m. and 2 p.m. in the vicinity of the project site.

4.1.3 Cadna Noise Modeling Software

Modeling of the outdoor noise environment is accomplished using Cadna Version 2018, which is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. Cadna (Computer Aided Noise Abatement) assists in the calculation, presentation, assessment, and alleviation of noise exposure. It allows for the input of project information such as noise source data, barriers, structures, and topography to create a detailed model and uses the most up-to-date calculation standards to predict outdoor noise impacts. Noise standards used by Cadna that are particularly relevant to this analysis include ISO 9613 (Attenuation of sound during propagation outdoors). Cadna provides results that are in line with basic acoustical calculations for distance attenuation and barrier insertion loss.

4.1.4 Railway Noise Calculation

The railway noise analysis is accomplished using CREATE noise model and Cadna Version 2018 (see references). CREATE performs the evaluation of a site's exposure to railway noise by taking into account factors such as the distance from the site to the railroad track centerline, the number of diesel trains in both directions during an average 24-hour day, the fraction of trains that operate during the night, the average number of diesel locomotives, the average length of each train, the average train speed past the site, the rail types, and whether the site is nearby crossings where train whistles or horns are sounded. Results from CREATE are given at a single point, and therefore, Cadna is used in order to calculate noise impacts over the entire project site.

4.2 Measurement Equipment

The following equipment was used at the site to measure existing noise levels:

- Larson Davis Model LxT Type 1 Sound Level Meter, Serial # 4084
- Larson Davis Model CA250 Type 1 Calibrator, Serial # 2625
- Tripod, microphone windscreen

The sound level meter was field-calibrated prior to and following the noise measurement to ensure accuracy. All sound level measurements conducted and presented in this report, in accordance with the regulations, were made with a sound level meter that conforms to the American National Standards Institute specifications for sound level meters (ANSI S1.4). All instruments are maintained with National Bureau of Standards traceable calibrations, per the manufacturers' standards.

5.0 NOISE AND VIBRATION IMPACTS

5.1 Exterior Transportation Noise Impacts

5.1.1 Noise Impacts to Outdoor Use Areas

As per the City of San Diego Noise Element to the General Plan, outdoor use areas of single-family land uses must maintain noise levels no greater than 65 CNEL. Future combined noise impacts at private outdoor use areas were calculated and show that noise levels will range from approximately 53 CNEL to approximately 59 CNEL. Future combined noise impacts at outdoor use areas are shown in Table 6, and receiver locations are shown in Figure 7. Please refer to Appendix D for more information.

Table 6. Future Combined Noise Levels at Outdoor Use Areas		
Receiver	**Location**	**Exterior Noise Level (CNEL)**
OU1	Lot 1	59.4
OU2	Lot 2	56.8
OU3	Lot 3	56.1
OU4	Lot 4	55.1
OU5	Lot 5	54.2
OU6	Lot 6	53.5
OU7	Lot 7	53.5
OU8	Lot 8	53.7
OU9	Lot 9	53.4
OU10	Lot 10	53.3
OU11	Lot 11	53.4
OU12	Lot 12	53.1
OU13	Lot 13	52.7
OU14	Lot 14	53.0
OU15	Lot 15	53.6
OU16	Lot 16	54.3
OU17	Lot 17	56.2
OU18	Lot 18	57.5
OU19	Lot 19	58.0
OU20	Lot 20	57.9
OU21	Lot 21	57.9
OU22	Lot 22	55.0
OU23	Lot 23	54.1
OU24	Lot 24	53.6

As shown above, outdoor use areas at all lots are expected to be exposed to transportation noise levels of less than 65 CNEL in the future noise environment, and therefore, are expected to comply with the requirements of the City of San Diego as currently designed.

5.2 Interior Transportation Noise Impacts

The City of San Diego and State of California requires single-family developments to be designed in order to attenuate, control, and maintain interior noise levels to no greater than 45 CNEL in habitable space. Current exterior building construction is generally expected to achieve at least 15 decibels of exterior-to-interior noise attenuation, with windows opened, according to the U.S. EPA (see reference). Therefore, proposed project building structures exposed to exterior noise levels greater than 60 CNEL could be subject to interior noise levels exceeding the 45 CNEL noise limit in habitable residential space.

Calculations show that future noise levels on site are not expected to exceed 60 CNEL at any lots, with the exception of Lot 1. Due to high noise levels at Lot 1, an exterior to interior analysis should be performed when building plans become available, prior to the issuance of building permits. However, the required interior noise levels are feasible and can be achieved with readily available building materials and construction methods, such as the installation of dual pane windows, and installation of a mechanical ventilation system to provide fresh air to the interior of the residence while windows are closed.

These project design features have been approximated using the project plans currently available; however, they should be confirmed or adjusted in a detailed noise analysis to be prepared when construction documents become available and prior to the issuance of building permits.

5.3 Permanent Project-Related Noise Impacts

Noise levels of proposed permanent project-related mechanical equipment were calculated using Cadna at surrounding property lines to the north, east, and west. The air conditioning unit type is not yet proposed; therefore a typical air conditioning unit was used. All air conditioning units on site were evaluated as Carrier 24ACC6 five-ton units. Off-site receivers were calculated at a height of five feet above ground level. Noise levels were calculated considering shielding that will be provided by the proposed on-site structures, but did not consider shielding from other exterior barriers.

Results of mechanical noise impact calculations are shown in Table 7. Please see Figure 8 for a graphical representation of the mechanical noise contours and noise source and receiver locations. Additional information can be found in Appendix D: Cadna Analysis Data and Results.

Table 7. Calculated Mechanical Equipment Noise Levels – As Designed

Receiver	Receiver Location	Nighttime Noise Limit (dBA)	Equipment Noise Level (dBA)
M1/2	Lot 1 / Lot 2	40	**47.0**
M3/4	Lot 3 / Lot 4	40	**46.4**
M5/6	Lot 5 / Lot 6	40	**44.1**
M7/8	Lot 7 / Lot 8	40	**46.0**
M9	Lot 9	40	38.7
M10/11	Lot 10 / Lot 11	40	38.2
M12	Lot 12	40	36.3
M13/14	Lot 13 / Lot 14	40	**44.6**
M15/16	Lot 15 / Lot 16	40	**41.9**
M17	Lot 17	40	40.0
M18	Lot 18	40	**45.0**
M19/20	Lot 19 / Lot 20	40	**47.9**

Table 7. Calculated Mechanical Equipment Noise Levels – As Designed			
Receiver	**Receiver Location**	**Nighttime Noise Limit (dBA)**	**Equipment Noise Level (dBA)**
M21	Lot 21	40	**46.4**

As shown above, noise levels from the anticipated mechanical units are expected to exceed the applicable City of San Diego Municipal Code nighttime noise limits at surrounding property lines at all lots with the exception of Lots 9, 10, 11, 12, and 17 with no exterior noise barriers in place. Therefore, additional project design features are required. Noise attenuation barriers were placed in the model and evaluated to determine the barrier height required to lower HVAC noise levels to be compliant with the San Diego Municipal Code nighttime noise limits. Please refer to Table 8 for mechanical noise levels with these barrier walls in place, and Figure 9 for a graphical representation of equipment noise contours and barrier locations. Detailed calculations can be found in Appendix D.

Table 8. Calculated Mechanical Equipment Noise Levels – With Sound Attenuation Barriers				
Receiver	**Receiver Location**	**Nighttime Noise Limit (dBA)**	**Equipment Noise Level (dBA)**	**Required Barrier Height (feet)**
M1/2	Lot 1 / Lot 2	40	39.0	6
M3/4	Lot 3 / Lot 4	40	39.7	5
M5/6	Lot 5 / Lot 6	40	38.0	5
M7/8	Lot 7 / Lot 8	40	39.0	6
M13/14	Lot 13 / Lot 14	40	38.7	5
M15/16	Lot 15 / Lot 16	40	39.5	4
M18	Lot 18	40	39.0	5
M19/20	Lot 19 / Lot 20	40	39.6	6
M21	Lot 21	40	38.7	6

As shown in Table 8, with sound attenuation barriers of the heights detailed above installed around HVAC units in the configuration shown in Figure 9 in place, project-related noise impacts to surrounding properties are expected to comply with the applicable City of San Diego nighttime noise limits. These project design features should be included as a condition of approval of the project.

A sound wall should be solid and constructed of masonry, wood, plastic, fiberglass, steel, or a combination of those materials, with no cracks or gaps, through or below the wall. Any seams or cracks must be filled or caulked. If wood is used, it can be tongue and groove and must be at least 7/8-inch thick or have a surface density of at least 3½ pounds per square foot. Where architectural or aesthetic factors allow, glass or clear plastic may be used on the upper portion, if it is desirable to preserve a view. Sheet metal of 18-gauge (minimum) may be used, if it meets the other criteria and is properly supported and stiffened so that it does not rattle or create noise itself from vibration or wind.

5.4 Temporary Project-Related Noise Impacts

According to the City of San Diego Municipal Code, construction activity is prohibited between the hours of 7 p.m. and 7 a.m. and on Sundays or legal holidays. During permissible hours of operation, noise levels from construction activity must be limited to a twelve-hour average of no greater than 75 dBA at any property line zoned for residential use. As this project is not anticipated to generate any significant vibration due to construction equipment, no vibration impacts are expected.

An assumed schedule of construction activity was obtained from the Air Quality Screening Letter prepared for this project, prepared by Ldn Consulting, Inc., in order to determine potential temporary noise impacts to the surrounding residentially zoned receivers, per City of San Diego Municipal Code requirements. The nearest residential properties are located to the north, east, and west of the project site. Any other potentially noise-sensitive receivers are located at a greater distance from construction activity and therefore, would be exposed to lesser noise impacts due to distance attenuation and shielding provided by intervening structures. An anticipated summary of construction activity is shown in Table 9.

Table 9. Anticipated Construction Activity

Phase	Anticipated Large Equipment
1. Site Preparation	Tractor / Loader / Backhoe
2. Grading	Grader, Rubber Tired Dozer, Tractor / Loader / Backhoe
3. Paving	Cement and Mortar Mixers (x 2), Paver, Paving Equipment, Roller, Tractor / Loader / Backhoe
4. Building Construction without Crane	Forklifts (x 2), Generator Sets, Tractor / Loader / Backhoe (x 2), Welder
5. Building Construction with Crane	Forklifts, Generator Sets, Tractor / Loader / Backhoe, Welder, Crane
6. Architectural Coating	Air Compressor

Noise levels were calculated at the nearest receivers to the north, east, and west. Construction equipment noise sources were modelled as area sources, which simulates the noise impacts of the equipment as it moves around the construction site. Noise calculations consider typical duty cycles of equipment, to account for periods of activity and inactivity on the site.

Noise levels for each stage of construction are shown in Table 10. Detailed calculations can be found in Appendix D. A graphical representation of the construction noise source and receiver locations can be found in Figure 10.

Table 10. Temporary Construction Noise Levels at Nearby Residential Properties							
Receiver	Location	12-Hour Average Noise Level of Equipment (dBA)					
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
C1	Southwest	56.0	66.5	65.8	60.9	61.6	45.9
C2	West	61.0	71.6	71.0	66.0	66.7	51.5
C3	West	61.4	71.9	71.4	66.3	67.0	51.8
C4	Northwest	58.0	68.6	68.0	62.9	63.6	48.5
C5	North	61.2	71.8	71.2	66.2	66.9	51.7
C6	Northeast	58.0	68.6	68.1	63.0	63.7	48.5
C7	East	61.6	72.1	71.6	66.5	67.2	52.0
C8	Southeast	58.0	68.6	68.0	63.0	63.7	48.5
C9	South	61.2	71.8	71.2	66.2	66.9	51.6
C10	Southeast	62.8	73.3	72.7	67.7	68.4	53.2
C11	Southeast	57.7	68.3	67.7	62.7	63.4	48.2

As shown above, temporary construction noise impacts are not expected to exceed 75 dBA at any noise-sensitive receivers during all phases of construction. It has been determined that noise levels from construction activities associated with this project are expected to comply with the applicable City of San Diego construction noise limits at all surrounding property lines with activity limited to the daytime hours of 7 a.m. to 7 p.m. during all phases of construction.

Although noise levels are shown to be in compliance with the construction noise limit of 75 dBA, the following good-practice noise control measures should still be practiced as a courtesy to surrounding properties.

1. Staging areas should be placed as far from occupied receivers as possible on the project site to limit any additional unnecessary noise exposure at sensitive receivers.

2. Place stationary equipment in locations that will have a lesser noise impact on nearby sensitive receivers.

3. Turn off equipment when not in use.

4. Limit the use of enunciators or public address systems, except for emergency notifications.

5. Equipment used in construction should be maintained in proper operating condition, and all loads should be properly secured, to prevent rattling and banging.

6. Schedule work to avoid simultaneous construction activities that both generate high noise levels.

7. Use equipment with effective mufflers.

8. Minimize the use of backup alarms.

With work limited to daytime hours permissible by the City of San Diego and adherence to the general good practice construction noise control techniques listed above, temporary construction noise is expected to remain in compliance with City of San Diego noise limits.

6.0 CONCLUSION

The current and future noise environment consists primarily of automobile and truck traffic noise from Lisbon Street and Imperial Avenue, with minor noise impacts from the nearby San Diego Metropolitan Transit System Orange Line Trolley. Future combined (traffic and rail) noise levels on site are expected to range from approximately 53 CNEL to approximately 68 CNEL.

As per the City of San Diego Noise Element to the General Plan, outdoor use areas of single-family land uses must maintain noise levels no greater than 65 CNEL. Future combined noise impacts at private outdoor use areas were calculated and show that noise levels will range from approximately 53 CNEL to approximately 59 CNEL. Calculations show that outdoor use areas at all lots are expected to be exposed to transportation noise levels of less than 65 CNEL in the future noise environment, and therefore, are expected to comply with the requirements of the City of San Diego as currently designed.

The City of San Diego Noise Element and State of California require interior noise levels of 45 CNEL or less in habitable residential spaces. Calculations show that future noise levels on site are not expected to exceed 60 CNEL at any lots, with the exception of Lot 1. Due to high noise levels at Lot 1, an exterior to interior analysis should be performed when building plans become available, prior to the issuance of building permits. However, the required interior noise levels are feasible and can be achieved with readily available building materials and construction methods.

The City of San Diego requires the assessment of noise impacts from project-related noise sources, such as mechanical equipment, to determine if additional project design features are necessary and feasible to reduce project-related noise impacts to comply with applicable noise limits. Calculations show that, with the project design features contained in Table 8 herein in place, exterior noise levels from proposed mechanical equipment are expected to meet the applicable noise limits defined by the City of San Diego Municipal Code at all surrounding property lines.

Noise levels from temporary construction activities associated with this project are expected to comply with the applicable City of San Diego construction noise limits at all surrounding property lines with activity limited to the daytime hours of 7 a.m. to 7 p.m. during all phases of construction, as designed. Construction is prohibited between the hours of 7 p.m. and 7 a.m. and on Sundays or legal holidays. It is also recommended that the general good-practice construction noise control methods listed herein be followed, as a courtesy to surrounding properties.

7.0 CERTIFICATION

All recommendations for noise control are based on the best information available at the time our consulting services are provided. However, as there are many factors involved in sound transmission, and Eilar Associates has no control over the construction, workmanship or materials, Eilar Associates is specifically not liable for final results of any recommendations or implementation of the recommendations.

The findings and recommendations of this acoustical analysis report are based on the information available and are a true and factual analysis of the potential acoustical issues associated with Lisbon Heights, located on Lisbon Street in the City of San Diego, California. This report was prepared by Mo Ouwenga Jonathan Brothers, and Amy Hool.

Mo Ouwenga, Acoustical Consultant

Amy Hool, Senior Acoustical Consultant

8.0 REFERENCES

1. City of San Diego Noise Element to the General Plan, June 2015.

2. City of San Diego Municipal Code, Section 59.5.0401: Sound Level Limits, Effective February 9, 2006.

3. City of San Diego Municipal Code, Section 59.5.0404: Construction Noise, Amended January 3, 1984.

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9. San Diego Association of Governments (SANDAG) Traffic Forecast Information Center, Series 12, http://tfic.sandag.org.

