Report #2014-049
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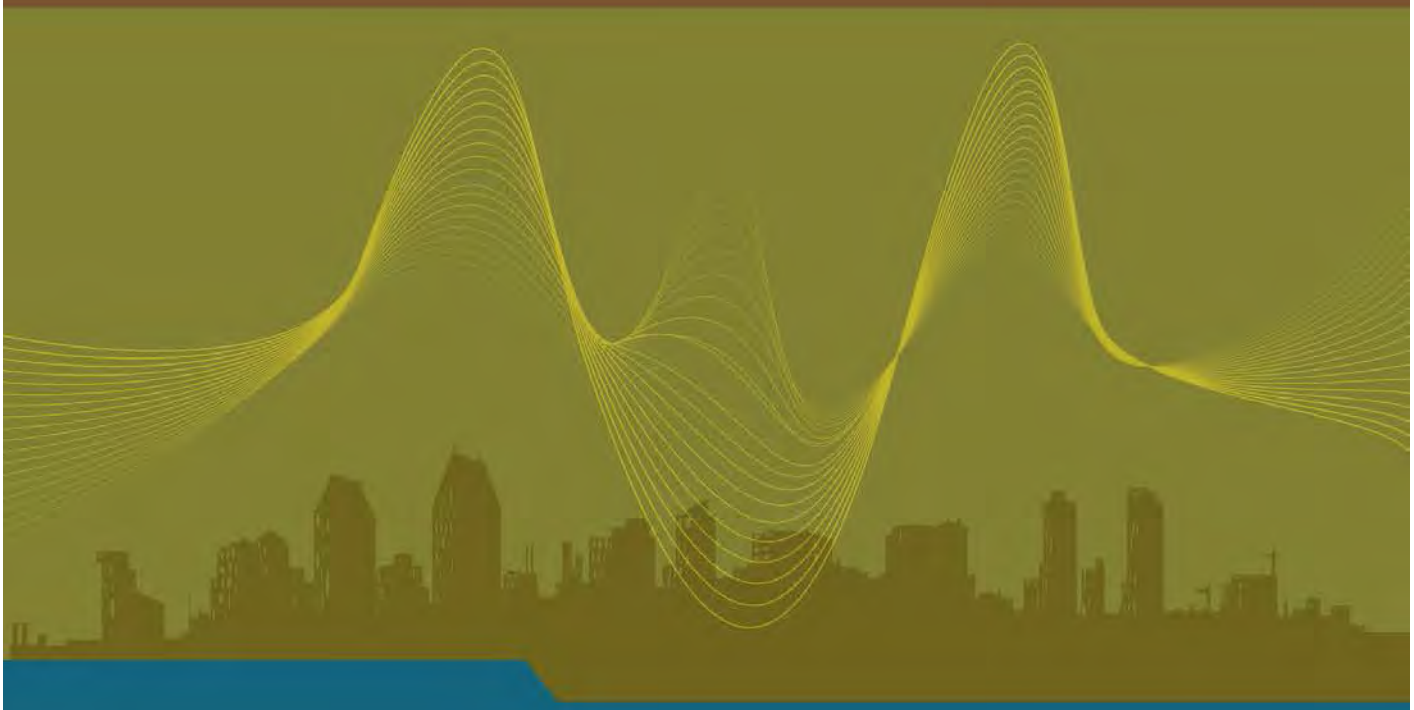

Exterior Noise Analysis

Costa Mesa 2

City of Costa Mesa, California

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1.0 Definitions

- **Noise** is undesired sound.
- **Sound** is an oscillation in pressure, stress, particle displacement, particle velocity, etc., in a medium with internal forces.
- **Decibel (dB)** is a unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power.
- **Level** in acoustics is the logarithm of the ratio of a quantity to a reference quantity of the same kind.
- **Time-Weighted** refers to the fact that noise occurring during certain time periods is given more significance because it occurs at times when people are more sensitive to noise.
- **"A-Weighting"** is a frequency correction that correlates overall sound pressure levels with the frequency response of the human ear.
- **Leq** is the equivalent sound pressure level or "energy" average noise level during a specific time period. It can be measured for any time period, but is typically measured for fifteen minutes, 1 hour, or twenty-four hours.
- **Community Noise Equivalent Level (CNEL)** is a 24-hour, time-weighted, average noise level based on the "A-weighted" decibel. In the calculation process, noise occurring in the evening time period (7 p.m. to 10 p.m.) is penalized by adding 5 dB, while noise occurring in the nighttime period (10 p.m. to 7 a.m.) is penalized by adding 10 dB. These time periods and decibel increases were selected to reflect a person's increased sensitivity to noise during late-night and early morning hours.
- **L(N), or L%**, is a statistical method of describing noise which accounts for the variance in noise levels throughout a given measurement period. L(N), where N equals a percentage, is a way of expressing the noise level exceeded for a percentage of time in a given measurement period. For example, since 15 minutes is 25% of 60 minutes, L(25) is the noise level that is exceeded for 15 minutes of a 60 minute measurement period.

2.0 Introduction

The purpose of this report is to determine compliance of *Costa Mesa 2* with the City of Costa Mesa's exterior noise standards for single family residential land use. Refer to Figure 1 for the location of the project. Refer to Figure 2 for the project site plan showing home lot numbers.

