APPENDIX C

Construction Noise Analysis

Refinery Construction Noise Assessment Report

Chevron Products Company El Segundo Refinery
Coke Drum Reliability Project – Construction Noise Assessment

Prepared for:
CHEVRON U.S.A. PRODUCTS COMPANY
324 West El Segundo Blvd.
El Segundo, California 90245

Prepared by:
Navcon Engineering Network
701 West Las Palmas Dr.
Fullerton, CA 92835

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1. Administrative Information

1.	Customer:	Chevron U.S.A. Products Company 324 West El Segundo Blvd. El Segundo, California 90245
2.	Customer Project Name:	Coke Drum Reliability Project
3.	Customer Service Order:	0015088396, dated 31-Oct-2011
4.	Navcon Project:	112504, Chevron Coke Drum Reliability Project Coke Drum Transport Noise Assessment
5.	Navcon Contact Information:	Navcon Engineering Network 701 West Las Palmas Drive Fullerton, CA 92835 Ph. 714-441-3488 Web. www.navcon.com

2. Chevron Coke Drum Reliability Project Description

- Chevron Products Company (Chevron) is proposing a project at its El Segundo Refinery to replace the six existing coke drums with six new coke drums of the same size and location within the Refinery. The proposed project is referred to as the Coke Drum Reliability Project and its overall focus is to increase reliability of the coke drum operations. The proposed Project is expected to take advantage of industry changes in coke drum design, which have improved over the more than 40 years since the installation of the existing coke drums. The proposed Project will not change the Refinery crude throughput capacity or Delayed Coker Unit capacity.
- It is anticipated that the six replacement coke drums will be fabricated overseas in Europe or Asia. The completed drums would then be shipped in their entirety to the Port of Los Angeles/Port of Long Beach and from there transported to the Chevron Refinery.
- Once the replacement drums are onsite, they will be installed during a planned shutdown of the Delayed Coker Unit (commonly called a turn-around), at which time the other equipment in the Unit will also be shutdown. Installation will be accomplished by removal of the six derrick structures in one piece from the existing drums, setting it nearby at grade, and replacing the drums one by one onto the modified holding structure. Piping, electrical wiring, and control wiring will be disconnected to free the derrick structure for this lift. The derrick structure will then be reset atop the drums; piping, wiring, and controls will be reconnected; and, the Coker will be placed back in operation. The removed drums will be dismantled on site and transported by truck for metal recycling. Other demolition debris will be transported to the appropriate disposal facility.

2. Chevron Coke Drum Reliability Project Description (cont'd)

- The Chevron Refinery property is bounded by the City of El Segundo to the North and the City of Manhattan Beach to the South. Residential communities are located to the North (El Segundo) and to the South-West and South (Manhattan Beach). Commercial areas are located to the North-East & East (El Segundo). El Segundo Power is located to the South-West. Refer to ***Aerial Photo 2.1***.

Aerial Photo 2.1, Project Site Plan

3. Introduction

- Navcon Engineering Network (Navcon) was contracted by Chevron Products Company to conduct a noise study for the Chevron Coke Drum Reliability Project (Project). The overall effort included an assessment of the noise associated with the transport of the coke drums between King Harbor Marina and the Refinery and an assessment of the construction related noise within the Refinery.
  - The coke drum transport noise assessment is presented in **Navcon Report No. 112504**.
  - The construction related noise assessment is presented in this report, **Navcon Report No. 112504-1**.
- The coke drum construction noise assessment is summarized in ***Section 4***.
- The detailed scope of work included:
  1. an environmental noise survey to document current noise levels at the perimeter of the refinery (***Section 5***).
  2. the development of a three dimensional analytical noise model and prediction of the construction noise levels (***Section 6***),
  3. the assessment of the construction noise impact (***Section 7***),
- The project was conducted by Jim Steedman and Hans Forschner of Navcon Engineering under the guidance of Peter A. Will, Project Engineer, Chevron Products Company.

- The noise impact is determined based upon net changes in the Community Noise Exposure Level (CNEL) due to the proposed project.
  - The CNEL is the average A-weighted noise level over a 24-hour day. It is computed by averaging the noise level measured during each hour with the addition of a 5 dB weighting applied to the evening levels (7 PM to 10 PM) and a 10 dB weighting applied to the nighttime levels (10 PM to 7 AM).
- The standard methods and procedures group noise-sensitive land uses and set ambient noise level limits according to the land use compatibility shown in ***Table 4.1***. The ambient noise levels are considered to be normally/conditionally acceptable, normally unacceptable, or clearly unacceptable based upon the CNEL.
- A project is considered to pose a significant impact on the community noise, if the operations cause the ambient noise level at the property line to increase the CNEL by 3 dBA.