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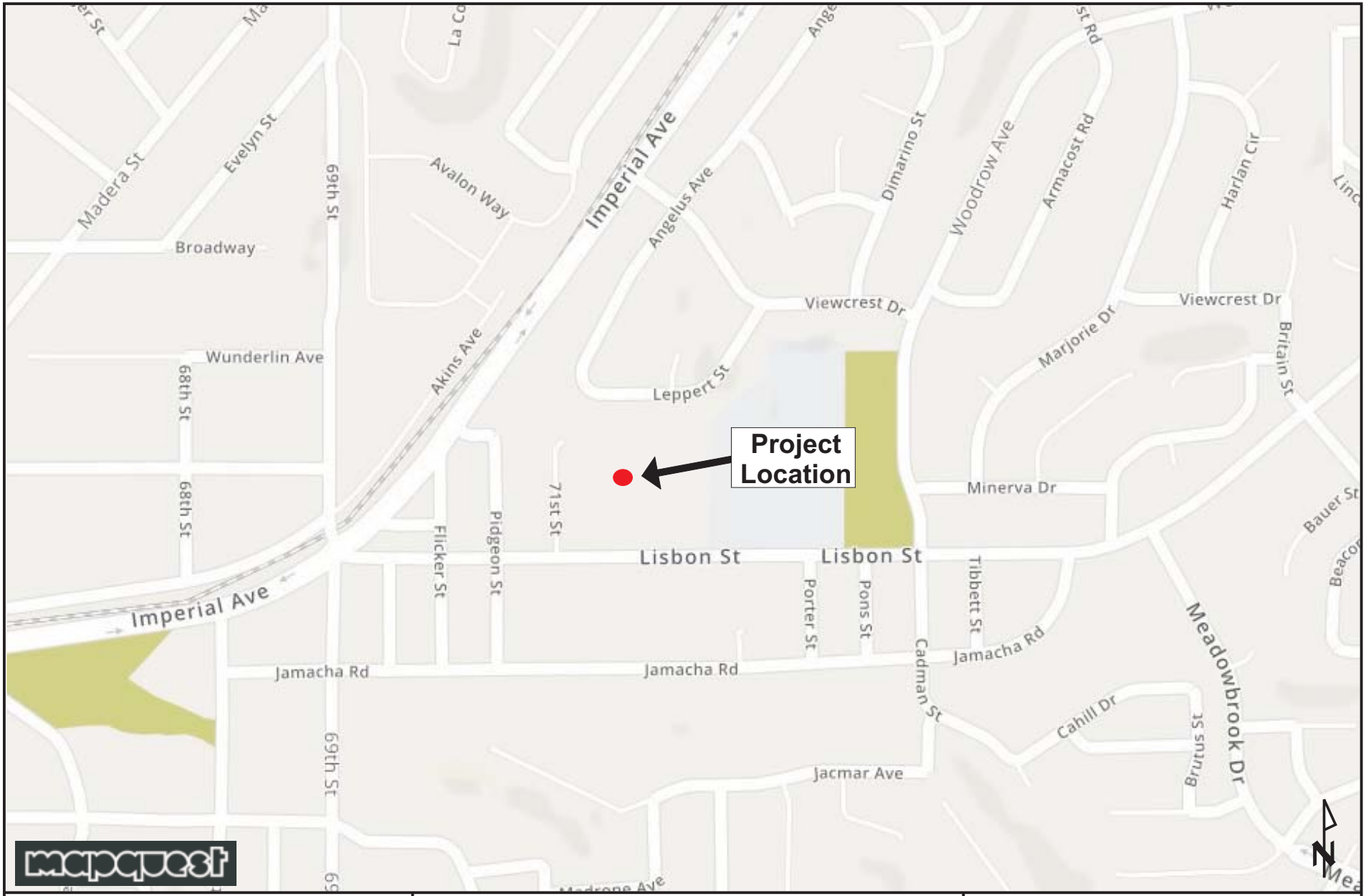
14. U.S. Department of Transportation Federal Highway Administration, Construction Noise Handbook, Construction Equipment Noise Levels and Ranges.

15. Wyle Laboratories, Development of Ground Transportation Systems Noise Contours for the San Diego Region, December 1973.

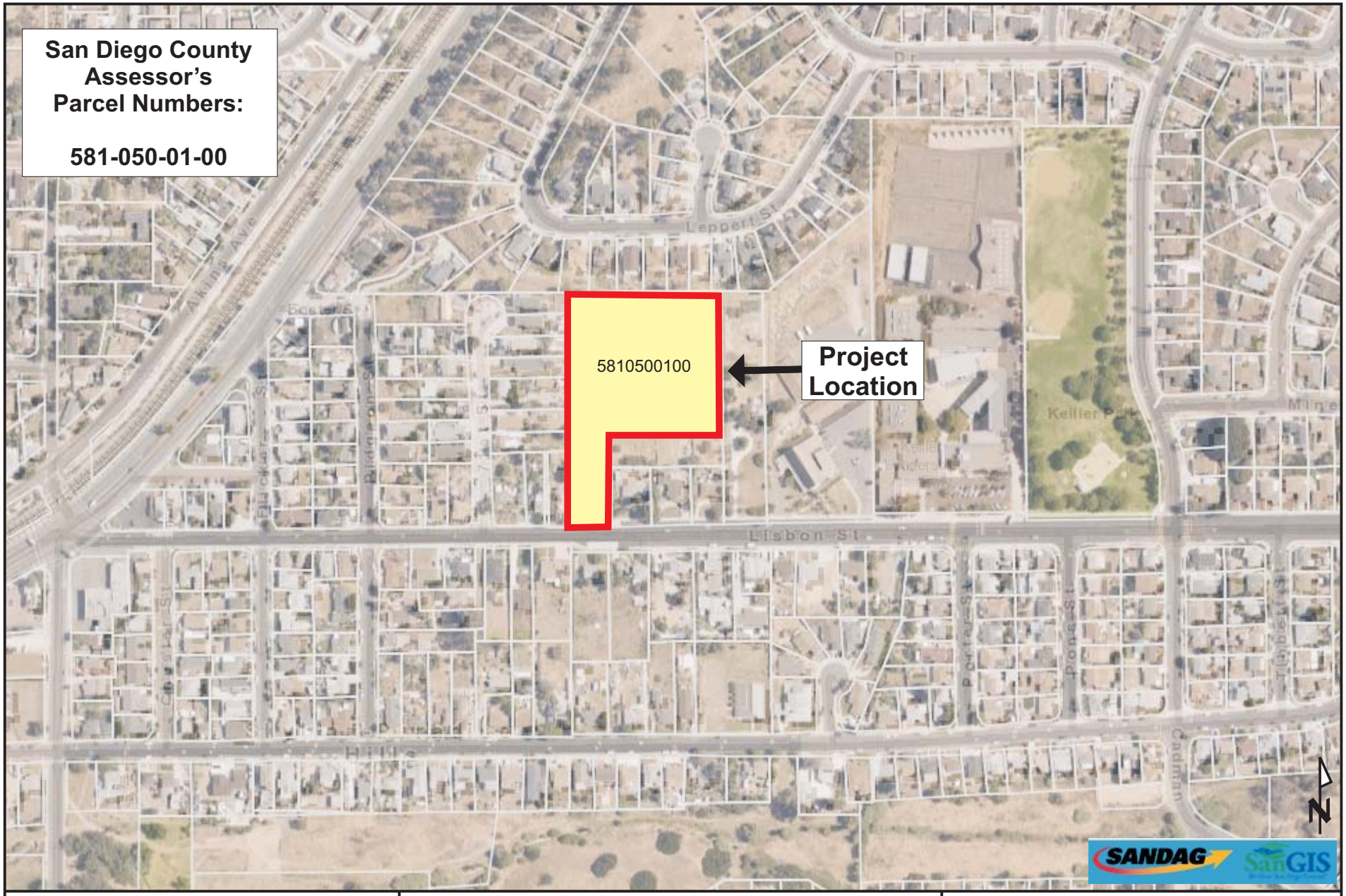
16. Katz-Okitsu and Associates Traffic Engineers, Traffic Distribution Study, 1986.

17. U.S. Environmental Protection Agency Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety, March 1974.

FIGURES

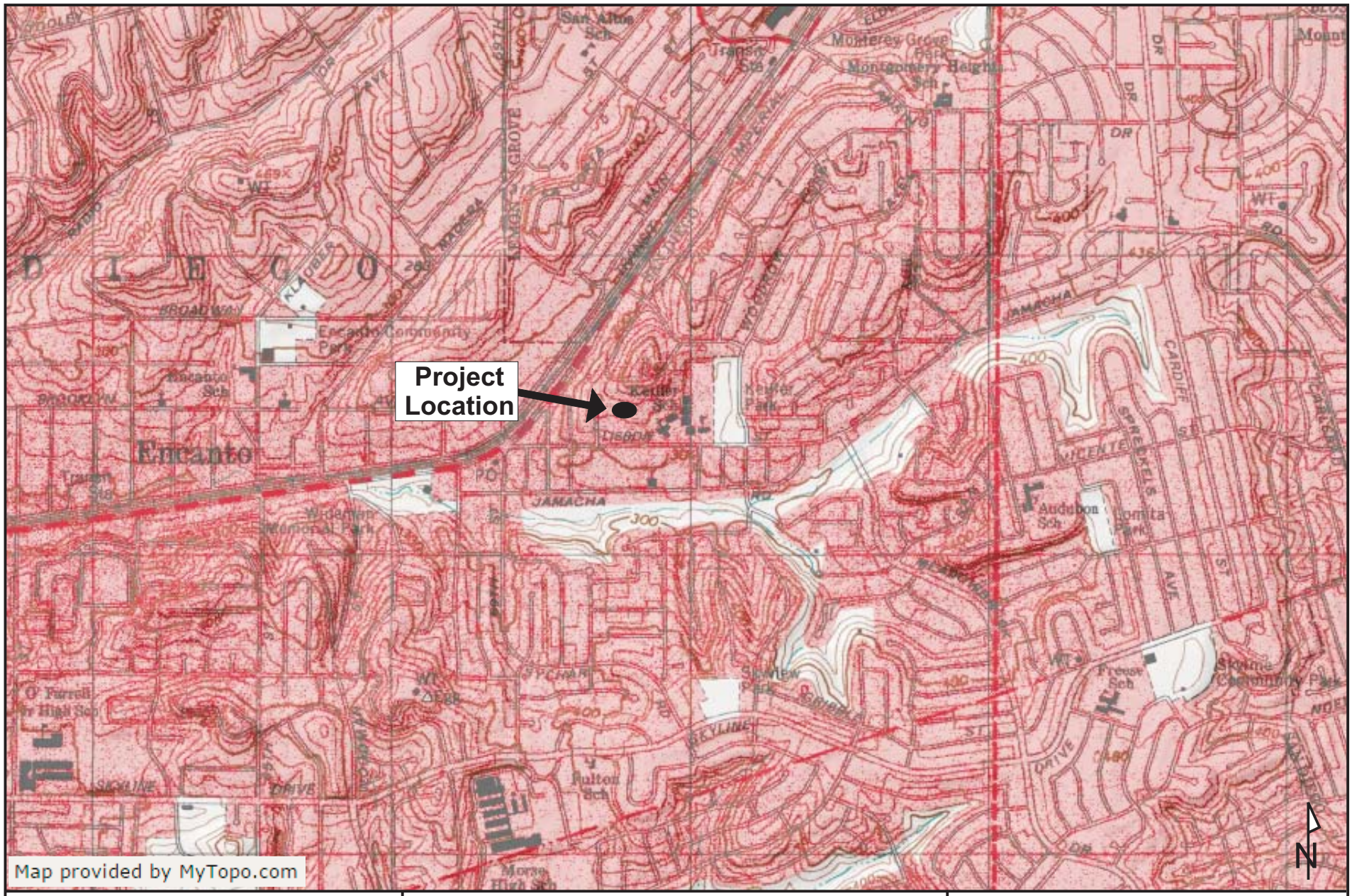


Eilar Associates, Inc. **210 South Juniper Street, Suite 100** **Escondido, California 92025** **760-738-5570**	**Vicinity Map** **Job # B80907N2**	**Figure 1**

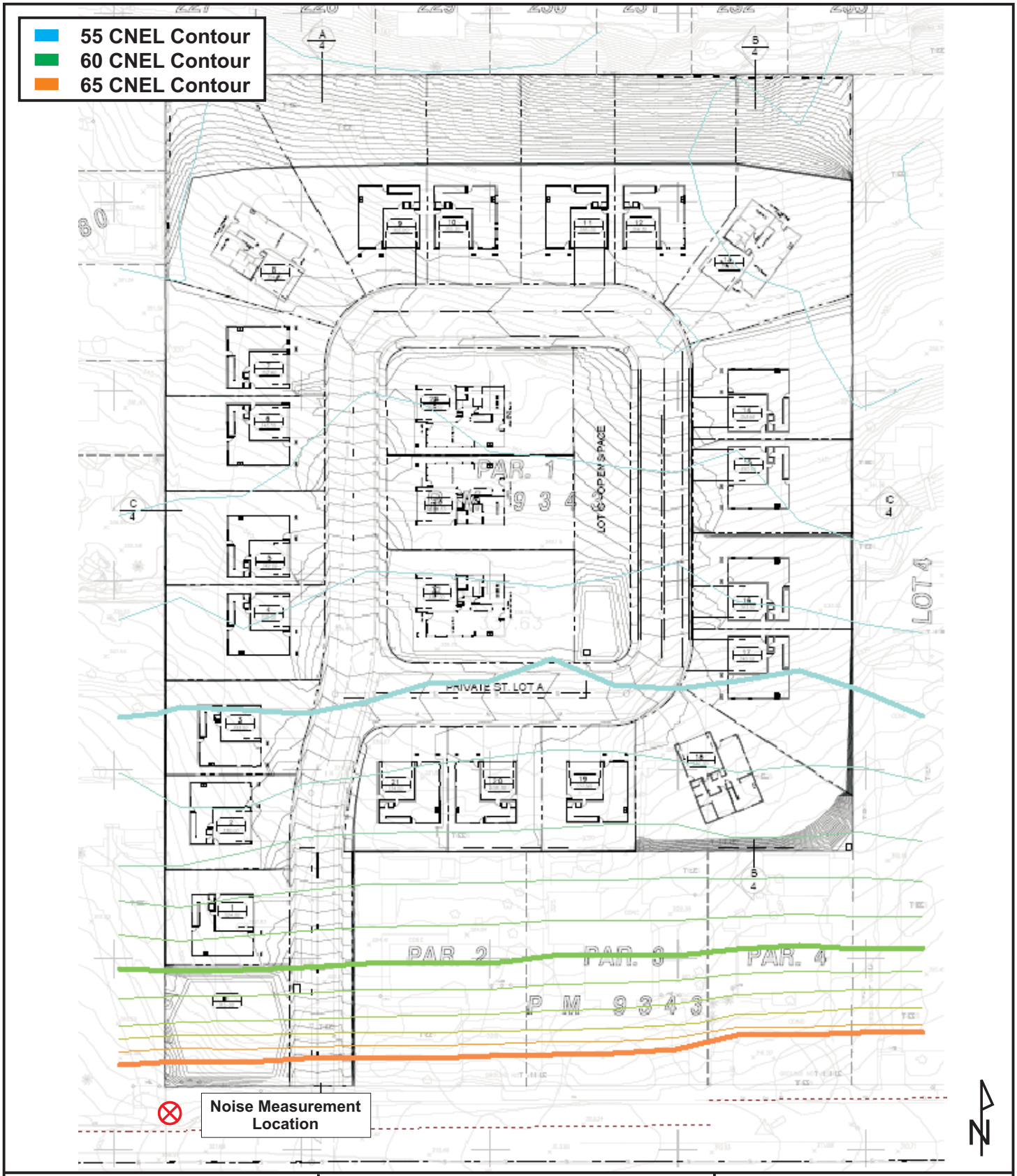


Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	Assessor's Parcel Map Job # B80907N2	Figure 2