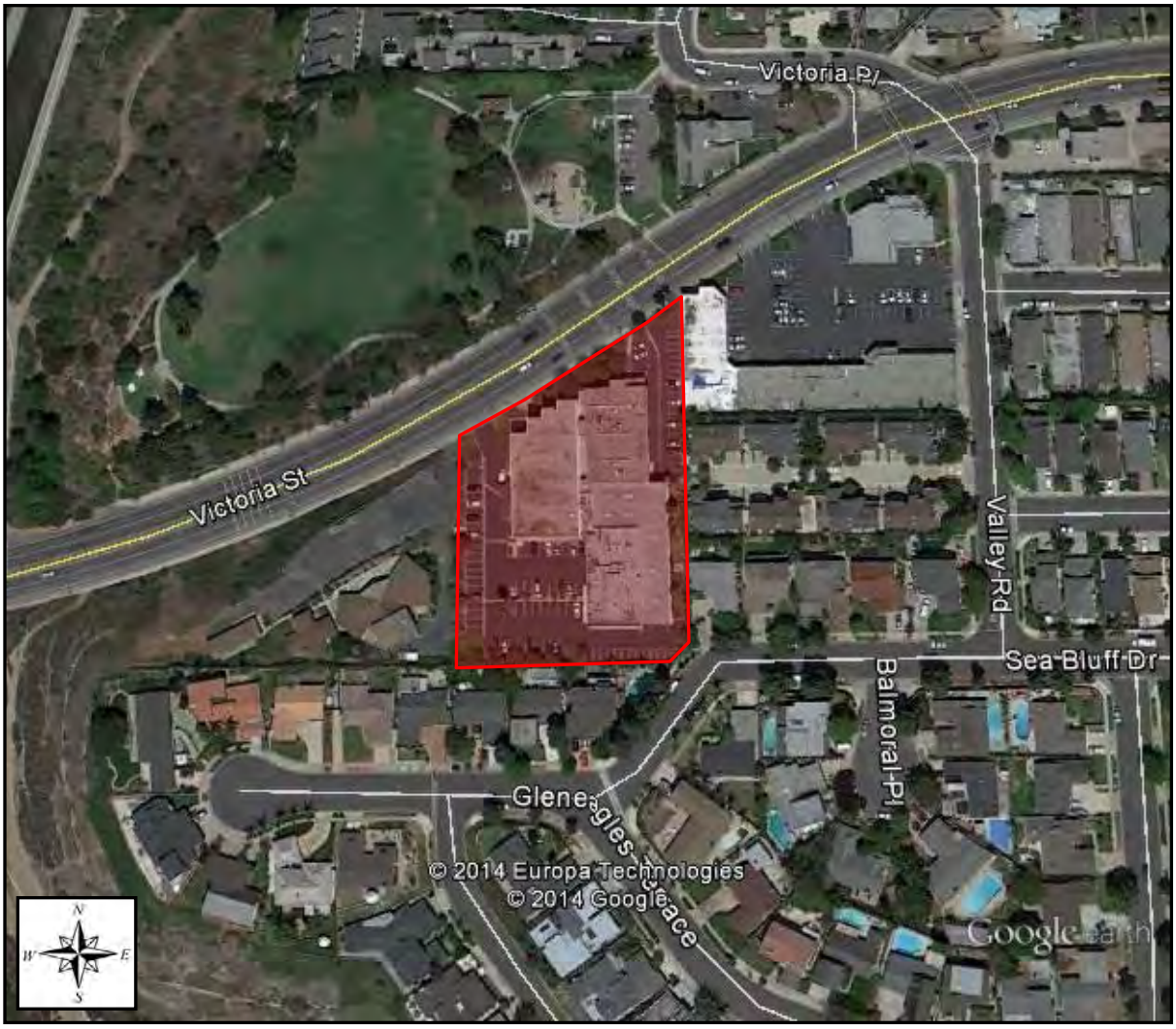

Figure 1 - Location of the Project

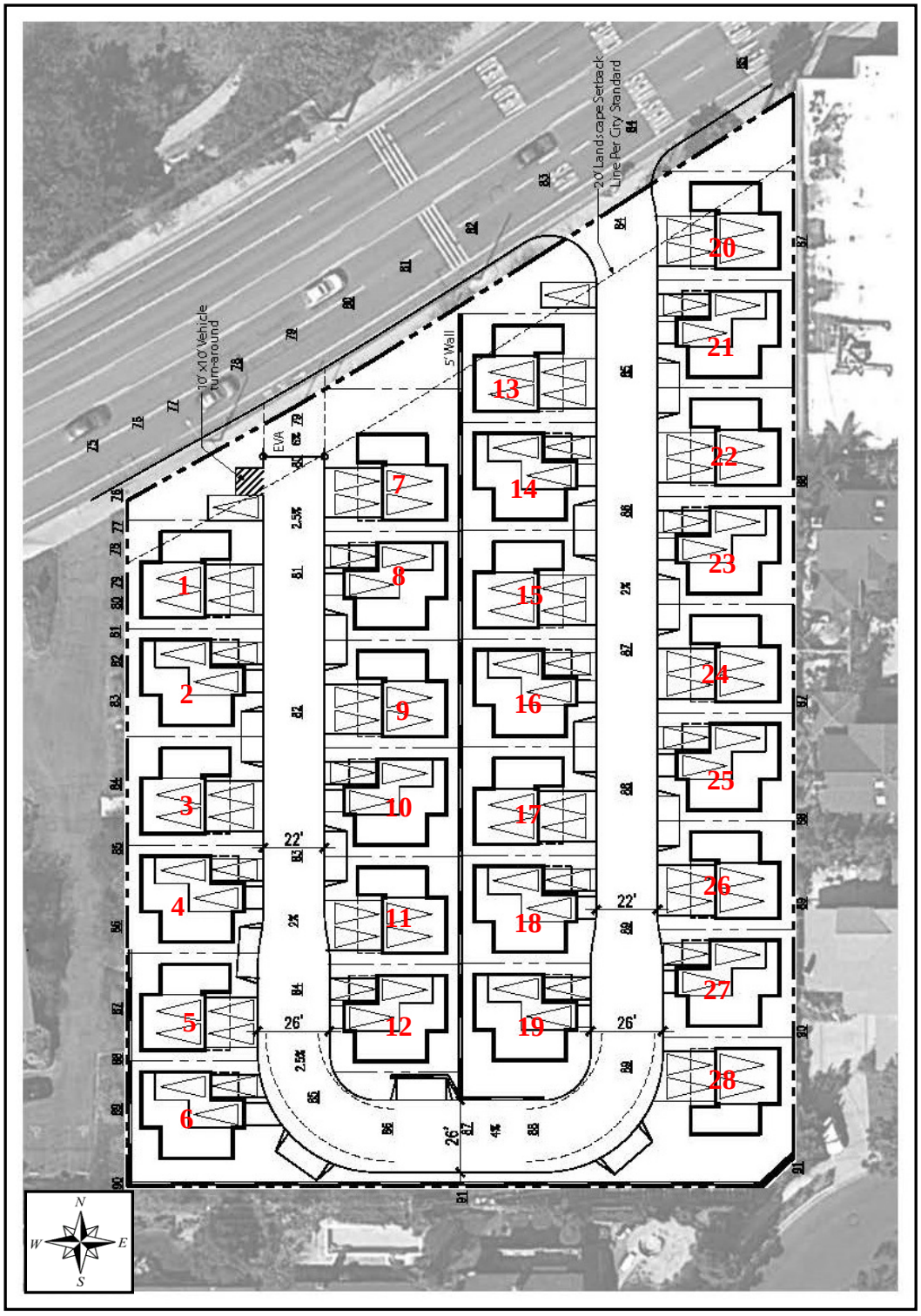

Figure 2 – Project Site Plan with Home Lot Numbers

3.0 Noise Exposure Standards

3.1 City of Costa Mesa, California

3.1.1 Noise Element of the General Plan (Transportation Noise Sources)

The City of Costa Mesa's Noise Element of their General Plan (Adopted January 2002) specifies an exterior noise standard of 65 dB CNEL and an interior noise standard of 45 dB CNEL with closed windows for single family residential land use. The exterior noise standard for single residential land use is limited to private yards. The interior environment excludes bathrooms, closets and corridors.

3.1.2 Noise Ordinance of the Municipal Code (Stationary or Non Transportation Noise Sources)

The City of Costa Mesa has established exterior and interior noise standards within Title 13- Chapter XIII (Planning, Zoning and Development – Noise Control). The noise ordinance is designed to control unnecessary, excessive and annoying sounds generated on one piece of property from impacting an adjacent property and to protect residential areas from noise sources other than transportation sources. The residential exterior and interior noise standards are contained in Table 1 below.

Table 1 – City of Costa Mesa's Exterior and Interior Noise Standards

Time Period	Exterior Noise Standards (dBA)					Interior Noise Standards (dBA)		
	L50	L25	L8	L2	LMax	L8	L2	LMax
Daytime (7 a.m. to 11 p.m.)	**55**	60	65	70	75	**55**	60	65
Nighttime (11 p.m. to 7 a.m.)	**50**	55	60	65	70	**45**	50	55

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

It also states corrections for time characteristics. No person shall create noise or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by such person, with causes the noise level measured on any other residential property to exceed:

1) The exterior noise standard for a cumulative period of more than 30 minutes in any hour (L50);
2) The exterior noise standard plus 5 dBA for a cumulative period of more than 15 in any hour (L25);
3) The exterior noise standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour (L8);
4) The exterior noise standard plus 15 dBA for a cumulative period of more than 1 minute in any hour (L2); or
5) The exterior noise standard plus 20 dBA for any time period (LMax).