Table 4.1, Land Use Compatibility Categories & Noise Levels

Land Use	Ambient Community Noise Exposure Level (dBA CNEL)		
	Normally/Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Single-family, duplex, mobile homes, multi-family homes	50 - 70	70 - 75	Above 70
Schools, libraries, churches, hospitals, nursing homes, motels, hotels	50 - 70	70 - 80	Above 80
Auditoriums, concert halls, amphitheaters	50 - 70	*(1)*	Above 65
Sports arenas, outdoor spectator sports	50 - 75	*(1)*	Above 70
Playgrounds, neighborhood parks	50 - 70	67 - 75	Above 72
Golf courses, riding stables, water recreation, cemeteries	50 - 75	70 - 80	Above 80
Office buildings, business and professional commercial	50 - 77	Above 75	*(1)*
Industrial, manufacturing, utilities, and agriculture	50 - 80	Above 75	*(1)*

(1) No values identified.

5. Environmental Noise Survey

- An environmental noise survey was conducted to document the current CNEL along the refinery property line.
- Four noise monitoring terminals (NMT) were used during the survey (refer to ***Aerial Map 5.1***).
  - NMT #1 was located on the south refinery property line at the intersection of Maple and Rosecrans, east of Gate 21 (refer to ***Photo Set 5.1***).
  - NMT #2 was located on the south refinery property line at the intersection of Bell Ave. and Rosecrans Ave. east of Gate 22 (refer to ***Photo Set 5.1***).
  - NMT #3 was located on the west refinery property line by Crest Drive & 45th Street, Manhattan Beach (refer to ***Photo Set 5.1***).
  - NMT #4 was located on the north refinery property line east of the Chevron Employee Credit Union (refer to ***Photo Set 5.2***).
- NMTs #1 - #4 were transportable systems based upon Larson Davis Model 824 noise analyzers. All of the systems meet the IEC 60651, IEC 60804 and ANSI S1.4 Type 1 instrument standards. The system sensitivities were checked using a National Institute of Standards Technology (NIST) traceable Bruel & Kjaer 4230 sound level calibrator prior to and following the noise survey.

5. Environmental Noise Survey (cont'd)

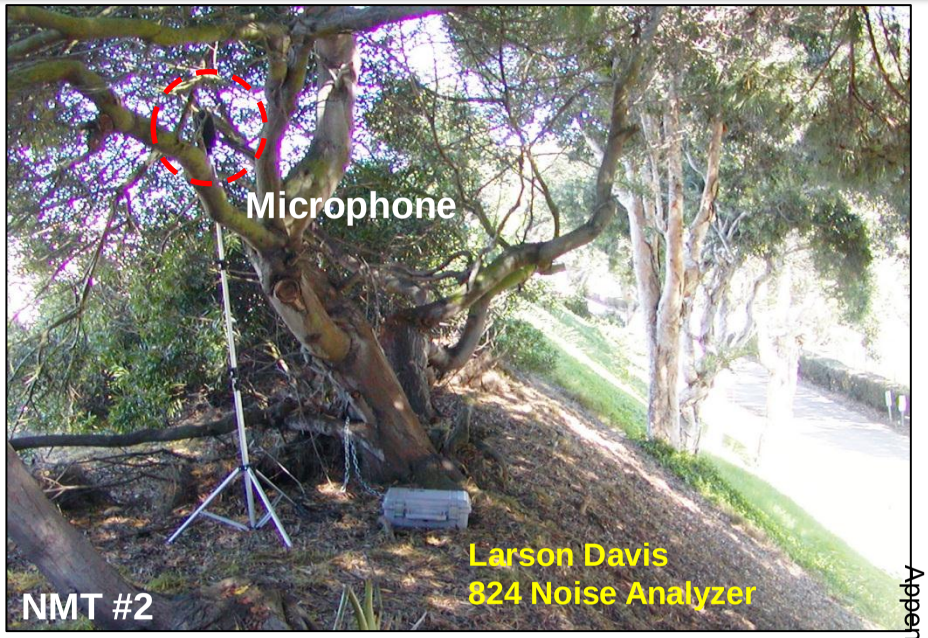
- The noise levels at NMT locations #1, #2 and #3 were recorded February 14-18, 2012.
- The noise levels at NMT location #4 were recorded March 9-13, 2012.
- The CNEL levels are summarized in ***Table 5.1***.