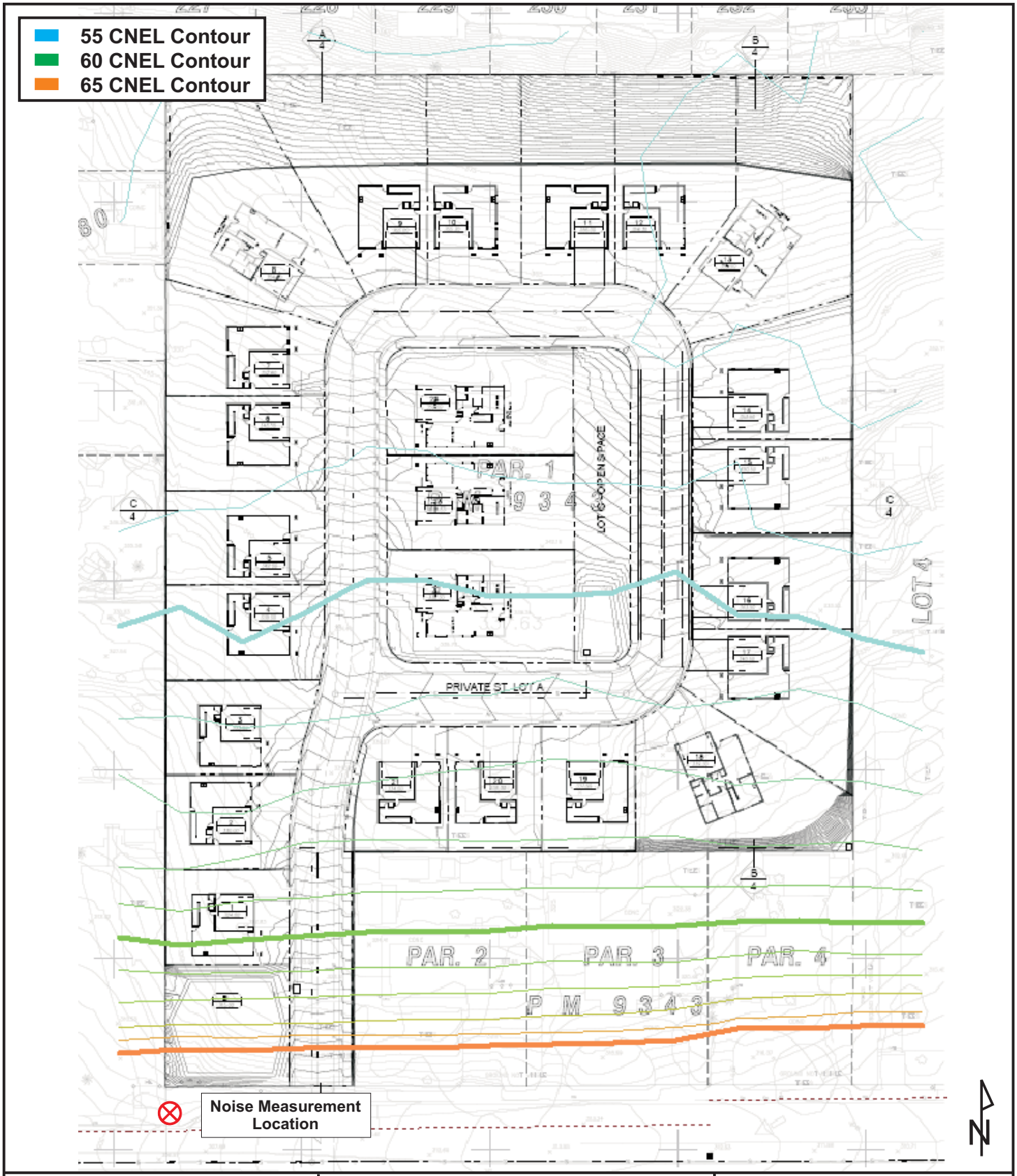
Eilar Associates, Inc. **210 South Juniper Street, Suite 100** **Escondido, California 92025** **760-738-5570**	**Satellite Aerial Photograph** **Job # B80907N2**	**Figure 3**



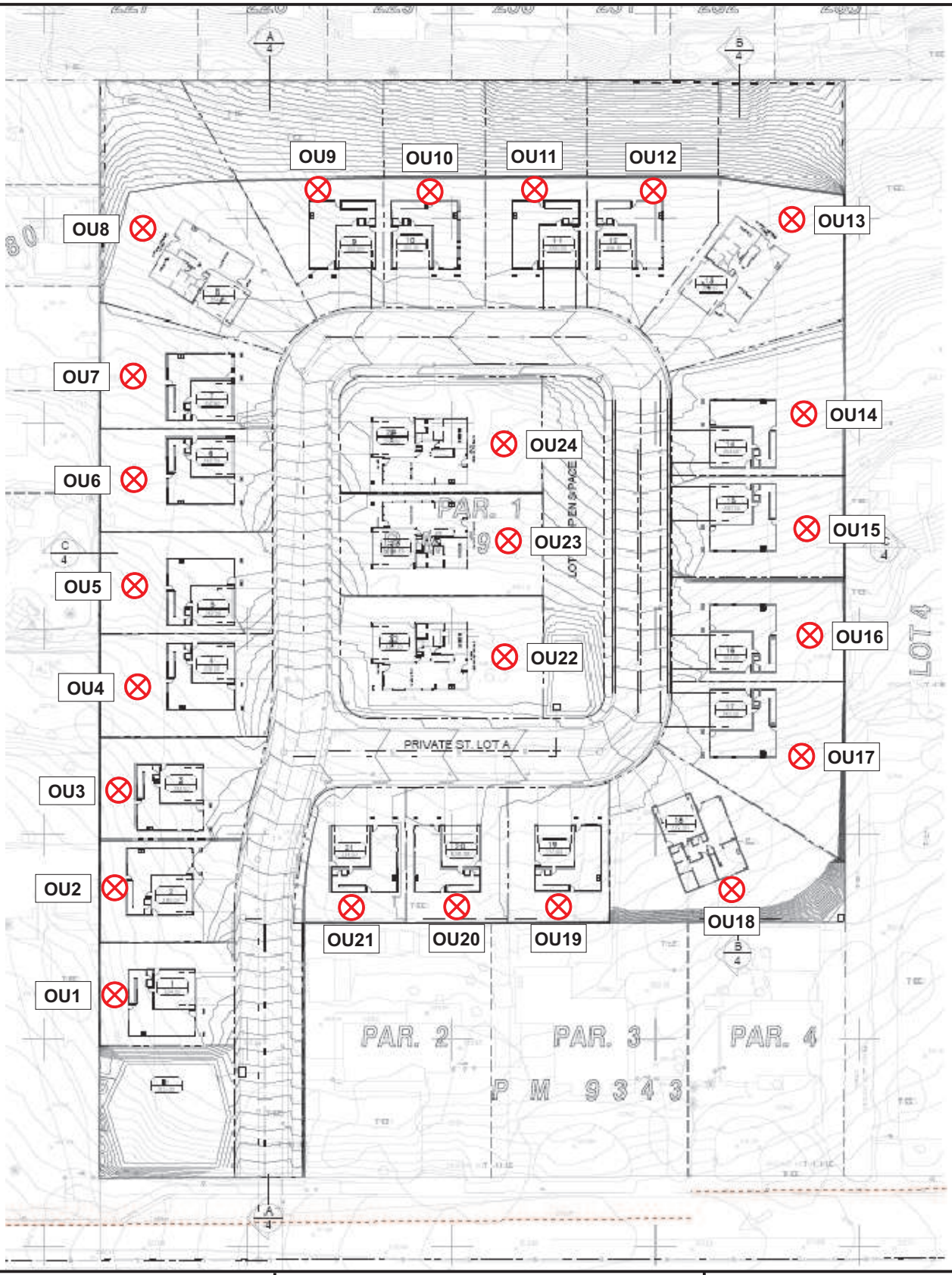
Eilar Associates, Inc. **210 South Juniper Street, Suite 100** **Escondido, California 92025** **760-738-5570**	**Topographic Map** **Job # B80907N2**	**Figure 4**



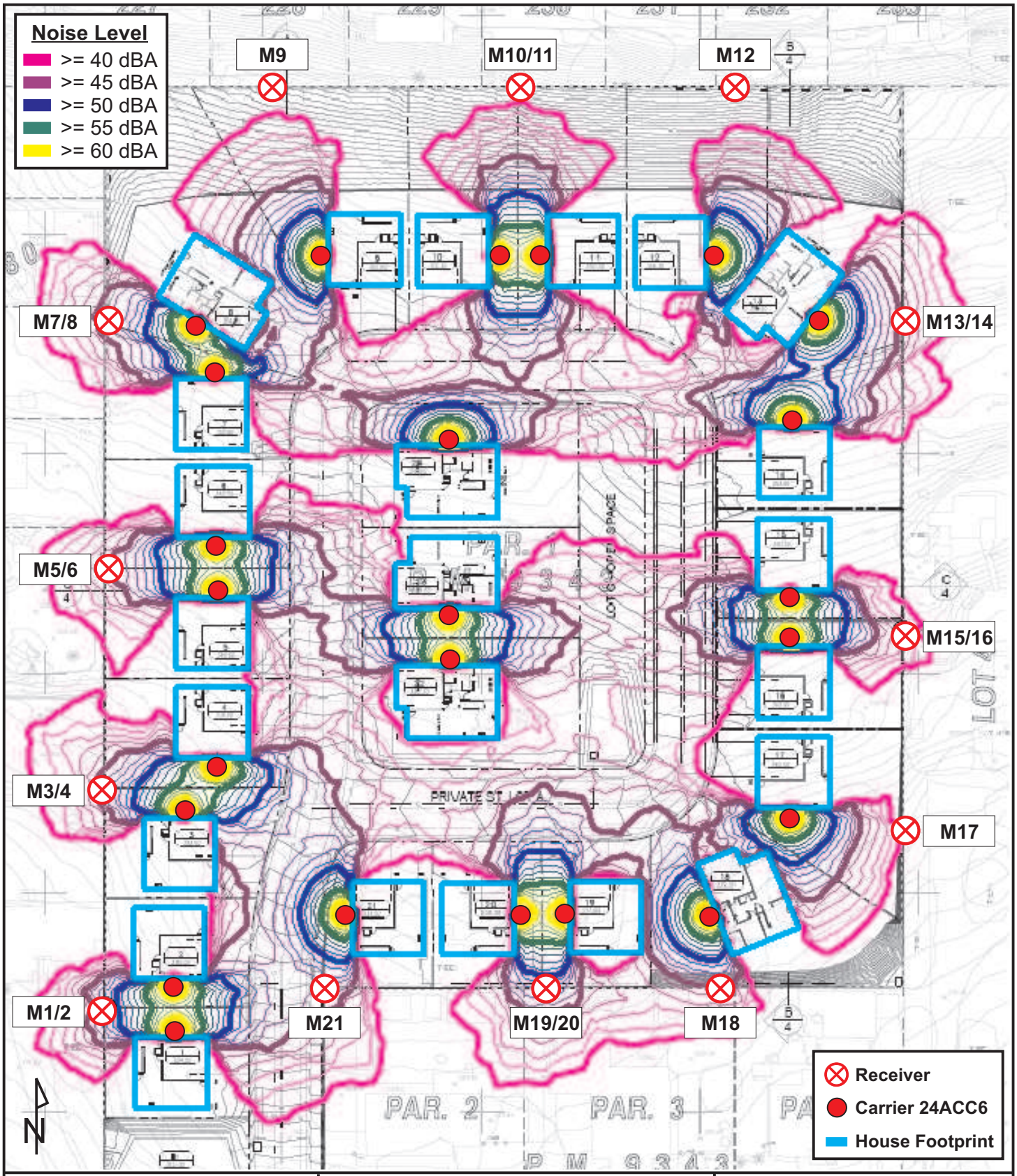
Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	**Site Plan Showing Current Combined CNEL Contours and Noise Measurement Location Job # B80907N2**	**Figure 5**



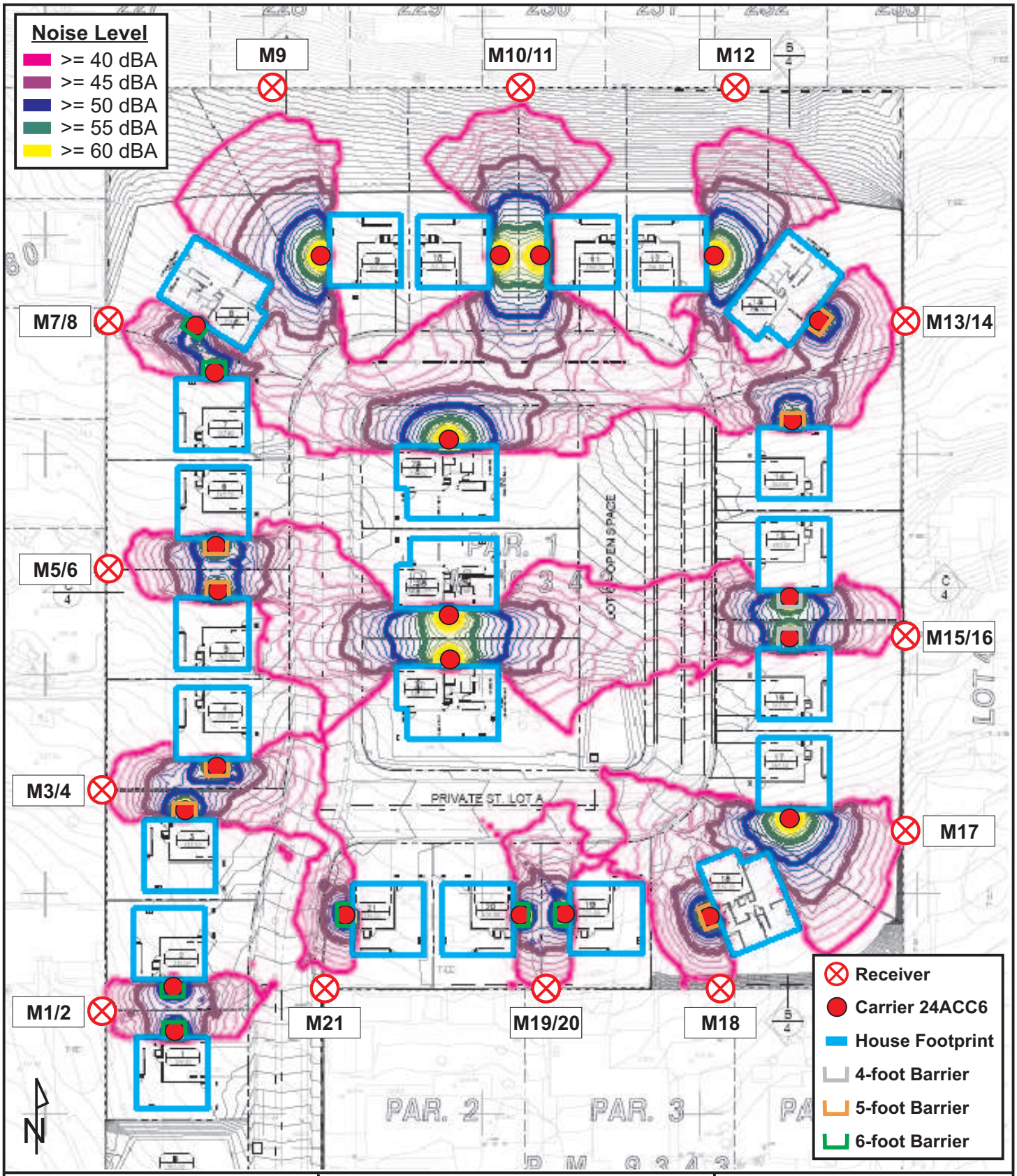
Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	**Site Plan Showing Future Combined CNEL Contours and Noise Measurement Location Job # B80907N2**	**Figure 6**