6) The interior noise standard for a cumulative period of more than 5 minutes in any hour (L8);
7) The interior noise standard plus 5 dBA for a cumulative period of more than 1 minute in any hour (L2); or
8) The interior noise standard plus 10 dBA for any time period (LMax).

If the measured ambient level exceeds any of noise limit categories 1-4 and 6-7 above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event measured ambient level exceeds noise limit categories 5 and 8 above, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

The noise ordinance exempts several categories of noise sources, including construction activities which take place between the hours of 7 a.m. and 7 p.m. Monday through Friday and 9 a.m. to 6 p.m. on Saturday. Construction activities are prohibited for all hours on Sundays and federal holidays.

3.2 State of California

Within the 2013 California Building Code (CBC) (California Code of Regulations, Title 24, Part 2, Volume 1, Chapter 12 – Interior Environment, Section 1207 – Sound Transmission), it is stated that residential structures located in noise critical areas shall be designed to prevent the intrusion of exterior noises beyond prescribed levels and should be consistent with the local land-use standards. Interior noise levels attributable to exterior sources shall not exceed 45 dB CNEL in any habitable room and should be consistent with the noise element of the local general plan.

Worst-case noise levels, either existing or future, shall be used as the basis for determining compliance. Future noise levels shall be predicted for a period of at least 10 years from the time of the building permit application.

Residential structures to be located where the CNEL exceeds 60 dB shall require an acoustical analysis showing that the proposed design will limit the exterior noise to the prescribed allowable interior noise level.

4.0 Noise Measurement Survey

A noise measurement survey was conducted on Wednesday, April 16, 2014 from the hours of 8 a.m. to 5 p.m. The goal of the noise measurement survey was to determine the existing ambient noise environment. Noise measurements recorded one second A-weighted noise values at three locations around the projects property line. Refer to Figure 3 for the noise measurement locations.