Aerial Map 5.1, Refinery Property Line Noise Monitoring Terminal Locations

(1) NMTs #1, #2 and #3 were located on the Manhattan Beach side of the refinery.

(2) NMT #4 was located on the El Segundo side of the refinery.

Photo Set 5.1, *Noise Monitoring Terminals (Refinery / Manhattan Beach Property Line)*



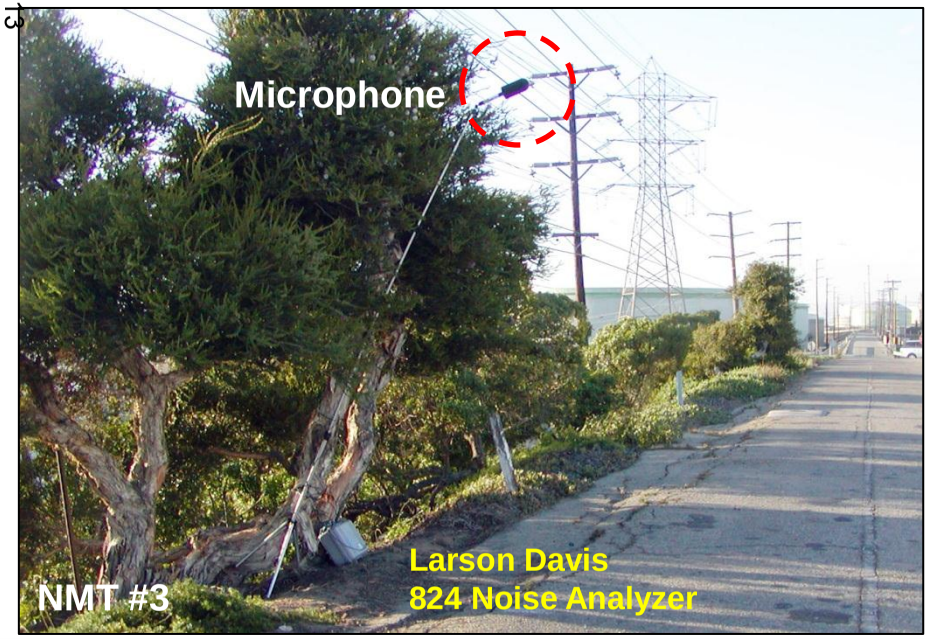


Table 5.1, Property Line Noise Survey – Community Nose Equivalent Levels (CNEL)