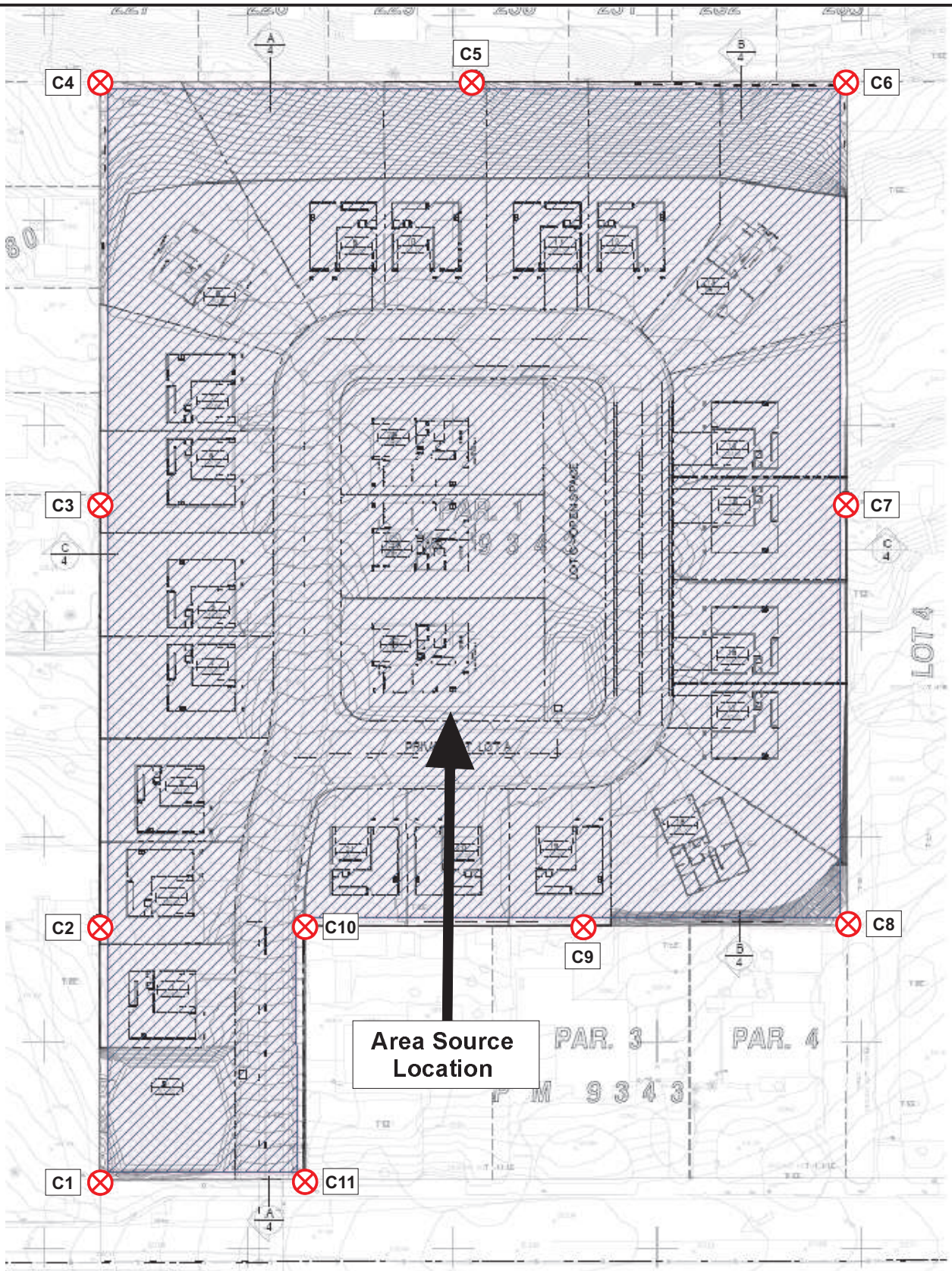
Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	**Site Plan Showing Outdoor Use Receiver Locations Job # B80907N2**	**Figure 7**



Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	Site Plan Showing Mechanical Equipment Noise Contours and Source and Receiver Locations - Without Barriers Job # B80907N2	Figure 8



Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	Site Plan Showing Mechanical Equipment Noise Contours and Source, Receiver, and Barrier Locations Job # B80907N2	Figure 9



Eilar Associates, Inc. 210 South Juniper Street, Suite 100 Escondido, California 92025 760-738-5570	**Site Plan Showing Construction Noise Source and Receiver Locations Job # B80907N2**	**Figure 10**

APPENDIX A

Project Plans

1 16 17 18 19 20 21 2 22

12

13

15

PAR. 1
P M 9343

PAR. 2

PAR. 3
P M 9343

PAR. 4

LOT 4
MAP 2285

6 7 8 11

4 5 10 9 3

0.33'
10.00' 0.67'
1.00' 4.00'
14.00' 14.00'
34.00'

PRIVATE ST. LOT A

LOT 3 OPEN SPACE

PAR. 1
P M 9 3 4

PAR. 2

PAR. 3

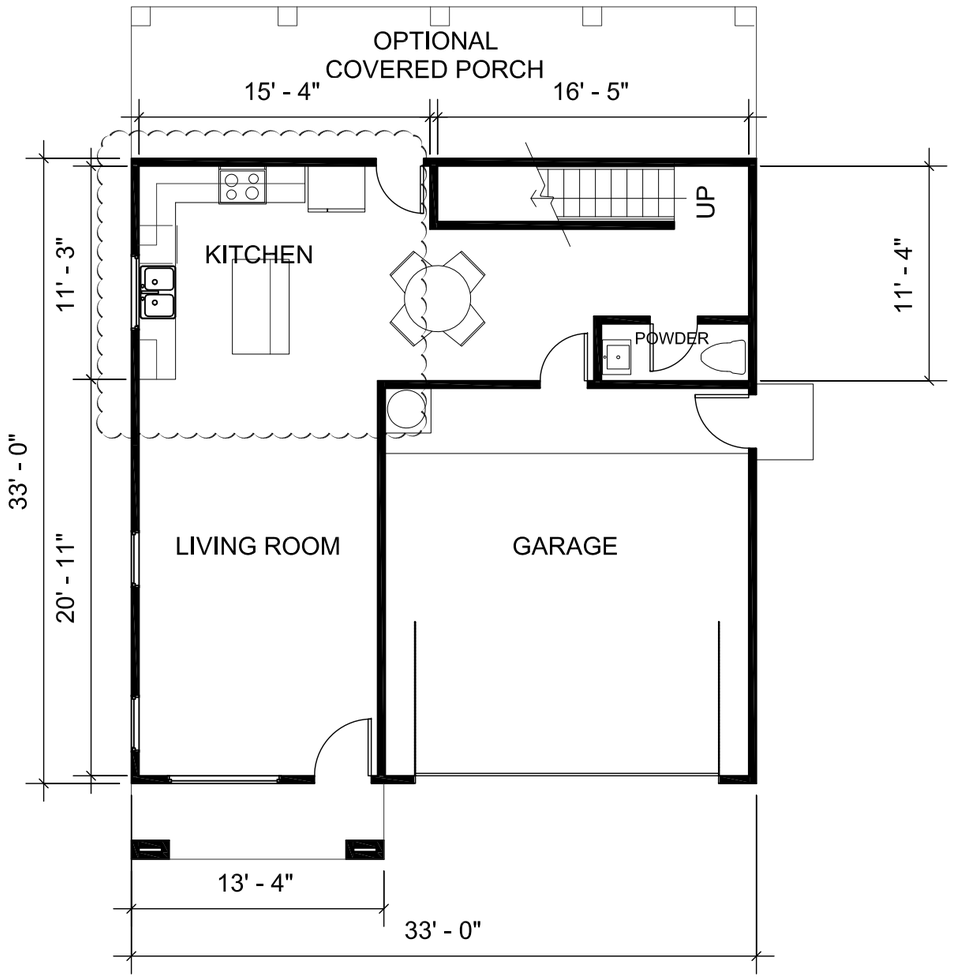
PAR. 4
P M 9 3 4 3

LOT 4

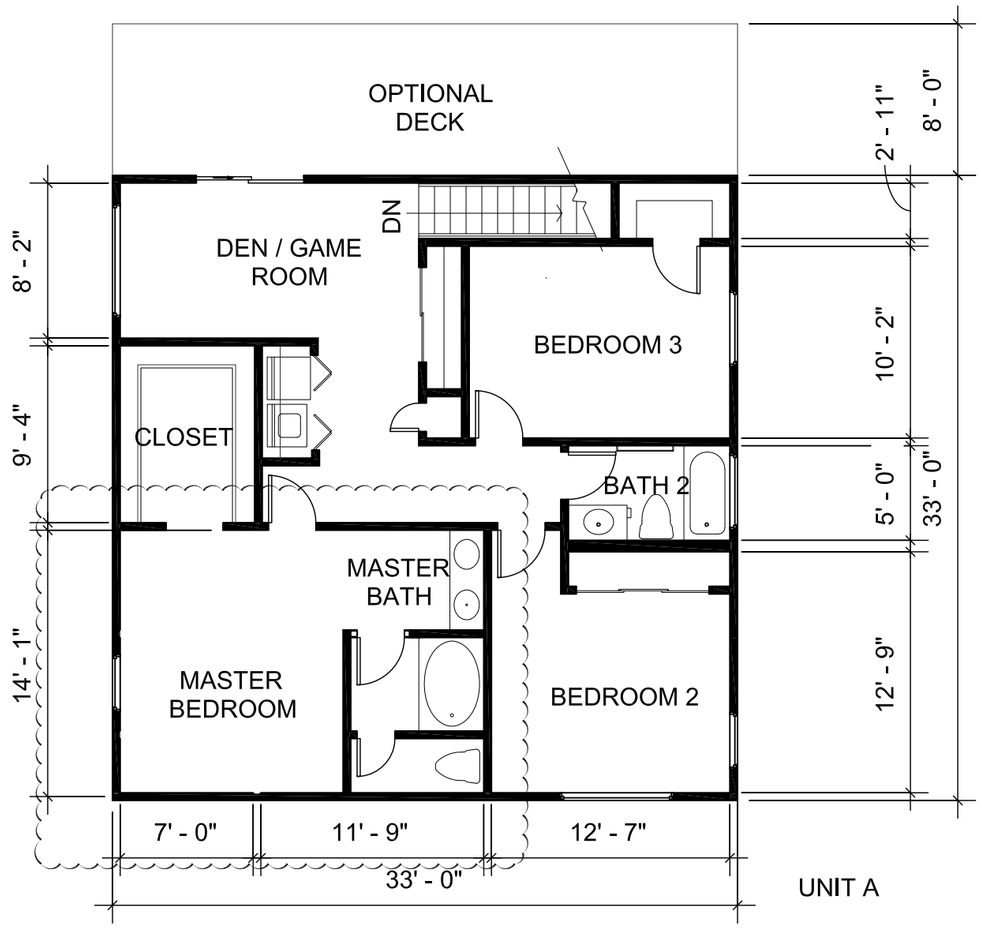
1 324.00
2 330.00
3 333.50
4 339.00
5 342.00
6 348.50
7 352.60
8 354.80
9 355.00
10 355.30
11 356.00
12 356.30
13 356.50
14 353.50
15 350.50
16 343.50
17 340.50
18 339.30
19 337.50
20 336.00
21 334.50
22 338.30
23 344.65
24 350.00
B 315.00

UNIT A

SCALE 1' = 1/8"



1ST FLOOR



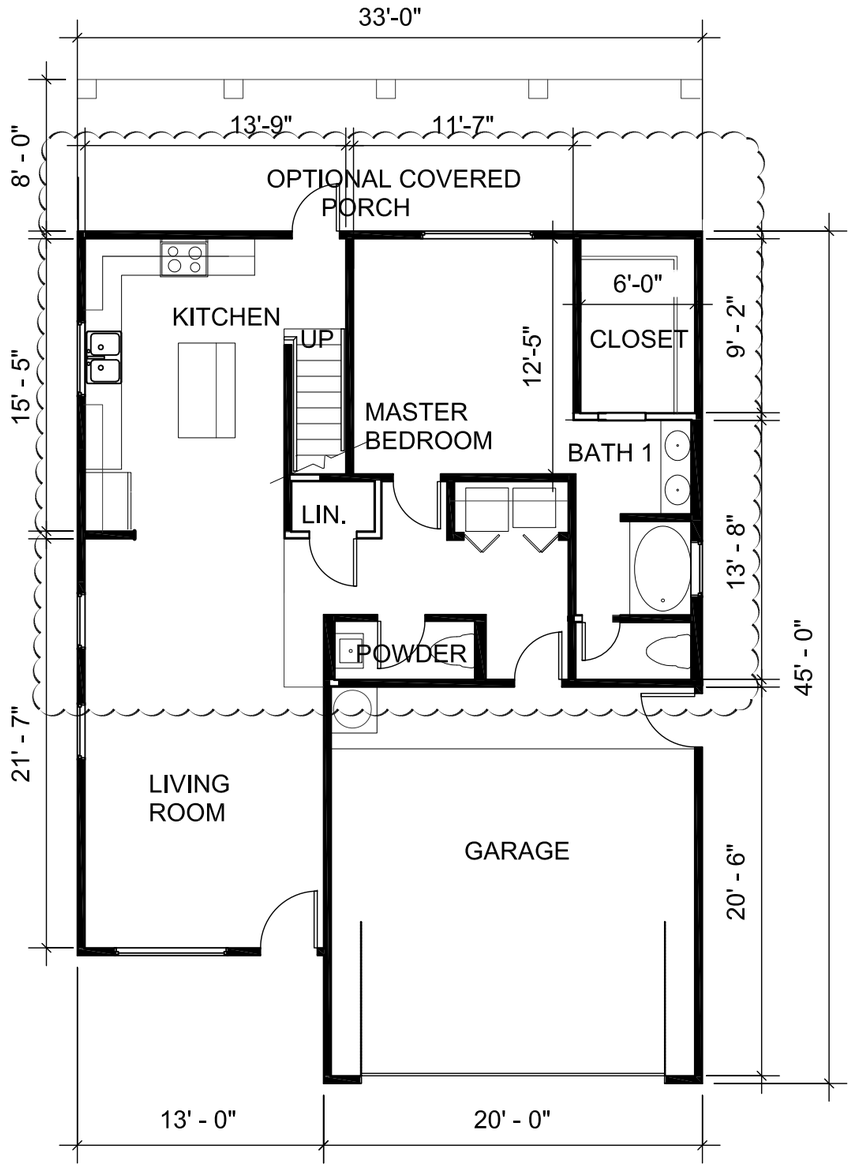
2ND FLOOR

UNIT A

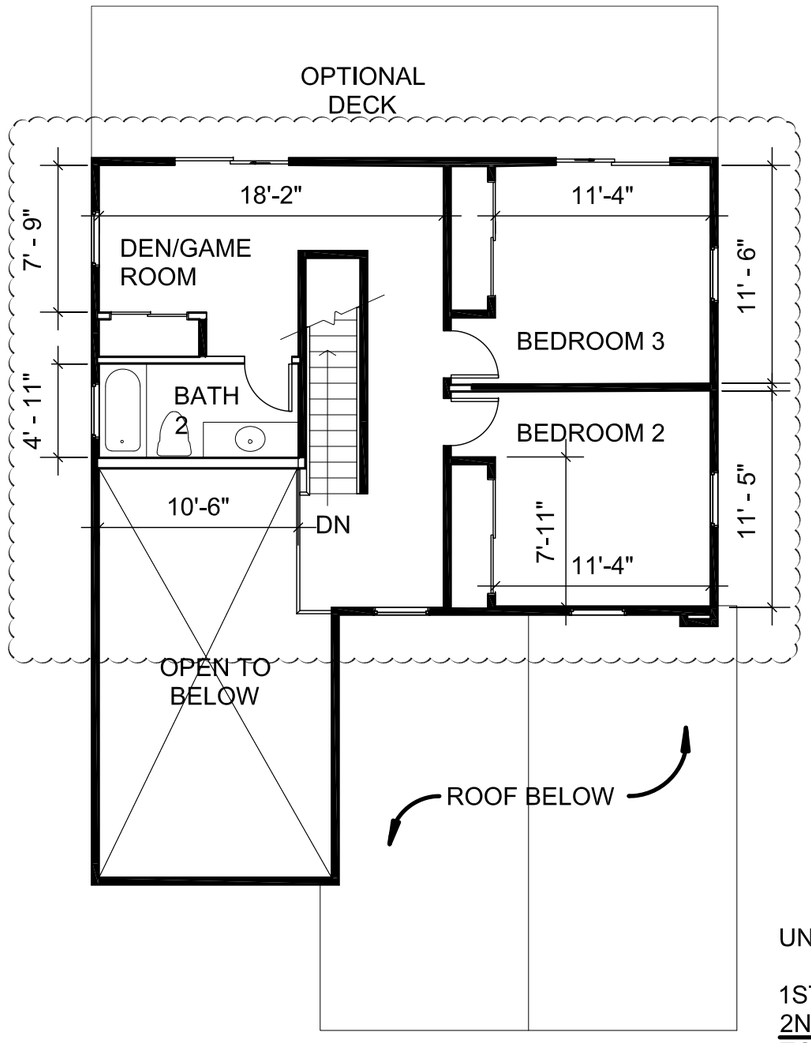
1ST FLOOR:	662 SF
2ND FLOOR:	1,088 SF
TOTAL LIVING:	1,750 SF
GARAGE:	426 SF
TOTAL:	2,176 SF

UNIT B

SCALE 1' = 1/8"