The monitors used to measure the noise levels were 01dB-Metravib SOLO sound level meters. The microphones used were 01dB-Metravib 1/2" condenser microphones. The equipment used meets the American National Standards Institute (ANSI) S1.4 specification for a Type 1 precision sound level meter. The sound level meters were calibrated before and after the test with a Brüel & Kjær Type 4231 sound level calibrator with calibration traceable to the National Institute of Standards and Technology (NIST).

Noise measurement Location 1 was selected for its close proximity to the commercial building to the east of the project site. The sound level meter at this location was placed at a distance of 10 feet from the nearest property line. There is an existing 6-foot block wall around the property at this location. There are currently multiple occupants of the commercial building.

Noise measurement Location 2 was selected for its close proximity to Victoria Street to the north of the project site. The sound level meter at this location was placed at a distance of 10 feet from the sidewalk.

Noise measurement Location 3 was selected for its close proximity to the church to the west of the project site. The sound level meter at this location was placed at a distance of 10 feet from the nearest property line. There is an existing 6-foot chain link fence around the property at this location. At the time of the noise measurement, the church had been demolished and new construction was in progress.

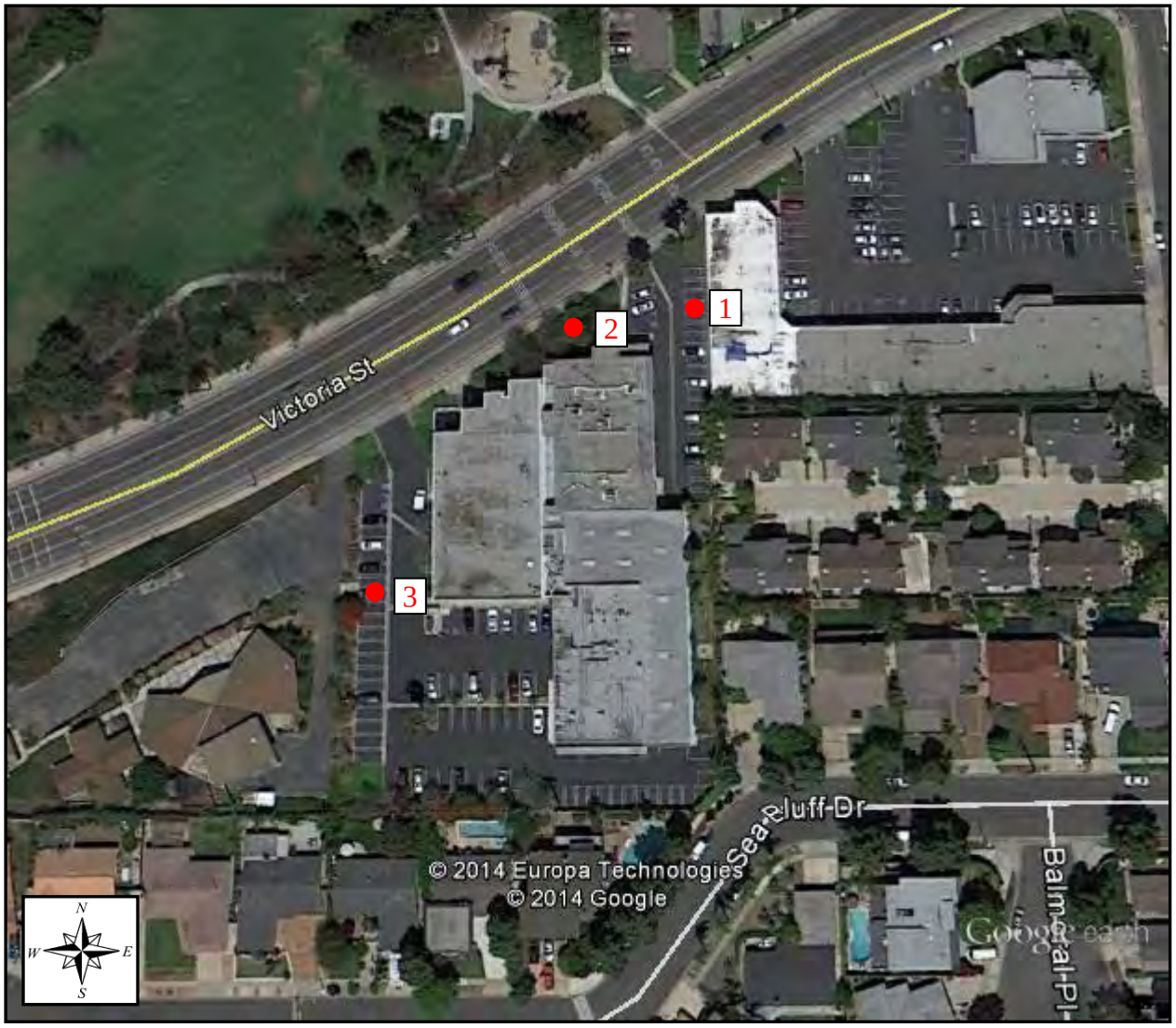

Figure 3 – Noise Measurement Locations

4.1 Noise Measurement Results

The noise measurement survey results for noise measurement Location 1 are presented in Table 2. The table lists the resulting L50, L25, L8, L2, LMax and Leq noise values in terms of dBA for each hour of the measurement. The City of Costa Mesa's daytime exterior noise standards are listed on the bottom row of the table for comparison and values that exceed these standards are shown in red within the table. The noise at this location was dominated by traffic on Victoria Street. Noise from the commercial building to the east of the project site was not audible and therefore should have a less than significant impact to the project site.