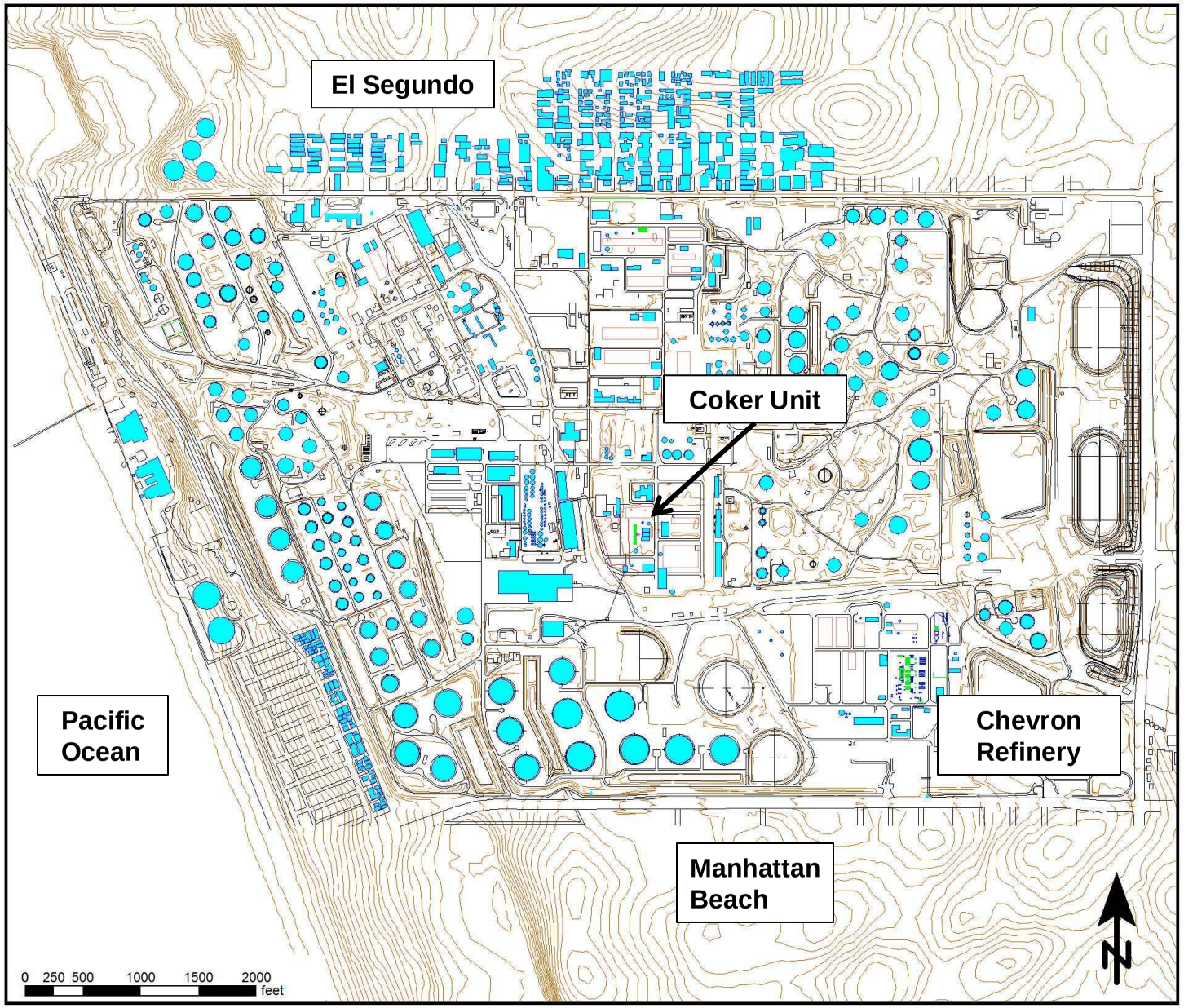
CNEL [dBA]	NMT #1 Manhattan Beach South-East Property Line	NMT #2 Manhattan Beach South-West Property Line	NMT #3 Manhattan Beach West Property Line	NMT #4 El Segundo North-West Property Line
Day 1	67.6	62.1	58.5	68.0
Day 2	68.6	64.7	61.4	68.9
Day 3	68.4	64.6	62.0	68.3
Day 4	68.2	63.6	59.0	69.5
Day 5	67.4	62.9	58.5	70.3
Average	**68.0**	**63.6**	**59.9**	**69.0**
Maximum	68.6	64.7	62.0	70.3
Minimum	67.4	62.1	58.5	68.0
Stdev	0.5	1.1	1.7	0.9

- NMT #1 (CNEL Days 1-5 were recoded Feb. 14-18, 2012, refer to ***Aerial Photo 5.1*** and ***Photo Set 5.1***)
- NMT #2 (CNEL Days 1-5 were recoded Feb. 14-18, 2012 , refer to ***Aerial Photo 5.1*** and ***Photo Set 5.1***)
- NMT #3 (CNEL Days 1-5 were recoded Feb. 14-18, 2012 , refer to ***Aerial Photo 5.1*** and ***Photo Set 5.1***)
- NMT #4 (CNEL Days 1-5 were recoded Mar. 09-13, 2012 , refer to ***Aerial Photo 5.1*** and ***Photo Set 5.1***)

6. Three Dimensional Noise Model & Construction Noise Predictions

- A three dimensional noise model was created using the noise modeling software, SoundPLAN. The model geometry included all acoustically significant buildings and ground topography. The ground was modeled with an absorption coefficient of 0.5. The 3D model geometry is shown in ***Figures 6.1 & 6.2***.
- The noise source emission levels were based upon Chevron's construction equipment and operational plan. According to the proposed project time table, the peak construction is scheduled to occur between February 2014 and April 2014. The equipment sound power emission levels, listed in ***Table 6.1***, were based upon the equipment activity during that period (i.e., number of equipment, usage and load factors). Thus, the noise level predictions presented in this report are conservative and considered worst case.
- The noise model predictions were made based upon the algorithms and procedures described in "Environmental Noise from Industrial Plants. General Prediction Method, Danish Acoustical Laboratory, 1982. Report 32".
- The construction noise CNEL was predicted at the four locations monitored during the environmental noise survey (i.e., NMT #1 – NMT #4, refer to ***Section 5***) and CNEL noise contours generated over the project area. The measured ambient CNEL and the predicted construction noise CNEL are shown along with the predicted CNEL contours in ***Noise Map 6.1***.