1ST FLOOR



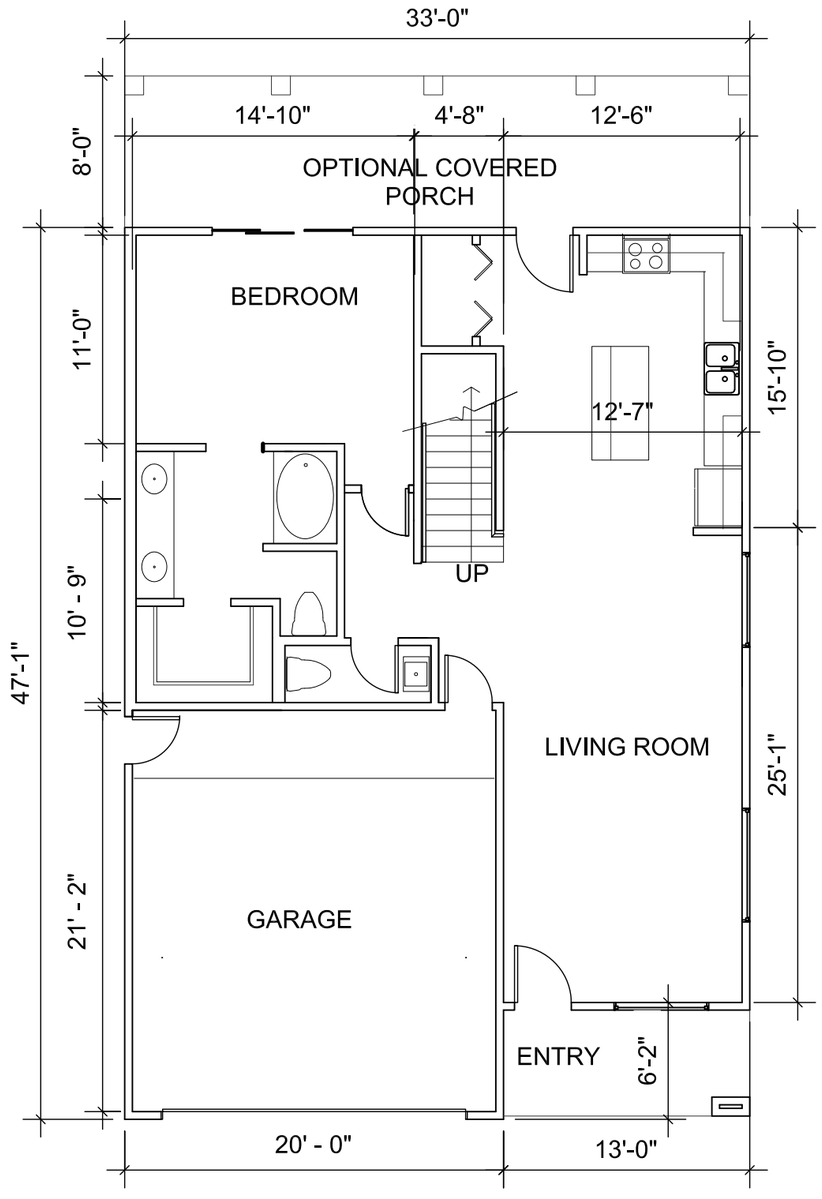
2ND FLOOR

UNIT B

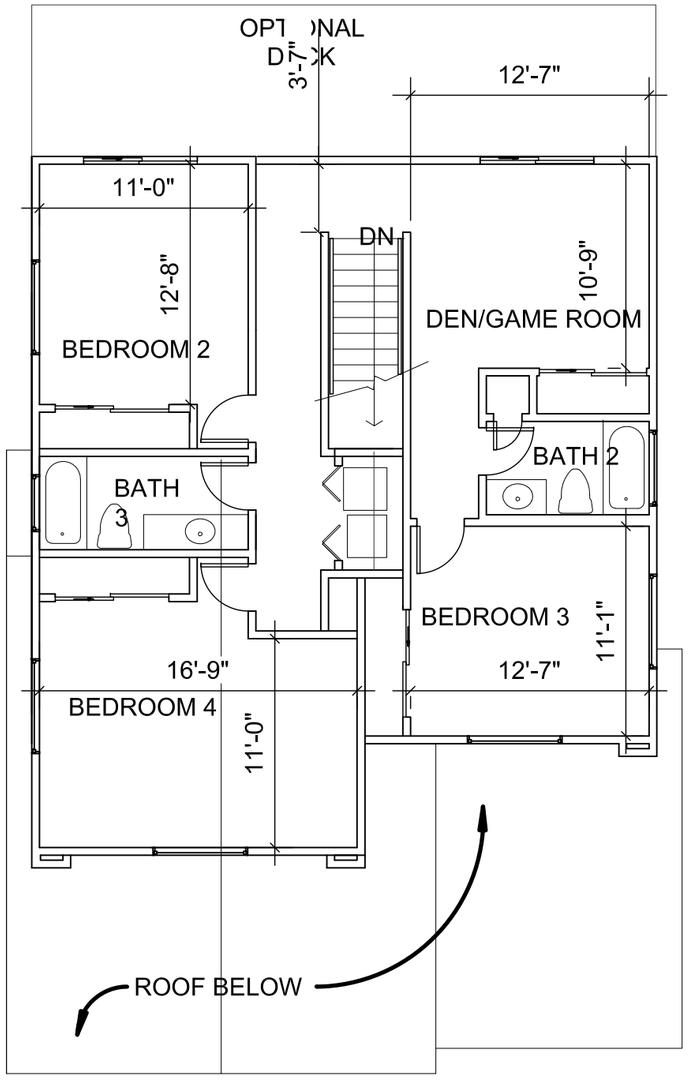
1ST FLOOR:	971 SF
2ND FLOOR:	691 SF
TOTAL LIVING:	1,662 SF
GARAGE:	426 SF
TOTAL:	2,088 SF

UNIT C

SCALE 1' = 1/8"



1ST FLOOR



2ND FLOOR

UNIT C

1ST FLOOR:	1,038 SF
2ND FLOOR:	1,126 SF
TOTAL LIVING:	2,164 SF
GARAGE:	433 SF
TOTAL:	2,597 SF

APPENDIX B

Pertinent Sections of the City of San Diego Noise Element to the General Plan, San Diego Municipal Code, and California Building Code

NE-A.2. Assure the appropriateness of proposed developments relative to existing and future noise levels by consulting the guidelines for noise-compatible land use (shown on Table NE-3) to minimize the effects on noise-sensitive land uses.

NE-A.3. Limit future residential and other noise-sensitive land uses in areas exposed to high levels of noise.

NE-A.4. Require an acoustical study consistent with Acoustical Study Guidelines (Table NE-4) for proposed developments in areas where the existing or future noise level exceeds or would exceed the "compatible" noise level thresholds as indicated on the Land Use - Noise Compatibility Guidelines (Table NE-3), so that noise mitigation measures can be included in the project design to meet the noise guidelines.

NE-A.5. Prepare noise studies to address existing and future noise levels from noise sources that are specific to a community when updating community plans.

TABLE NE-3 Land Use - Noise Compatibility Guidelines

Land Use Category	Exterior Noise Exposure (dBA CNEL)				
	60	65	70	75	
Parks and Recreational					
Parks, Active and Passive Recreation					
Outdoor Spectator Sports, Golf Courses; Water Recreational Facilities; Indoor Recreation Facilities					
Agricultural					
Crop Raising & Farming; Community Gardens, Aquaculture, Dairies; Horticulture Nurseries & Greenhouses; Animal Raising, Maintain & Keeping; Commercial Stables					
Residential					
Single Dwelling Units; Mobile Homes		**45**			
Multiple Dwelling Units **For uses affected by aircraft noise, refer to Policies NE-D.2. & NE-D.3.*		**45**	**45***		
Institutional					
Hospitals; Nursing Facilities; Intermediate Care Facilities; Kindergarten through Grade 12Educational Facilities; Libraries; Museums; Child Care Facilities		**45**			
Other Educational Facilities including Vocational/Trade Schools and Colleges and Universities		**45**	**45**		
Cemeteries					
Retail Sales					
Building Supplies/Equipment; Food, Beverages & Groceries; Pets & Pet Supplies; Sundries, Pharmaceutical, & Convenience Sales; Wearing Apparel & Accessories			**50**	**50**	

Land Use Category	Exterior Noise Exposure (dBA CNEL)				
	60	65	70	75	
Commercial Services					
Building Services; Business Support; Eating & Drinking; Financial Institutions; Maintenance & Repair; Personal Services; Assembly & Entertainment (includes public and religious assembly); Radio & Television Studios; Golf Course Support			**50**	**50**	
Visitor Accommodations		**45**	**45**	**45**	
Offices					
Business & Professional; Government; Medical, Dental & Health Practitioner; Regional & Corporate Headquarters			**50**	**50**	
Vehicle and Vehicular Equipment Sales and Services Use					
Commercial or Personal Vehicle Repair & Maintenance; Commercial or Personal Vehicle Sales & Rentals; Vehicle Equipment & Supplies Sales & Rentals; Vehicle Parking					
Wholesale, Distribution, Storage Use Category					
Equipment & Materials Storage Yards; Moving & Storage Facilities; Warehouse; Wholesale Distribution					
Industrial					
Heavy Manufacturing; Light Manufacturing; Marine Industry; Trucking & Transportation Terminals; Mining & Extractive Industries					
Research & Development				**50**	

	Compatible	**Indoor Uses**	Standard construction methods should attenuate exterior noise to an acceptable indoor noise level. Refer to Section I.
		Outdoor Uses	Activities associated with the land use may be carried out.
45, 50	**Conditionally Compatible**	**Indoor Uses**	Building structure must attenuate exterior noise to the indoor noise level indicated by the number (45 or 50) for occupied areas. Refer to Section I.
		Outdoor Uses	Feasible noise mitigation techniques should be analyzed and incorporated t make the outdoor activities acceptable. Refer to Section I.
	Incompatible	**Indoor Uses**	New construction should not be undertaken.
		Outdoor Uses	Severe noise interference makes outdoor activities unacceptable.

Article 9.5: Noise Abatement and Control

Division 4: Limits

("Noise Level Limits, Standards and Control"
added 9–18–1973 by O–11122 N.S.)
(Retitled to "Limits" on 9–22–1976 by O–11916 N.S.)

§59.5.0401 Sound Level Limits

(a) It shall be unlawful for any person to cause noise by any means to the extent that the one–hour average sound level exceeds the applicable limit given in the following table, at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person.

TABLE OF APPLICABLE LIMITS

Land Use	Time of Day	One-Hour Average Sound Level (decibels)
1. Single Family Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45 40
2. Multi-Family Residential (Up to a maximum density of 1/2000)	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50 45
3. All other Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55 50
4. Commercial	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	65 60 60
5. Industrial or Agricultural	any time	75

(b) The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts. Permissible construction noise level limits shall be governed by Sections 59.5.0404 of this article.

§59.5.0404 Construction Noise

(a) It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington's Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.

(b) Except as provided in subsection C. hereof, it shall be unlawful for any person, including The City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12–hour period from 7:00 a.m. to 7:00 p.m.

(c) The provisions of subsection B. of this section shall not apply to construction equipment used in connection with emergency work, provided the Administrator is notified within 48 hours after commencement of work.

(Amended 1–3–1984 by O–16100 N.S.)

§59.5.0406 Refuse Vehicles and Parking Lot Sweepers

No person shall operate or permit to be operated a refuse compacting, processing, or collection vehicle between the hours of 7:00 p.m. to 6:00 a.m. or a parking lot sweeper between the hours of 7:00 p.m. to 7:00 a.m. in any residential area unless a permit has been applied for and granted by the Administrator.

("Refuse Vehicles" added 9–18–1973 by O–11122 N.S.; amended 9–22–1976 by O–11916 N.S.)

(Amended 6-9-2010 by O-19960 N.S.; effective 7-9-2010.)

1206.3 Courts. Courts shall be not less than 3 feet (914 mm) in width. Courts having windows opening on opposite sides shall be not less than 6 feet (1829 mm) in width. Courts shall be not less than 10 feet (3048 mm) in length unless bounded on one end by a public way or yard. For buildings more than two stories above grade plane, the court shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional story. For buildings exceeding 14 stories above grade plane, the required dimensions shall be computed on the basis of 14 stories above grade plane.

1206.3.1 Court access. Access shall be provided to the bottom of courts for cleaning purposes.

1206.3.2 Air intake. Courts more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m^2) in area and leading to the exterior of the building unless abutting a yard or public way.

1206.3.3 Court drainage. The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system complying with the *California Plumbing Code*.

SECTION 1207
SOUND TRANSMISSION

1207.1 Scope. This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units and sleeping units or between dwelling units and sleeping units and adjacent public areas such as halls, corridors, stairways or service areas.

1207.2 Air-borne sound. Walls, partitions and floor/ceiling assemblies separating dwelling units and sleeping units from each other or from public or service areas shall have a sound transmission class of not less than 50, or not less than 45 if field tested, for air-borne noise when tested in accordance with ASTM E90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to entrance doors; however, such doors shall be tight fitting to the frame and sill.

1207.2.1 Masonry. The sound transmission class of concrete masonry and clay masonry assemblies shall be calculated in accordance with TMS 0302 or determined through testing in accordance with ASTM E90.

1207.3 Structure-borne sound. Floor/ceiling assemblies between dwelling units and sleeping units or between a dwelling unit or sleeping unit and a public or service area within the structure shall have an impact insulation class rating of not less than 50, or not less than 45 if field tested, when tested in accordance with ASTM E492.

Exception: *Impact sound insulation is not required for floor-ceiling assemblies over nonhabitable rooms or spaces not designed to be occupied, such as garages, mechanical rooms or storage areas.*

1207.4 Allowable interior noise levels. *Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan.*

1207.5 Acoustical control. [BSC-CG] *See California Green Building Standards Code, Chapter 5, Division 5.5 for additional sound transmission requirements.*

SECTION 1208
INTERIOR SPACE DIMENSIONS

1208.1 Minimum room widths. Habitable spaces, other than a kitchen, shall be not less than 7 feet (2134 mm) in any plan dimension. Kitchens shall have a clear passageway of not less than 3 feet (914 mm) between counter fronts and appliances or counter fronts and walls.

[HCD 1] *For limited-density owner-built rural dwellings, there shall be no requirements for room dimensions, provided there is adequate light and ventilation and adequate means of egress.*

1208.2 Minimum ceiling heights. Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than 7 feet (2134 mm).

Exceptions:

1. In one- and two-family dwellings, beams or girders spaced not less than 4 feet (1219 mm) on center shall be permitted to project not more than 6 inches (152 mm) below the required ceiling height.
2. If any room in a building has a sloped ceiling, the prescribed ceiling height for the room is required in one-half the area thereof. Any portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.
3. The height of mezzanines and spaces below mezzanines shall be in accordance with Section 505.1.
4. Corridors contained within a dwelling unit or sleeping unit in a Group R occupancy shall have a ceiling height of not less than 7 feet (2134 mm).
5. ***[OSHPD 1, 2 & 3]*** *Minimum ceiling heights shall comply with Section 1224.4.10.*
6. ***[OSHPD 4]*** *Minimum ceiling heights shall comply with Section 1227.8*

1208.2.1 Furred ceiling. Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

1208.3 Room area. Every dwelling unit shall have no fewer than one room that shall have not less than 120 square feet (13.9 m^2) of net floor area. Other habitable rooms shall have a net floor area of not less than 70 square feet (6.5 m^2).

Exception: Kitchens are not required to be of a minimum floor area.