Table 2 – Location 1 Noise Measurement Results (dBA)

Date	Start Time	End Time	L50	L25	L8	L2	LMax	Leq
4/16/2014	8:00 AM	9:00 AM	67.6	70.8	73.1	74.8	83.1	69.1
4/16/2014	9:00 AM	10:00 AM	65.5	68.5	71.0	72.8	82.8	67.0
4/16/2014	10:00 AM	11:00 AM	64.6	67.8	70.1	71.9	79.0	66.1
4/16/2014	11:00 AM	12:00 AM	64.4	67.9	70.2	72.2	81.5	66.1
4/16/2014	12:00 AM	1:00 PM	65.5	68.6	70.9	72.6	75.9	66.8
4/16/2014	1:00 PM	2:00 PM	64.6	67.8	69.8	71.7	82.8	66.0
4/16/2014	2:00 PM	3:00 PM	65.1	68.4	70.5	72.4	78.9	66.7
4/16/2014	3:00 PM	4:00 PM	65.7	68.7	70.6	72.5	83.7	67.0
4/16/2014	4:00 PM	5:00 PM	66.5	69.1	70.9	72.4	80.9	67.4
Daytime Exterior Noise Standards:			**55.0**	**60.0**	**65.0**	**70.0**	**75.0**	-

The noise measurement survey results for noise measurement Location 2 are presented in Table 3. The table lists the resulting L50, L25, L8, L2, LMax and Leq noise values in terms of dBA for each hour of the measurement. The City of Costa Mesa's daytime exterior noise standards are listed on the bottom row of the table for comparison and values that exceed these standards are shown in red within the table. The noise at this location was dominated by traffic on Victoria Street.

Table 3 – Location 2 Noise Measurement Results (dBA)

Date	Start Time	End Time	L50	L25	L8	L2	LMax	Leq
4/16/2014	8:00 AM	9:00 AM	74.1	77.0	78.9	80.7	83.2	75.1
4/16/2014	9:00 AM	10:00 AM	72.9	76.2	78.5	80.4	84.6	74.4
4/16/2014	10:00 AM	11:00 AM	72.0	75.5	77.9	79.8	86.0	73.7
4/16/2014	11:00 AM	12:00 AM	71.4	75.2	77.7	79.9	84.9	73.5
4/16/2014	12:00 AM	1:00 PM	71.8	75.4	77.6	79.7	82.9	73.5
4/16/2014	1:00 PM	2:00 PM	71.5	75.1	77.5	79.6	85.0	73.3
4/16/2014	2:00 PM	3:00 PM	71.9	75.5	77.8	79.7	87.9	73.7
4/16/2014	3:00 PM	4:00 PM	72.8	75.9	78.1	80.0	86.6	74.2
4/16/2014	4:00 PM	5:00 PM	74.1	76.7	78.6	80.5	104.4	75.9
Daytime Exterior Noise Standards:			**55.0**	**60.0**	**65.0**	**70.0**	**75.0**	-

The noise measurement survey results for noise measurement Location 3 are presented in Table 4. The table lists the resulting L50, L25, L8, L2, LMax and Leq noise values in terms of dBA for each hour of the measurement. The City of Costa Mesa's daytime exterior noise standards are listed on the bottom row of the table for comparison and values that exceed these standards are shown in red within the table. The noise at this location was dominated by construction noise emanating from property to the west of the project site. This construction is temporary and will likely be completed prior to the completion of construction of this project.

Table 4 – Location 3 Noise Measurement Results (dBA)

Date	Start Time	End Time	L50	L25	L8	L2	LMax	Leq
4/16/2014	8:00 AM	9:00 AM	64.1	66.1	67.6	68.9	75.5	64.6
4/16/2014	9:00 AM	10:00 AM	60.7	63.2	65.5	67.4	73.4	61.9
4/16/2014	10:00 AM	11:00 AM	60.1	62.7	65.1	68.7	75.1	61.8
4/16/2014	11:00 AM	12:00 AM	60.7	63.7	67.1	73.6	82.2	63.9
4/16/2014	12:00 AM	1:00 PM	59.5	62.3	64.2	65.9	69.1	60.6
4/16/2014	1:00 PM	2:00 PM	62.7	65.3	67.7	71.5	78.5	64.4
4/16/2014	2:00 PM	3:00 PM	63.7	65.8	67.7	70.3	75.2	64.6
4/16/2014	3:00 PM	4:00 PM	62.3	64.7	66.8	69.5	75.4	63.5
4/16/2014	4:00 PM	5:00 PM	62.5	64.8	66.6	68.0	77.4	63.2
Daytime Exterior Noise Standards:			**55.0**	**60.0**	**65.0**	**70.0**	**75.0**	**-**

The existing ambient noise environment around the project site was dominated by traffic noise emanating from Victoria Street. Noise from the commercial building to the east of the project site was not audible and therefore should have a less than significant impact to the project site. Therefore, exterior and interior mitigation measures will not be required for the project to comply with the City of Costa Mesa's Noise Ordinance of the Municipal Code.

5.0 Roadway Methodology

The roadway noise exposure in this report was computed using an acoustical planning and modeling program called SoundPLAN (Version 7.3). SoundPLAN was created by Braunstein & Berndt GmbH and incorporates the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) (Version 2.5) noise emission and noise prediction methodology. Table 5[1] lists the arterial vehicle mix percentages for day, evening, and night time periods. The vehicles are divided into automobiles, medium trucks and heavy trucks.