APPENDIX C

CREATE Railway Noise Model Results

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: B80907N1

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	45	41	38
Source 1	45	41	38
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS				
Parameter	**Source 1**		**Source 2**	**Source 3**
Source Num.	RRT/LRT	4		
Distance (source to receiver)	distance (ft)	966.82		
Daytime Hours	speed (mph)	25		
(7 AM - 10 PM)	trains/hour	7.5		
	cars/train	4		
Nighttime Hours	speed (mph)	25		
(10 PM - 7 AM)	trains/hour	3.6		
	cars/train	4		
Wheel Flats?	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	Y		
Embedded Track?	Y/N	N		
Aerial Structure?	Y/N	N		
Barrier Present?	Y/N	N		
Intervening Rows of of Buildings	number of rows	0		

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

APPENDIX D

Cadna Analysis Data and Results

Cadna Noise Model - Mechanical - Sound Levels - All Models													
Name	ID	Type	Weight	Oktave Spectrum (dB)									Source
				63	125	250	500	1000	2000	4000	8000	A	lin	
Carrier 24ACC6	AC	Lw	A		58.5	64.5	68.5	70.0	65.0	61.5	53.5	74.0	78.9	Manufacturer

Cadna Noise Model - Construction - Sound Levels - All Phases													
Name	ID	Type	Weight	Oktave Spectrum (dB)									Source
				63	125	250	500	1000	2000	4000	8000	A	lin	
Front End Loader	S1	Lw (c)		113.0	113.0	102.0	104.0	100.0	98.0	97.0	89.0	106.5	116.6	DEFRA
Grader	S2	Lw (c)		117.2	116.2	112.2	108.2	113.2	107.2	103.2	94.2	115.7	121.6	DEFRA
Dozer	S3	Lw (c)		104.9	108.9	106.9	106.9	103.9	100.9	94.9	86.9	108.9	113.9	DEFRA
Concrete Mixer Truck	S4	Lw (c)		114.0	105.0	97.0	100.0	101.0	109.0	91.0	86.0	111.0	115.9	DEFRA
Paver	S5	Lw (c)		103.0	108.0	105.0	103.0	102.0	101.0	98.0	91.0	107.5	112.3	DEFRA
Concrete Pump Truck	S6	Lw (c)		115.0	107.0	101.0	102.0	104.0	104.0	97.0	89.0	108.8	116.5	DEFRA
Roller	S7	Lw (c)		111.0	106.0	108.0	103.0	98.0	93.0	85.0	77.0	104.6	114.1	DEFRA
Forklift	S8	Lw (c)		116.0	110.0	100.0	98.0	95.0	93.0	87.0	78.0	101.5	117.2	DEFRA
Generator	S9	Lw (c)		108.9	102.9	85.9	82.9	81.9	76.9	73.9	65.9	90.3	109.9	DEFRA
Welder	S10	Lw (c)		97.0	98.0	99.0	97.0	99.0	96.0	91.0	86.0	102.7	105.8	DEFRA
Crane	S11	Lw (c)		109.5	108.5	102.5	103.5	102.5	102.5	93.5	84.5	107.7	113.8	DEFRA
Air Compressor	S12	Lw (c)		115.0	104.0	95.0	90.0	88.0	86.0	89.0	78.0	96.5	115.4	DEFRA

Cadna Noise Model - Traffic - Sound Levels														
Name	Type	Weight	Oktave Spectrum (dB)											Source
			32	63	125	250	500	1000	2000	4000	8000	A	lin	
Trolley	TR	Lw	106.7	110.8	115.3	115.0	120.2	115.8	111.4	109.7	103.1	121.0	124.0	CREATE

Cadna Noise Model - Mechanical - Point Sources - All Models						
Name	Result. PWL	Lw / Li		Coordinates		
	Day	Type	Value	X	Y	Z
	(dBA)			(m)	(m)	(m)
1	74.0	Lw	AC	1137.27	551.59	99.97
2	74.0	Lw	AC	1137.07	557.88	101.77
3	74.0	Lw	AC	1138.37	582.19	102.87
4	74.0	Lw	AC	1142.90	588.37	104.47
5	74.0	Lw	AC	1143.14	612.78	105.37
6	74.0	Lw	AC	1142.85	619.13	107.37
7	74.0	Lw	AC	1142.70	643.34	109.87
8	74.0	Lw	AC	1139.99	649.72	109.07
9	74.0	Lw	AC	1157.71	659.52	109.37
10	74.0	Lw	AC	1182.05	659.46	109.41
11	74.0	Lw	AC	1188.10	659.42	109.67
12	74.0	Lw	AC	1212.38	659.56	109.77
13	74.0	Lw	AC	1226.75	650.65	109.87
14	74.0	Lw	AC	1223.21	636.46	108.87
15	74.0	Lw	AC	1222.74	611.93	107.97
16	74.0	Lw	AC	1222.73	606.00	105.87
17	74.0	Lw	AC	1222.82	581.27	104.97
18	74.0	Lw	AC	1211.57	567.65	104.57
19	74.0	Lw	AC	1191.38	567.82	104.07
20	74.0	Lw	AC	1185.28	567.85	103.57
21	74.0	Lw	AC	1160.88	567.85	103.17
22	74.0	Lw	AC	1175.40	603.22	104.27
23	74.0	Lw	AC	1175.35	609.45	106.27
24	74.0	Lw	AC	1175.32	633.83	107.87

Cadna Noise Model - Construction - Area Sources - Phase 1						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Loader	106.5	64.9	PWL-Pt	S1	24	1

Cadna Noise Model - Construction - Area Sources - Phase 2						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Grader	115.7	74.1	PWL-Pt	S2	24	1
Dozer	108.9	67.2	PWL-Pt	S3	24	1
Loader	106.5	64.9	PWL-Pt	S1	24	1

Cadna Noise Model - Construction - Area Sources - Phase 3						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Concrete Mixer Truck	114.0	72.4	PWL-Pt	S4	24	2
Paver	107.5	65.9	PWL-Pt	S5	30	1
Concrete Pump Truck	108.8	67.2	PWL-Pt	S6	12	1
Roller	104.6	63	PWL-Pt	S7	12	1
Loader	106.5	64.9	PWL-Pt	S1	24	1

Cadna Noise Model - Construction - Area Sources - Phase 4						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Forklift	104.6	62.9	PWL-Pt	S8	24	2
Generator	90.3	48.6	PWL-Pt	S9	30	1
Loader	109.5	67.9	PWL-Pt	S1	24	2
Welder	102.7	61.1	PWL-Pt	S10	24	1

Cadna Noise Model - Construction - Area Sources - Phase 5						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Forklift	104.6	62.9	PWL-Pt	S8	24	2
Generator	90.3	48.6	PWL-Pt	S9	30	1
Loader	109.5	67.9	PWL-Pt	S1	24	2
Welder	102.7	61.1	PWL-Pt	S10	24	1
Crane	107.7	66.1	PWL-Pt	S11	9.6	1

Cadna Noise Model - Construction - Area Sources - Phase 6						
Name	Result. PWL Day (dBA)	Result. PWL" Day (dBA)	Lw / Li Type	Lw / Li Value	Operating Time (min)	Moving Point Source Number
Air Compressor	96.5	54.9	PWL-Pt	S12	24	1

Cadna Noise Model - Construction - Area Sources - All Phases				
Area	Height	Coordinates X	Coordinates Y	Coordinates Z
	(m)	(m)	(m)	(m)
All Areas	1.52	1128.57	682.08	0
		1237.64	682.08	0
		1237.64	558.68	0
		1156.64	558.68	0
		1156.81	520.74	0
		1128.57	520.74	0

Cadna Noise Model - Terrain Contours Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
420	1217.63	779.77	128.02
	1206.29	764.77	128.02
	1186.29	764.10	128.02
	1181.29	797.11	128.02
	1197.96	828.11	128.02
	1220.29	844.45	128.02
	1233.96	842.11	128.02
	1257.63	824.44	128.02
	1265.63	806.44	128.02
	1259.96	778.77	128.02
	1249.30	766.77	128.02
	1217.63	779.77	128.02
400	1171.29	734.76	121.92
	1161.62	747.43	121.92
	1155.95	790.77	121.92
	1193.96	847.78	121.92
	1218.29	862.45	121.92
	1237.29	860.78	121.92
	1276.63	820.44	121.92
	1278.63	805.77	121.92
	1272.30	774.10	121.92
	1252.63	741.10	121.92
	1262.63	721.10	121.92
	1259.96	704.76	121.92
	1240.63	694.43	121.92
	1199.62	689.76	121.92
	1161.95	698.09	121.92
	1155.95	715.10	121.92
	1171.29	734.76	121.92
380	1293.30	822.44	115.83
	1287.30	770.10	115.83
	1316.97	760.10	115.83
	1312.31	740.10	115.83
	1272.30	694.43	115.83
	1228.63	671.76	115.83
	1188.78	673.82	115.83
	1144.28	684.76	115.83
	1089.61	700.09	115.83
	1086.27	707.43	115.83
	1119.95	743.77	115.83
	1117.61	768.44	115.83
	1187.29	863.45	115.83
	1220.29	876.78	115.83
	1236.29	876.45	115.83
	1293.30	822.44	115.83
360	1618.02	1087.43	109.73
	1522.26	918.99	109.73
	1491.17	950.50	109.73
	1450.85	940.84	109.73
	1400.87	858.93	109.73
	1423.55	833.31	109.73
	1343.32	808.94	109.73
	1331.56	749.72	109.73
	1308.46	709.40	109.73
	1280.32	688.81	109.73
	1266.03	663.61	109.73
	1229.49	640.93	109.73
	1168.59	637.99	109.73
	1126.12	650.67	109.73
	1060.22	705.20	109.73
	1040.90	746.78	109.73
	1065.68	788.78	109.73

Cadna Noise Model - Terrain Contours Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
360 (cont.)	1080.38	798.02	109.73
	1100.12	773.66	109.73
	1142.54	825.75	109.73
	1178.25	878.67	109.73
	1226.55	898.83	109.73
	1250.49	889.59	109.73
	1267.71	871.53	109.73
	1294.18	879.09	109.73
	1317.70	879.51	109.73
	1330.30	918.99	109.73
	1310.14	999.64	109.73
	1337.86	1081.97	109.73
	1364.74	1187.82	109.73
	777.53	1187.82	109.73
	754.85	1054.25	109.73
	766.61	1014.76	109.73
	754.01	963.52	109.73
	726.29	913.95	109.73
	621.28	826.59	109.73
	512.07	820.71	109.73
	549.03	876.99	109.73
	633.04	925.71	109.73
	650.68	963.52	109.73
	634.72	1187.82	109.73
340	1785.97	560.56	103.63
	1718.62	549.89	103.63
	1688.62	528.56	103.63
	1608.61	529.89	103.63
	1581.94	568.56	103.63
	1545.26	591.90	103.63
	1529.93	641.91	103.63
	1553.93	722.59	103.63
	1601.94	883.94	103.63
	1629.66	998.19	103.63
	1620.42	995.67	103.63
	1516.25	857.90	103.63
	1531.37	836.90	103.63
	1525.49	805.82	103.63
	1451.57	811.70	103.63
	1355.80	799.94	103.63
	1341.52	721.81	103.63
	1289.43	680.65	103.63
	1262.44	619.26	103.63
	1236.11	604.08	103.63
	1234.15	593.60	103.63
	1215.74	593.56	103.63
	1199.99	584.86	103.63
	1175.65	582.74	103.63
	1150.60	594.06	103.63
	1150.64	600.53	103.63
	1135.61	600.62	103.63
	1113.73	618.20	103.63
	1056.58	619.79	103.63
	1044.93	617.14	103.63
	1023.24	634.07	103.63
	1040.17	702.87	103.63
	1028.00	748.39	103.63
	1059.22	802.89	103.63
	1119.55	883.34	103.63
	1128.02	884.92	103.63
	1139.13	849.99	103.63
	1178.03	899.48	103.63

Cadna Noise Model - Terrain Contours Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
340 (cont.)	1254.77	932.82	103.63
	1278.85	930.97	103.63
	1302.37	1030.94	103.63
	1351.93	1182.99	103.63
	880.65	1182.99	103.63
	778.58	1031.77	103.63
	769.91	953.10	103.63
	759.24	915.09	103.63
	707.90	855.08	103.63
	636.55	801.07	103.63
	512.53	781.07	103.63
	447.19	727.72	103.63
	353.17	716.39	103.63
	347.17	767.06	103.63
	430.52	825.74	103.63
	491.86	841.74	103.63
	562.54	910.42	103.63
	613.22	936.43	103.63
	624.55	961.10	103.63
	616.55	1027.11	103.63
	613.90	1188.72	103.63
320	1786.57	474.32	97.54
	1594.47	448.38	97.54
	1521.43	458.97	97.54
	1479.62	498.66	97.54
	1467.98	627.79	97.54
	1482.80	674.89	97.54
	1410.83	691.83	97.54
	1356.32	675.42	97.54
	1344.67	622.50	97.54
	1301.81	597.62	97.54
	1252.59	542.06	97.54
	1219.78	525.65	97.54
	1160.63	522.74	97.54
	1147.28	521.06	97.54
	1130.79	521.05	97.54
	1122.93	536.76	97.54
	1116.84	558.86	97.54
	1102.82	568.91	97.54
	1057.48	569.25	97.54
	1025.47	560.91	97.54
	1007.80	565.25	97.54
	992.13	582.92	97.54
	984.80	599.92	97.54
	988.46	633.59	97.54
	997.80	642.26	97.54
	1002.80	701.27	97.54
	1015.13	724.94	97.54
	1015.80	750.61	97.54
	1042.79	797.19	97.54
	1169.28	984.53	97.54
	1181.45	983.47	97.54
	1197.33	949.60	97.54
	1223.79	970.77	97.54
	1246.54	972.89	97.54
	1243.37	1018.40	97.54
	1222.20	1015.23	97.54
	1207.38	1038.51	97.54
	1288.06	1180.54	97.54
	1081.36	1179.21	97.54
	1038.68	1086.52	97.54
	1008.01	1079.85	97.54

Cadna Noise Model - Terrain Contours Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
320 (cont.)	994.34	1049.18	97.54
	925.33	1055.52	97.54
	828.31	965.5	97.54
	812.44	944.86	97.54
	787.03	928.45	97.54
	763.75	861.77	97.54
	669.01	782.39	97.54
	661.6	758.04	97.54
	627.2	751.69	97.54
	537.76	741.11	97.54
	448.41	686.1	97.54
	387.07	678.76	97.54
	373.4	670.76	97.54
	348.73	670.76	97.54
	336.06	686.43	97.54
	308.05	686.76	97.54
	308.72	760.44	97.54
	342.39	803.12	97.54
	431.41	856.79	97.54
	479.75	862.8	97.54
	583.48	962.82	97.54
	575.54	1187.48	97.54
300	1094.22	169.97	91.44
	1123.33	224.48	91.44
	1101.1	247.24	91.44
	1129.68	266.29	91.44
	1183.13	275.81	91.44
	1281.57	256.23	91.44
	1329.2	231.36	91.44
	1414.94	258.88	91.44
	1563.13	262.05	91.44
	1616.58	236.12	91.44
	1664.21	187.43	91.44
	1662.09	310.22	91.44
	1756.83	346.73	91.44
	1743.6	362.08	91.44
	1664.74	343.56	91.44
	1589.59	354.67	91.44
	1610.76	374.25	91.44
	1505.97	386.95	91.44
	1483.74	408.65	91.44
	1387.95	433	91.44
	1366.25	485.92	91.44
	1327.61	489.1	91.44
	1315.44	454.7	91.44
	1211.18	430.35	91.44
	1081.52	486.98	91.44
	1045.53	492.27	91.44
	1021.53	453.6	91.44
	942.18	445.6	91.44
	939.51	472.27	91.44
	980.85	489.27	91.44
	989.52	509.28	91.44
	973.52	520.95	91.44
	946.51	529.61	91.44
	937.51	544.62	91.44
	939.84	574.62	91.44
	944.18	605.3	91.44
	958.53	646.13	91.44
	973.35	667.83	91.44
	975.47	690.59	91.44
	999.22	718.02	91.44

Cadna Noise Model - Terrain Contours - Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
300 (cont.)	1004.51	762.48	91.44
	1165.40	1001.70	91.44
	1196.62	1006.46	91.44
	1189.74	1044.57	91.44
	1261.19	1176.35	91.44
	1226.00	1175.29	91.44
	1100.04	1039.54	91.44
	1080.46	1051.98	91.44
	1047.91	1031.07	91.44
	1035.90	999.73	91.44
	999.23	973.73	91.44
	949.89	945.72	91.44
	924.55	917.05	91.44
	823.86	858.37	91.44
	798.52	821.69	91.44
	718.50	770.35	91.44
	678.50	717.00	91.44
	633.49	685.66	91.44
	548.47	679.00	91.44
	509.79	664.66	91.44
	493.46	641.32	91.44
	407.77	620.98	91.44
	265.79	645.35	91.44
	263.27	713.40	91.44
	306.12	782.29	91.44
	354.00	829.34	91.44
	399.37	854.54	91.44
	439.70	894.03	91.44
	471.62	920.91	91.44
	569.00	1120.44	91.44
280	271.26	167.28	85.35
	307.39	293.30	85.35
	419.97	269.78	85.35
	493.06	200.05	85.35
	511.54	265.58	85.35
	562.79	263.06	85.35
	676.81	144.36	85.35
	722.16	218.38	85.35
	824.85	237.05	85.35
	916.20	207.04	85.35
	1010.89	210.38	85.35
	1062.23	203.71	85.35
	1080.24	255.72	85.35
	1122.25	279.06	85.35
	1181.59	287.73	85.35
	1414.31	286.89	85.35
	1279.05	361.66	85.35
	1146.31	358.30	85.35
	1071.53	386.02	85.35
	971.56	395.27	85.35
	877.46	434.75	85.35
	838.82	463.32	85.35
	844.70	491.04	85.35
	872.42	501.12	85.35
	865.70	532.21	85.35
	884.19	601.94	85.35
	929.70	646.92	85.35
	945.05	696.14	85.35
	1044.55	839.04	85.35
	1031.32	869.21	85.35
	1000.09	848.04	85.35
	1009.09	875.03	85.35