Table 5 – Arterial Roadway Vehicle Mix Percentages

	Day	Evening	Night
Automobiles	75.51%	12.57%	9.34%
Medium Trucks	1.56%	0.09%	0.19%
Heavy Trucks	0.64%	0.02%	0.08%

6.0 Roadway Exterior Noise Exposure

The proposed project will be subject to noise from traffic on the one arterial roadway closest to the site: Victoria Street.

The latest existing (2011) ADT volume for Victoria Street was obtained from the Orange County Transportation Authority (OCTA) website. The future (2024) ADT volume for Victoria Street was estimated using the existing (2011) ADT volume with a 1% annual growth rate.

The speed limit for Victoria Street was obtained from a site visit. The existing and future traffic volumes and speed utilized in calculating the traffic noise exposure are presented in Table 6.

Table 6 – Existing and Future Traffic Volumes and Speeds

Roadway	Type	Traffic Volumes				Speed (mph)
		Existing Year	ADT	Future Year	ADT	
Victoria Street	Arterial	2011	28,000	2024	31,867	40

The worst-case exterior noise levels at the backyards and 2nd-3rd floors of the homes were calculated and are presented in Table 7. Figure 4 shows the results as lines, or contours of equal noise exposure. The figure shows the 40-75 dB CNEL roadway noise exposure contours at ground level. The worst-case exterior noise levels within Table 7 and Figure 4 take into account the planned 6-foot perimeter walls around the project. Refer to Figure 5 for the location of the planned 6-foot perimeter walls around the project site.

The worst case exterior noise levels at the backyards were calculated to be as high as 68.2 dB CNEL adjacent to Victoria Street. Since this level exceeds the City of Costa Mesa's exterior noise standard of 65 dB CNEL, additional exterior mitigation measures will be required.

[1] County of Orange Environmental Management Agency, *Sound Attenuation Guidelines,* File C54-115, September 4, 1984.

The perimeter walls around Lots 1, 7, 13 and 20 will be required to be 8 feet in height. Refer to Figure 6 for the locations of the required 8 foot perimeter walls (green lines) relative to the planned 6 foot perimeter walls (red lines). With the 8 foot perimeter walls, the exterior noise levels in the backyards of Lots 1, 7, 13, and 20 were calculated to be as high as 64.1, 64.8, 63.9 and 64.5 dB CNEL, respectively These levels are below the City of Costa Mesa's exterior noise standard of 65 dB CNEL.

Table 7 – Worst-Case Exterior Noise Levels (dB CNEL)

Lot	Backyard	2nd Floor	3rd Floor
1	66.3	70.4	69.9
2	61.5	65.7	65.1
3	58.9	63.4	63.5
4	57.4	61.0	61.3
5	57.5	60.4	60.6
6	55.6	59.3	59.4
7	68.2	70.1	69.5
8	63.0	66.7	66.3
9	53.0	61.6	61.7
10	52.6	59.0	60.3
11	48.2	56.7	57.6
12	47.4	54.6	55.5
13	67.2	70.3	69.9
14	61.3	64.8	64.3
15	55.9	59.7	59.6
16	52.0	54.5	55.9
17	48.0	49.8	50.7
18	46.5	51.9	52.9
19	44.5	46.5	45.1
20	66.9	70.0	70.6
21	64.2	68.1	67.5
22	57.4	62.9	62.9
23	54.4	60.1	61.2
24	54.3	54.4	55.8
25	52.1	54.8	55.7
26	51.7	50.2	51.6
27	51.0	51.7	52.1
28	50.0	45.3	45.2

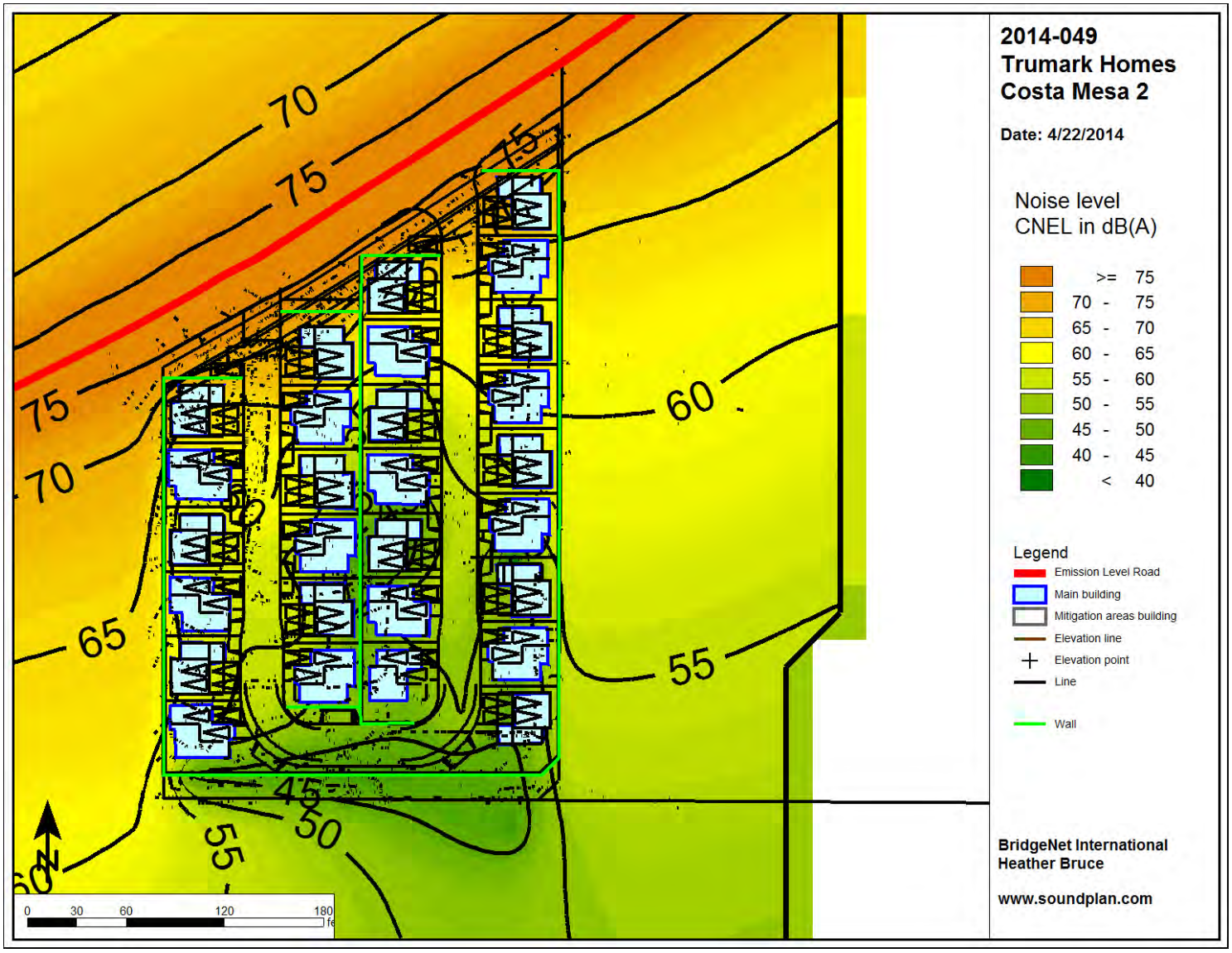

Figure 4 – Roadway Noise Exposure Contours at Ground Level (dB CNEL)

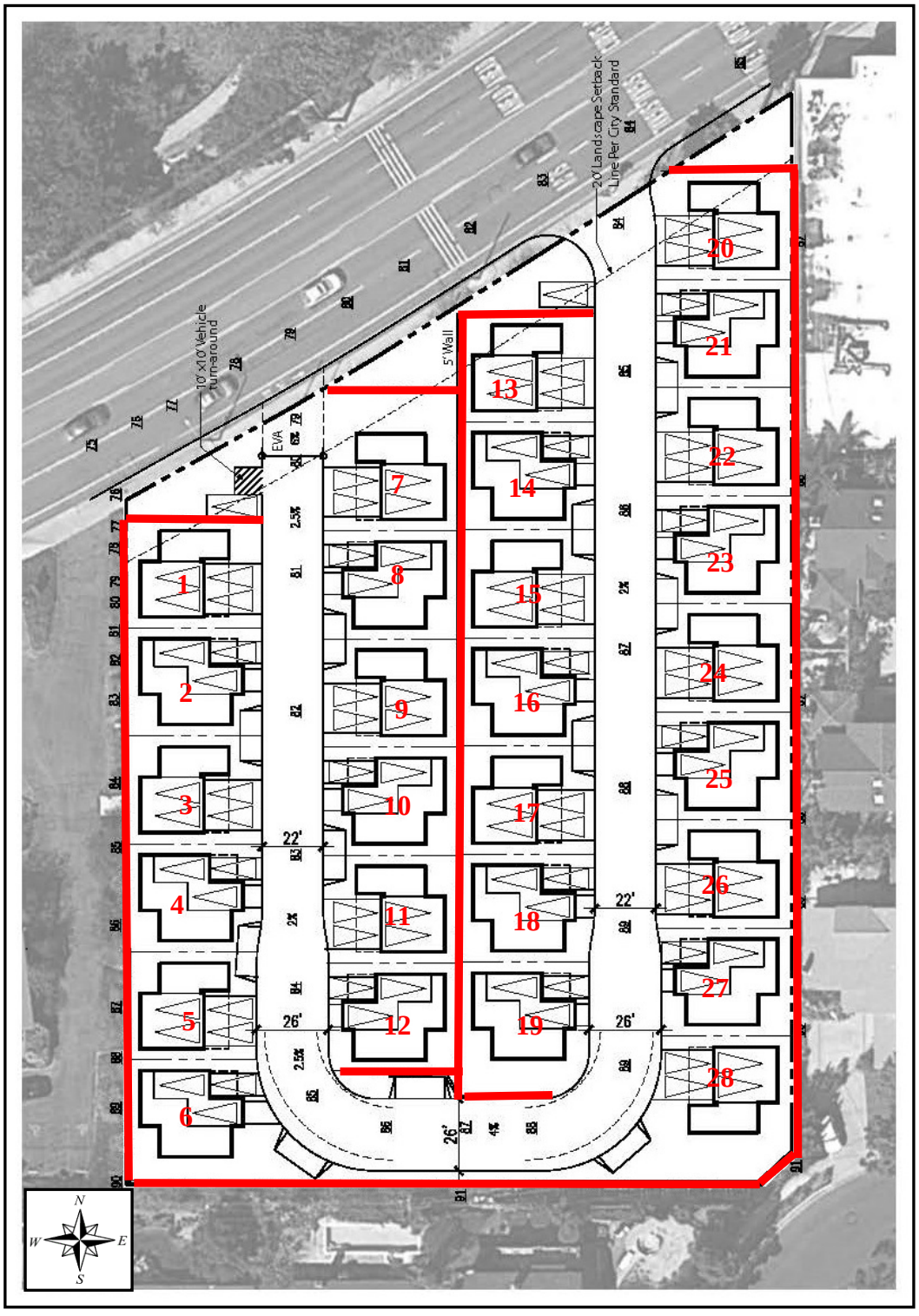

Figure 5 – Location of the Planned 6 foot Perimeter Walls (Red Lines)