Cadna Noise Model - Terrain Contours - Mechanical & Traffic			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
280 (cont.)	1027.08	903.08	85.35
	1022.85	907.85	85.35
	968.34	854.39	85.35
	915.41	790.35	85.35
	869.37	768.12	85.35
	776.75	694.03	85.35
	637.55	527.84	85.35
	604.74	523.61	85.35
	550.76	575.48	85.35
	513.18	553.25	85.35
	395.16	538.96	85.35
	276.74	547.30	85.35
260	273.08	325.38	79.25
	386.10	288.70	79.25
	546.14	283.70	79.25
	626.49	243.69	79.25
	667.83	183.01	79.25
	674.50	242.36	79.25
	921.22	256.36	79.25
	918.56	264.36	79.25
	865.21	274.36	79.25
	832.54	315.04	79.25
	803.20	325.71	79.25
	783.86	377.72	79.25
	766.52	375.05	79.25
	755.85	452.40	79.25
	742.52	447.07	79.25
	736.51	414.40	79.25
	684.50	407.06	79.25
	668.50	397.73	79.25
	659.83	441.07	79.25
	669.50	474.41	79.25
	768.86	558.10	79.25
	770.86	575.10	79.25
	646.83	494.75	79.25
	546.47	469.74	79.25
	494.13	498.42	79.25
	427.33	495.05	79.25
	364.32	511.02	79.25
	351.72	503.46	79.25
	271.07	514.80	79.25
240	273.89	472.56	73.15
	344.46	425.09	73.15
	280.61	407.45	73.15
	340.26	372.58	73.15
	405.79	380.57	73.15
	460.40	356.62	73.15
	454.94	346.54	73.15
	428.89	360.40	73.15
	395.71	341.08	73.15
	324.72	331.00	73.15
	276.83	347.38	73.15

Cadna Noise Model - Terrain Contours - Mechanical Only			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
PD	1128.54	530.37	96.00
	1131.67	536.42	96.00
	1144.49	536.46	96.00
	1146.53	528.99	96.00
	1144.78	522.01	96.00
	1131.21	521.85	96.00
	1128.54	530.37	96.00
P1	1130.61	540.27	98.80
	1130.45	553.16	98.80
	1144.18	552.89	98.80
	1144.44	540.06	98.80
	1130.61	540.27	98.80
P2	1130.20	556.20	100.60
	1143.72	556.73	100.60
	1143.19	569.33	100.60
	1129.54	569.59	100.60
	1130.20	556.20	100.60
P3	1131.21	584.80	101.70
	1145.32	584.47	101.70
	1145.57	570.69	101.70
	1130.54	570.77	101.70
	1131.21	584.80	101.70
P4	1135.22	587.39	103.30
	1149.25	587.35	103.30
	1148.91	599.88	103.30
	1134.80	599.83	103.30
	1135.30	587.73	103.30
P5	1136.40	601.45	104.20
	1148.72	601.53	104.20
	1148.43	614.19	104.20
	1136.19	614.23	104.20
	1136.40	601.45	104.20
P6	1136.40	630.45	106.20
	1148.86	630.22	106.20
	1149.13	618.06	106.20
	1136.33	617.99	106.20
	1136.40	630.45	106.20
P7	1136.71	631.86	107.50
	1148.15	631.89	107.50
	1147.98	644.15	107.50
	1136.51	644.55	107.50
	1136.71	631.86	107.50
P8	1147.09	645.06	107.90
	1132.10	651.07	107.90
	1140.04	664.18	107.90
	1153.31	655.00	107.90
	1147.09	645.06	107.90
P9	1155.61	665.73	108.20
	1168.85	665.60	108.20
	1169.14	654.16	108.20
	1156.45	654.54	108.20
	1155.61	665.73	108.20
P10	1170.28	665.77	108.30
	1170.70	654.16	108.28
	1183.44	654.25	108.25
	1183.31	665.90	108.23
	1170.28	665.77	108.20
P11	1186.28	665.81	108.50
	1186.57	654.16	108.50
	1199.60	654.33	108.50
	1199.72	665.85	108.50
	1186.28	665.81	108.50

Cadna Noise Model - Terrain Contours - Mechanical Only			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
P12	1200.70	665.91	108.60
	1200.91	654.34	108.60
	1213.27	654.22	108.60
	1213.77	666.16	108.60
	1200.70	665.91	108.60
P13	1212.89	651.80	108.70
	1222.54	664.20	108.70
	1233.06	657.18	108.70
	1222.91	644.28	108.70
	1212.89	651.80	108.70
P14	1217.38	638.00	107.70
	1230.20	638.13	107.70
	1229.33	624.72	107.70
	1217.38	625.02	107.70
	1217.38	638.00	107.70
P15	1217.78	623.52	106.80
	1229.38	623.42	106.80
	1229.28	610.59	106.80
	1217.55	610.82	106.80
	1217.78	623.52	106.80
P16	1217.59	607.18	104.70
	1229.98	607.18	104.70
	1229.69	594.63	104.70
	1217.19	594.45	104.70
	1217.59	607.18	104.70
P17	1217.65	592.83	103.80
	1229.46	592.83	103.80
	1229.42	578.34	103.80
	1217.77	581.18	103.80
	1217.65	592.83	103.80
P18	1206.88	574.74	103.40
	1212.94	560.46	103.40
	1225.67	565.85	103.40
	1220.08	577.46	103.40
	1214.73	577.83	103.40
P19	1189.69	573.05	102.90
	1189.69	560.89	102.90
	1202.68	561.35	102.90
	1202.81	573.21	102.90
	1189.69	573.05	102.90
P20	1173.91	573.34	102.40
	1173.87	561.56	102.40
	1186.44	561.60	102.40
	1186.48	573.13	102.40
	1173.91	573.34	102.40
P21	1172.37	573.00	102.00
	1172.54	561.44	102.00
	1159.05	561.35	102.00
	1160.09	572.88	102.00
	1172.37	573.00	102.00
P22	1167.13	604.89	103.10
	1167.30	591.36	103.10
	1183.87	591.32	103.10
	1183.92	604.77	103.10
	1167.13	604.89	103.10
P23	1167.34	607.44	105.10
	1183.71	607.52	105.10
	1183.62	620.88	105.10
	1167.21	620.63	105.10
	1167.34	607.44	105.10
P24	1167.11	622.47	106.70
	1184.44	622.57	106.70
	1184.28	636.03	106.70
	1166.91	635.86	106.70
	1167.11	622.47	106.70

Cadna Noise Model - Mechanical - Buildings - All Models					
Name	Abs.	Coordinates			
		X	Y	Z	Ground
		(m)	(m)	(m)	(m)
B1	0.37	1141.80	550.61	104.90	98.80
		1131.79	550.65	104.90	98.80
		1131.82	540.69	104.90	98.80
		1141.75	540.69	104.90	98.80
		1141.80	550.61	104.90	98.80
B2	0.37	1141.47	568.65	106.70	100.60
		1131.46	568.69	106.70	100.60
		1131.49	558.73	106.70	100.60
		1141.42	558.73	106.70	100.60
		1141.47	568.65	106.70	100.60
B3	0.37	1142.97	581.01	107.80	101.70
		1132.96	581.05	107.80	101.70
		1132.99	571.09	107.80	101.70
		1142.92	571.09	107.80	101.70
		1142.97	581.01	107.80	101.70
B4	0.37	1147.48	599.39	109.40	103.30
		1137.47	599.42	109.40	103.30
		1137.50	589.46	109.40	103.30
		1147.43	589.46	109.40	103.30
		1147.48	599.39	109.40	103.30
B5	0.37	1147.48	611.83	110.30	104.20
		1137.47	611.87	110.30	104.20
		1137.50	601.91	110.30	104.20
		1147.43	601.91	110.30	104.20
		1147.48	611.83	110.30	104.20
B6	0.37	1147.65	630.04	112.30	106.20
		1137.64	630.07	112.30	106.20
		1137.67	620.11	112.30	106.20
		1147.60	620.11	112.30	106.20
		1147.65	630.04	112.30	106.20
B7	0.37	1147.31	642.32	115.50	109.40
		1137.30	642.35	113.75	107.65
		1137.34	632.39	113.70	107.60
		1147.26	632.39	113.69	107.59
		1147.31	642.32	115.50	109.40
B8	0.37	1150.59	655.63	114.00	107.90
		1148.66	652.35	114.00	107.90
		1149.96	651.49	114.00	107.90
		1146.91	646.42	114.00	107.90
		1134.88	653.87	114.00	107.90
		1140.05	662.33	114.00	107.90
		1150.59	655.63	114.00	107.90
B9	0.37	1168.69	665.12	114.30	108.20
		1158.68	665.15	114.30	108.20
		1158.72	655.19	114.30	108.20
		1168.64	655.19	114.30	108.20
		1168.69	665.12	114.30	108.20
B10	0.37	1181.05	665.03	114.34	108.24
		1171.04	665.07	114.39	108.29
		1171.08	655.11	114.38	108.28
		1181.00	655.11	114.35	108.25
		1181.05	665.03	114.34	108.24
B11	0.37	1199.09	665.03	114.60	108.50
		1189.08	665.07	114.60	108.50
		1189.12	655.11	114.60	108.50
		1199.04	655.11	114.60	108.50
		1199.09	665.03	114.60	108.50
B12	0.37	1211.29	664.78	114.70	108.60
		1201.28	664.82	114.70	108.60
		1201.31	654.86	114.70	108.60
		1211.24	654.86	114.70	108.60
		1211.29	664.78	114.70	108.60
B13	0.37	1222.70	646.95	114.80	108.70
		1230.22	656.93	114.80	108.70
		1222.41	663.07	114.80	108.70
		1213.72	651.62	114.80	108.70
		1218.36	647.91	114.80	108.70
		1219.53	649.49	114.80	108.70
		1222.70	646.95	114.80	108.70

Cadna Noise Model - Mechanical - Buildings - All Models					
Name	Abs.	Coordinates			
		X	Y	Z	Ground
		(m)	(m)	(m)	(m)
B14	0.37	1228.49	635.47	113.80	107.70
		1218.48	635.50	113.80	107.70
		1218.52	625.54	113.80	107.70
		1228.44	625.54	113.80	107.70
		1228.49	635.47	113.80	107.70
B15	0.37	1228.41	622.77	112.90	106.80
		1218.40	622.81	112.90	106.80
		1218.43	612.85	112.90	106.80
		1228.36	612.85	112.90	106.80
		1228.41	622.77	112.90	106.80
B16	0.37	1228.41	604.90	110.80	104.70
		1218.40	604.93	110.80	104.70
		1218.43	594.97	110.80	104.70
		1228.36	594.97	110.80	104.70
		1228.41	604.90	110.80	104.70
B17	0.37	1228.41	592.37	109.90	103.80
		1218.40	592.40	109.90	103.80
		1218.43	582.44	109.90	103.80
		1228.36	582.44	109.90	103.80
		1228.41	592.37	109.90	103.80
B18	0.37	1219.72	576.42	109.50	103.40
		1224.11	565.89	109.50	103.40
		1214.93	562.05	109.50	103.40
		1210.04	574.71	109.50	103.40
		1215.25	576.84	109.50	103.40
		1216.09	575.02	109.50	103.40
		1219.72	576.42	109.50	103.40
B19	0.37	1202.29	572.15	109.00	102.90
		1192.28	572.19	109.00	102.90
		1192.32	562.23	109.00	102.90
		1202.24	562.23	109.00	102.90
		1202.29	572.15	109.00	102.90
B20	0.37	1184.46	572.02	108.50	102.40
		1174.45	572.05	108.50	102.40
		1174.48	562.09	108.50	102.40
		1184.41	562.09	108.50	102.40
		1184.46	572.02	108.50	102.40
B21	0.37	1172.00	572.09	108.10	102.00
		1161.99	572.12	108.10	102.00
		1162.02	562.16	108.10	102.00
		1171.95	562.16	108.10	102.00
		1172.00	572.09	108.10	102.00
B22	0.37	1167.99	602.26	109.20	103.10
		1182.25	602.29	109.20	103.10
		1182.23	592.21	109.20	103.10
		1169.65	592.29	109.20	103.10
		1169.63	596.45	109.20	103.10
		1168.15	596.45	109.20	103.10
		1167.99	602.26	109.20	103.10
B23	0.37	1182.08	620.38	111.20	105.10
		1182.13	610.31	111.20	105.10
		1167.93	610.44	111.20	105.10
		1168.01	616.57	111.20	105.10
		1170.01	616.49	111.20	105.10
		1169.93	620.17	111.20	105.10
		1182.08	620.38	111.20	105.10
B24	0.37	1167.91	632.95	112.80	106.70
		1182.17	632.98	112.80	106.70
		1182.14	622.90	112.80	106.70
		1169.57	622.98	112.80	106.70
		1169.54	627.14	112.80	106.70
		1168.07	627.14	112.80	106.70
		1167.91	632.95	112.80	106.70

Cadna Noise Model - Mechanical - Buildings - Mitigation Only					
Name	Abs.	Coordinates			
		X	Y	Z	Ground
		(m)	(m)	(m)	(m)
W1	0.37	1136.35	550.64	100.63	98.80
		1136.36	552.41	100.63	98.80
		1138.18	552.41	100.63	98.80
		1138.19	550.64	100.63	98.80
W2	0.37	1136.16	558.71	102.43	100.60
		1136.16	557.12	102.43	100.60
		1138.00	557.12	102.43	100.60
		1137.99	558.71	102.43	100.60
W3	0.37	1137.47	581.04	103.22	101.70
		1137.47	583.05	103.22	101.70
		1139.29	583.06	103.22	101.70
		1139.29	581.07	103.22	101.70
W4	0.37	1142.01	589.44	104.82	103.30
		1142.01	587.58	104.82	103.30
		1143.84	587.59	104.82	103.30
		1143.83	589.44	104.82	103.30
W5	0.37	1142.25	611.85	105.72	104.20
		1142.25	613.59	105.72	104.20
		1144.08	613.60	105.72	104.20
		1144.08	611.88	105.72	104.20
W6	0.37	1142.02	620.10	107.72	106.20
		1142.01	618.31	107.72	106.20
		1143.84	618.31	107.72	106.20
		1143.84	620.10	107.72	106.20
W7	0.37	1141.76	642.34	110.35	108.52
		1141.75	644.13	110.35	108.52
		1143.59	644.14	110.71	108.88
		1143.58	642.33	110.70	108.87
W8	0.37	1139.60	650.94	109.73	107.90
		1138.79	649.50	109.73	107.90
		1140.35	648.50	109.73	107.90
		1141.21	649.94	109.73	107.90
W13	0.37	1225.46	650.60	110.22	108.70
		1227.01	649.49	110.22	108.70
		1228.07	650.92	110.22	108.70
		1226.46	651.94	110.22	108.70
W14	0.37	1222.31	635.49	109.22	107.70
		1222.30	637.31	109.22	107.70
		1224.13	637.32	109.22	107.70
		1224.13	635.49	109.22	107.70
W15	0.37	1221.85	612.82	108.02	106.80
		1221.84	611.20	108.02	106.80
		1223.67	611.20	108.02	106.80
		1223.67	612.82	108.02	106.80
W16	0.37	1221.84	605.01	105.92	104.70
		1221.84	606.78	105.92	104.70
		1223.67	606.79	105.92	104.70
		1223.67	605.00	105.92	104.70
W18	0.37	1212.22	568.95	104.92	103.40
		1210.51	568.40	104.92	103.40
		1211.15	566.48	104.92	103.40
		1212.93	567.14	104.92	103.40
W19	0.37	1192.27	568.74	104.73	102.90
		1190.51	568.74	104.73	102.90
		1190.51	566.91	104.73	102.90
		1192.26	566.89	104.73	102.90
W20	0.37	1184.45	568.76	104.23	102.40
		1186.12	568.74	104.23	102.40
		1186.13	566.93	104.23	102.40
		1184.45	566.93	104.23	102.40
W21	0.37	1161.98	568.77	103.83	102.00
		1160.04	568.78	103.83	102.00
		1160.04	566.95	103.83	102.00
		1161.97	566.92	103.83	102.00

Cadna Noise Model -Mechanical - Noise Levels at Receivers - Without Barriers					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
M1/2	47.0	1.52	1127.50	554.62	100.19
M3/4	46.4	1.52	1127.53	585.19	102.94
M5/6	44.1	1.52	1127.45	615.90	105.56
M7/8	46.0	1.52	1127.54	650.18	111.20
M9	38.7	1.52	1150.93	682.98	117.26
M10/11	38.2	1.52	1185.05	683.19	120.19
M12	36.3	1.52	1215.37	683.22	121.06
M13/14	44.6	1.52	1238.54	650.37	110.97
M15/16	41.9	1.52	1238.54	607.11	105.37
M17	40.0	1.52	1238.61	579.45	103.60
M18	45.0	1.52	1213.45	557.50	104.42
M19/20	47.9	1.52	1188.55	557.48	103.93
M21	46.4	1.52	1157.73	557.57	103.01

Cadna Noise Model -Mechanical - Noise Levels at Receivers - With Barriers					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
M1/2	39.0	1.52	1127.50	554.62	100.19
M3/4	39.7	1.52	1127.53	585.19	102.94
M5/6	37.9	1.52	1127.45	615.90	105.56
M7/8	39.0	1.52	1127.54	650.18	111.20
M9	38.6	1.52	1150.93	682.98	117.26
M10/11	37.6	1.52	1185.05	683.19	120.19
M12	35.9	1.52	1215.37	683.22	121.06
M13/14	38.7	1.52	1238.54	650.37	110.97
M15/16	39.4	1.52	1238.54	607.11	105.37
M17	39.9	1.52	1238.61	579.45	103.60
M18	38.9	1.52	1213.45	557.50	104.42
M19/20	39.6	1.52	1188.55	557.48	103.93
M21	38.7	1.52	1157.73	557.57	103.01

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 1					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	56.0	1.52	1127.28	519.36	1.52
C2	61.0	1.52	1127.44	557.59	1.52
C3	61.4	1.52	1127.46	619.67	1.52
C4	58.0	1.52	1127.49	683.13	1.52
C5	61.2	1.52	1183.05	683.24	1.52
C6	58.0	1.52	1238.67	683.08	1.52
C7	61.6	1.52	1238.54	620.61	1.52
C8	58.0	1.52	1238.65	557.52	1.52
C9	61.2	1.52	1199.28	557.46	1.52
C10	62.8	1.52	1157.84	557.33	1.52
C11	57.7	1.52	1157.91	519.63	1.52

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 2					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	66.5	1.52	1127.28	519.36	1.52
C2	71.6	1.52	1127.44	557.59	1.52
C3	71.9	1.52	1127.46	619.67	1.52
C4	68.6	1.52	1127.49	683.13	1.52
C5	71.8	1.52	1183.05	683.24	1.52
C6	68.6	1.52	1238.67	683.08	1.52
C7	72.1	1.52	1238.54	620.61	1.52
C8	68.6	1.52	1238.65	557.52	1.52
C9	71.8	1.52	1199.28	557.46	1.52
C10	73.3	1.52	1157.84	557.33	1.52
C11	68.3	1.52	1157.91	519.63	1.52

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 3					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	65.8	1.52	1127.28	519.36	1.52
C2	71.0	1.52	1127.44	557.59	1.52
C3	71.4	1.52	1127.46	619.67	1.52
C4	68.0	1.52	1127.49	683.13	1.52
C5	71.2	1.52	1183.05	683.24	1.52
C6	68.1	1.52	1238.67	683.08	1.52
C7	71.6	1.52	1238.54	620.61	1.52
C8	68.0	1.52	1238.65	557.52	1.52
C9	71.2	1.52	1199.28	557.46	1.52
C10	72.7	1.52	1157.84	557.33	1.52
C11	67.7	1.52	1157.91	519.63	1.52

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 4					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	60.9	1.52	1127.28	519.36	1.52
C2	66.0	1.52	1127.44	557.59	1.52
C3	66.3	1.52	1127.46	619.67	1.52
C4	62.9	1.52	1127.49	683.13	1.52
C5	66.2	1.52	1183.05	683.24	1.52
C6	63.0	1.52	1238.67	683.08	1.52
C7	66.5	1.52	1238.54	620.61	1.52
C8	63.0	1.52	1238.65	557.52	1.52
C9	66.2	1.52	1199.28	557.46	1.52
C10	67.7	1.52	1157.84	557.33	1.52
C11	62.7	1.52	1157.91	519.63	1.52

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 5					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	61.6	1.52	1127.28	519.36	1.52
C2	66.7	1.52	1127.44	557.59	1.52
C3	67.0	1.52	1127.46	619.67	1.52
C4	63.6	1.52	1127.49	683.13	1.52
C5	66.9	1.52	1183.05	683.24	1.52
C6	63.7	1.52	1238.67	683.08	1.52
C7	67.2	1.52	1238.54	620.61	1.52
C8	63.7	1.52	1238.65	557.52	1.52
C9	66.9	1.52	1199.28	557.46	1.52
C10	68.4	1.52	1157.84	557.33	1.52
C11	63.4	1.52	1157.91	519.63	1.52

Cadna Noise Model - Construction - Noise Levels at Receivers - Phase 5					
Name	Level Lr	Height	Coordinates		
	Day		X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
C1	45.9	1.52	1127.28	519.36	1.52
C2	51.5	1.52	1127.44	557.59	1.52
C3	51.8	1.52	1127.46	619.67	1.52
C4	48.5	1.52	1127.49	683.13	1.52
C5	51.7	1.52	1183.05	683.24	1.52
C6	48.5	1.52	1238.67	683.08	1.52
C7	52.0	1.52	1238.54	620.61	1.52
C8	48.5	1.52	1238.65	557.52	1.52
C9	51.6	1.52	1199.28	557.46	1.52
C10	53.2	1.52	1157.84	557.33	1.52
C11	48.2	1.52	1157.91	519.63	1.52

Cadna Noise Model - Roadway Source Input - Calibration								
Name	Lme Day (dBA)	Exact Traffic Count Data			Speed Limit (km/h)	SCS Distance (m)	Surface Type	Throttle
		Total (hourly)	Total% Medium /Heavy Trucks	%Heavy Trucks				
Imperial-North	65.0	592	4.0	50.0	81	21	1	Yes
Imperial-South	66.6	1222	4.0	50.0	64	21	1	Yes
Lisbon-West	61.2	396	4.0	50.0	56	10	1	Yes
Lisbon-Center	61.2	396	4.0	50.0	56	10	1	Yes
Lisbon-East	61.2	396	4.0	50.0	56	18	1	Yes

Cadna Noise Model - Roadway Source Input - Current								
Name	Lme Day (dBA)	Exact Traffic Count Data			Speed Limit (km/h)	SCS Distance (m)	Surface Type	Throttle
		Total (hourly)	Total% Medium /Heavy Trucks	%Heavy Trucks				
Imperial-North	66.5	837	4.0	50.0	81	21	1	Yes
Imperial-South	68.1	1730	4.0	50.0	64	21	1	Yes
Lisbon-West	64.6	865	4.0	50.0	56	10	1	Yes
Lisbon-Center	64.6	865	4.0	50.0	56	10	1	Yes
Lisbon-East	64.6	865	4.0	50.0	56	18	1	Yes

Cadna Noise Model - Roadway Source Input - Future & Outdoor Use								
Name	Lme Day (dBA)	Exact Traffic Count Data			Speed Limit (km/h)	SCS Distance (m)	Surface Type	Throttle
		Total (hourly)	Total% Medium /Heavy Trucks	%Heavy Trucks				
Imperial-North	67.0	938	4.0	50.0	81	21	1	Yes
Imperial-South	70.0	2696	4.0	50.0	64	21	1	Yes
Lisbon-West	66.3	1260	4.0	50.0	56	10	1	Yes
Lisbon-Center	65.4	1040	4.0	50.0	56	10	1	Yes
Lisbon-East	65.4	1040	4.0	50.0	56	18	1	Yes

Cadna Noise Model - Roadway Source Input - Current			
Name	PWL Day (dBA)	Lw / Li	
		Type	Value
Orange Trolley	121.0	Lw	TR

Cadna Noise Model - Roadway Source Geometry			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
Imperial - North	771.23	519.11	79.77
	812.07	560.12	81.85
	846.43	598.89	83.61
	878.09	634.14	85.35
	929.85	702.89	85.35
	1091.91	927.89	88.09
	1266.44	1175.22	92.91
Imperial - South	263.84	383.96	73.57
	432.23	406.80	75.01
	527.76	421.62	77.93
	611.40	438.13	79.25
	688.28	466.67	79.25
	746.15	502.04	79.25
	771.23	519.11	79.77
Lisbon - West	771.23	519.11	79.77
	785.93	504.72	80.96
	928.47	506.00	90.13
	981.28	506.16	91.44
	1063.54	506.83	92.77
Lisbon - Center	1063.54	506.83	92.77
	1121.70	507.53	94.84
	1215.50	508.52	96.45
Lisbon - East	1215.50	508.52	96.45
	1565.38	511.84	101.14

Cadna Noise Model - Railway Line Source Geometry			
Name	Coordinates		
	X	Y	Z
	(m)	(m)	(m)
Orange Trolley	33.37	365.22	12.38
	550.07	445.52	79.85
	596.32	454.35	79.85
	647.19	470.75	79.85
	686.29	487.98	79.85
	730.22	513.42	79.85
	757.34	533.60	79.85
	788.71	560.96	81.04
	814.23	586.16	82.22
	834.92	613.02	84.42
	866.79	656.73	85.95
	925.85	738.65	85.95
	1235.20	1167.72	92.04

Cadna Noise Model - Existing Noise Levels at Receivers - Calibration					
Name	Level Lr	Height (relative)	Coordinates		
			X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
NML	68	1.52	1128.21	515.58	95.99

Cadna Noise Model - Future Noise Levels at Receivers - Outdoor Use					
Name	Level Traffic	Height	Coordinates		
			X	Y	Z
	(dBA)	(m)	(m)	(m)	(m)
OU1	59.4	1.52	1129.93	547.08	99.56
OU2	56.8	1.52	1129.86	562.71	100.34
OU3	56.1	1.52	1130.53	577.62	102.01
OU4	55.1	1.52	1132.95	592.84	103.87
OU5	54.2	1.52	1132.69	607.82	105.44
OU6	53.5	1.52	1132.56	623.85	107.12
OU7	53.5	1.52	1132.69	639.22	109.38
OU8	53.7	1.52	1134.01	661.08	112.85
OU9	53.4	1.52	1159.98	666.78	115.39
OU10	53.3	1.52	1176.81	666.78	116.41
OU11	53.4	1.52	1192.45	666.91	117.30
OU12	53.1	1.52	1209.94	666.91	116.86
OU13	52.7	1.52	1230.56	662.42	115.30
OU14	53.0	1.52	1232.46	633.78	109.90
OU15	53.6	1.52	1232.88	616.16	107.17
OU16	54.3	1.52	1233.41	600.59	104.92
OU17	56.2	1.52	1232.10	582.53	103.45
OU18	57.5	1.52	1221.60	562.35	102.21
OU19	58.0	1.52	1195.84	560.04	102.71
OU20	57.9	1.52	1180.69	559.83	102.77
OU21	57.9	1.52	1165.12	559.93	102.76
OU22	55.0	1.52	1187.98	597.52	106.65
OU23	54.1	1.52	1188.30	614.56	108.53
OU24	53.6	1.52	1188.03	629.34	110.18

APPENDIX E

Manufacturer Data Sheets

24ACC6
Performance™ 16 Air Conditioner with Puron® Refrigerant 1–1/2 to 5 Tons

Carrier
turn to the experts

Product Data

Puron
the environmentally sound refrigerant

Performance SERIES

Carrier's Air Conditioners with Puron® refrigerant provide a collection of features unmatched by any other family of equipment. The 24ACC has been designed utilizing Carrier's Puron refrigerant. The environmentally sound refrigerant allows you to make a responsible decision in the protection of the earth's ozone layer.

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. Refer to the combination ratings in the Product Data for system combinations that meet Energy Star® guidelines.

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

Efficiency

- 14 - 16.5 SEER / 11.5- 13.5 EER
- Microtube Technology™ refrigeration system
- Indoor air quality accessories available

Sound

- Sound level as low as 72 dBA
- Compressor sound blanket standard

Comfort

- System supports Edge® Thermidistat™ or standard thermostat controls

Reliability

- Puron® refrigerant - environmentally sound, won't deplete the ozone layer and low lifetime servce cost.
- Scroll compressor
- Internal pressure relief valve
- Internal thermal overload
- Filter drier
- High and low pressure switches
- Balanced refrigeration system for maximum reliability

Durability

WeatherArmor™ protection package:

- Solid, durable sheet metal construction
- Louvered coil guard
- Baked-on, complete outer coverage, powder paint

Applications

- Long-line - up to 250 feet (76.20 m) total equivalent length, up to 200 feet (60.96 m) condenser above evaporator, or up to 80 ft. (24.38 m) evaporator above condenser (See Longline Guide for more information.)
- Low ambient (down to -20°F/-28.9°C)) with accessory kit

ELECTRICAL DATA

UNIT SIZE	V/PH	OPER VOLTS*		COMPR		FAN	MCA	MIN WIRE SIZE† 60° C	MIN WIRE SIZE† 75° C	MAX LENGTH ft. (m)‡ 60° C	MAX LENGTH ft. (m)‡ 75° C	MAX FUSE** or CKT BRK AMPS
		MAX	MIN	LRA	RLA	FLA						
18–30	208/230/1–60	253	197	48.0	9.0	0.50	11.8	14	14	67 (20.4)	64 (19.5)	20
24–30				58.3	13.5	0.70	17.6	14	14	46 (14.0)	43 (13..1)	25
30–30				64.0	12.8	0.70	16.7	14	14	44 (13.4)	41 (12.5)	25
36–30				77.0	14.1	0.50	18.1	12	12	57 (17.4)	54 (16.5)	30
42–30				112.0	17.9	1.20	23.6	10	10	85 (25.9)	81 (24.7)	40
48–30				109.0	19.9	1.20	26.1	10	10	70 (21.3)	67 (20.4)	40
60–30				135.0	21.4	1.20	28.0	8	10	91 (27.7)	56 (17.1)	40

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

† If wire is applied at ambient greater than 30°C, consult table 310–16 of the NEC (NFPA 70). The ampacity of non–metallic–sheathed cable (NM), trade name ROMEX, shall be that of 60°C conditions, per the NEC (NFPA 70) Article 336–26. If other than uncoated (no–plated), 60 or 75°C insulation, copper wire (solid wire for 10 AWG or smaller, stranded wire for larger than 10 AWG) is used, consult applicable tables of the NEC (NFPA 70).

‡ Length shown is as measured one way along wire path between unit and service panel for voltage drop not to exceed 2%.

** Time–Delay fuse.

FLA – Full Load Amps

LRA – Locked Rotor Amps

MCA – Minimum Circuit Amps

RLA – Rated Load Amps

NOTE: Control circuit is 24–V on all units and requires external power source. Copper wire must be used from service disconnect to unit. All motors/compressors contain internal overload protection.

Complies with 2010 requirements of ASHRAE Standards 90.1

A-WEIGHTED SOUND POWER LEVEL (dBA)

Unit Size – Voltage, Series	Standard Rating (dBA)	TYPICAL OCTAVE BAND SPECTRUM (dBA without tone adjustment)						
		125	250	500	1000	2000	4000	8000
18–30	73	49.5	58.5	64.5	69.0	63.0	59.5	52.4
24–30	74	54.5	62.0	67.0	71.5	66.0	62.0	53.0
30–30	74	56.0	62.5	66.0	68.5	64.5	61.0	53.5
36–30	72	52.0	61.0	64.0	66.0	61.0	58.5	51.5
42–30	74	56.5	61.5	65.0	66.5	63.5	61.0	56.5
48–30	73	58.0	61.0	65.0	66.0	62.0	58.0	51.0
60–30	74	56.5	62.5	66.5	68.0	63.0	59.5	51.5

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

CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

UNIT SIZE–VOLTAGE, SERIES	REQUIRED SUBCOOLING °F (°C)
18–30	10 (5.6)
24–30	10 (5.6)
30–30	10 (5.6)
36–30	10 (5.6)
42–30	9 (5.0)
48–30	10 (5.6)
60–30	9 (5.0)