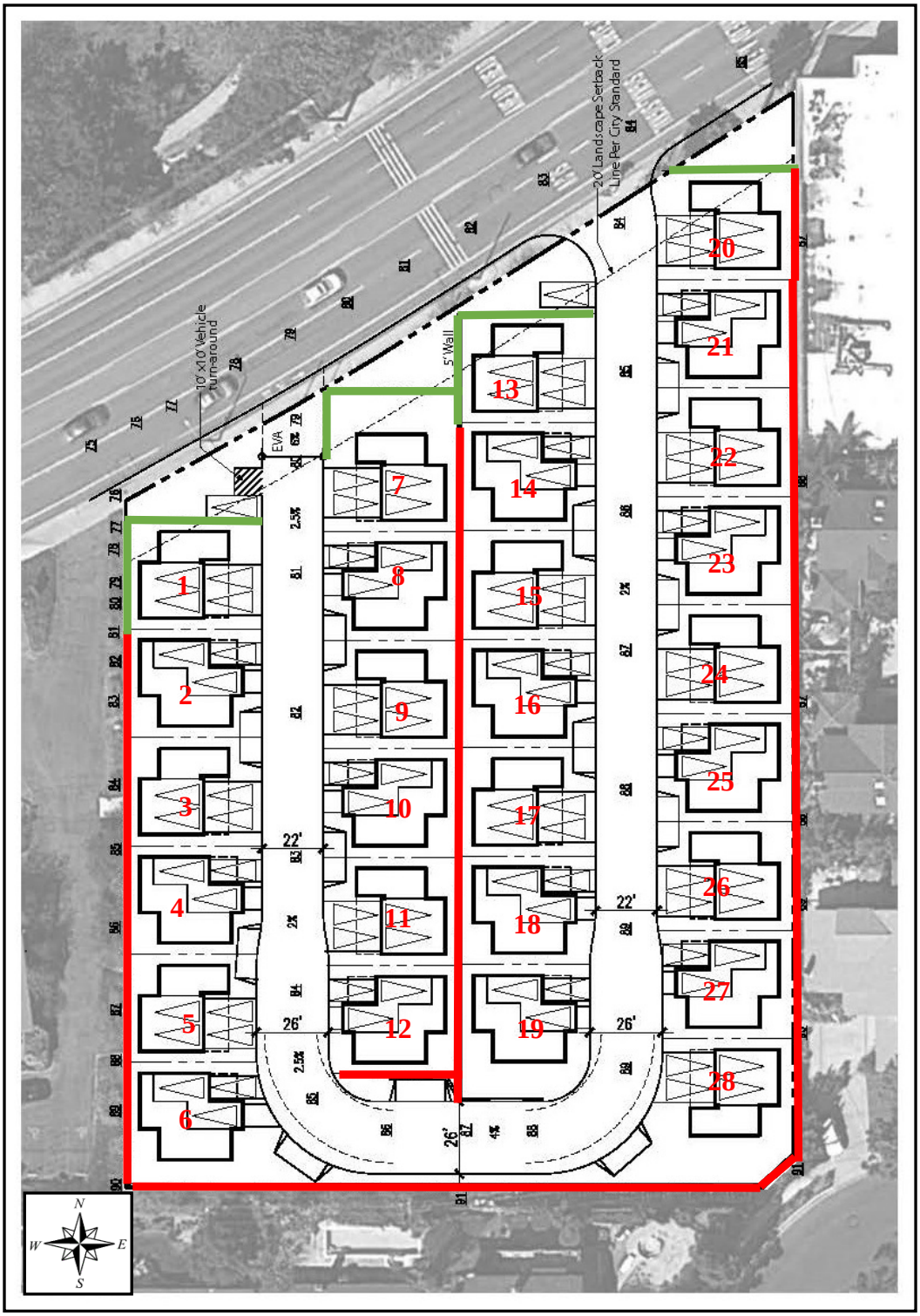

Figure 6 – Location of the Required 8 Foot Perimeter Walls (Green Lines)

7.0 Roadway Interior Noise Exposure

The project must comply with the City of Costa Mesa's interior noise standard of 45 dB CNEL for single family residential land use. To comply with the interior noise standard the homes must provide sufficient exterior to interior noise attenuation to reduce the interior noise exposure to acceptable levels.

The worst-case exterior noise levels at the 1st-3rd floors of the homes were calculated to be as high 64.2, 70.1, and 69.5 dB CNEL, respectively. This means the rooms within the 1st-3rd floors of the homes must provide at least 19.2, 25.1, and 24.5 dB, respectively of exterior to interior noise reduction in order to meet the interior noise standard. Our experience has shown that new standard construction in southern California will typically provide 25-30 dB of noise reduction.

Based upon the preliminary architectural plans, meeting the City of Costa Mesa's interior noise standard of 45 dB CNEL for single family residential land use is achievable. We estimate that some of the windows/doors within the rooms of the 2nd and 3rd floors of some of the homes adjacent to Victoria Street may need to be upgraded from STC 26 to between STC 28-30.

An interior noise analysis will be required for the project when architectural plans become available.

8.0 References

County of Orange Environmental Management Agency, *Sound Attenuation Guidelines*, File C54-115, September 4, 1984.

KTGY, Civil Engineering Site Plan for *Costa Mesa 2*, City of Costa Mesa, California, E-Mailed April 10, 2014.