Figure 6.1, Three Dimension Noise Model (2D View)



Chevron

Construction Noise Input Data

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Figure 6.2, Three Dimensional Noise Model Topography (3D View)

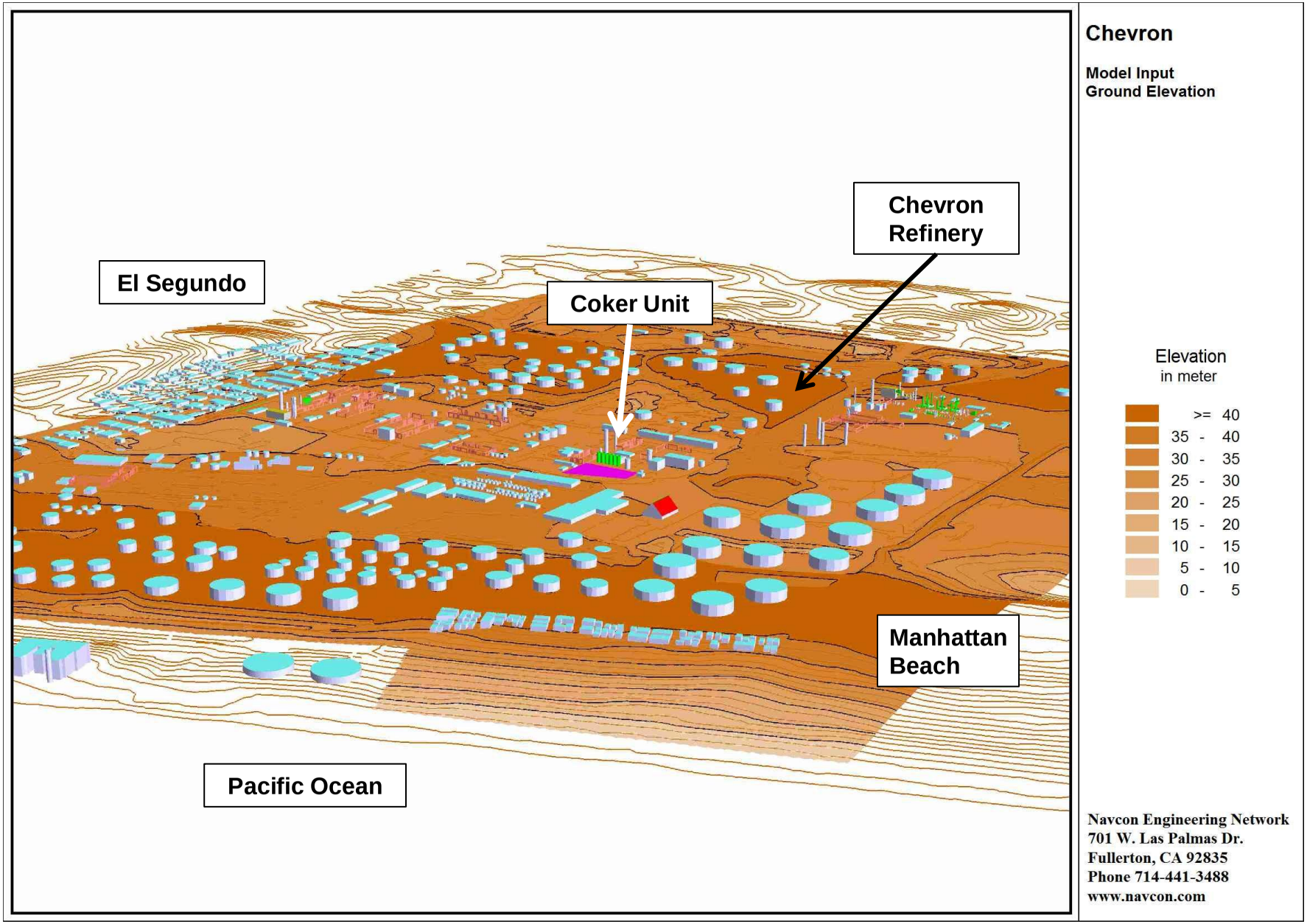
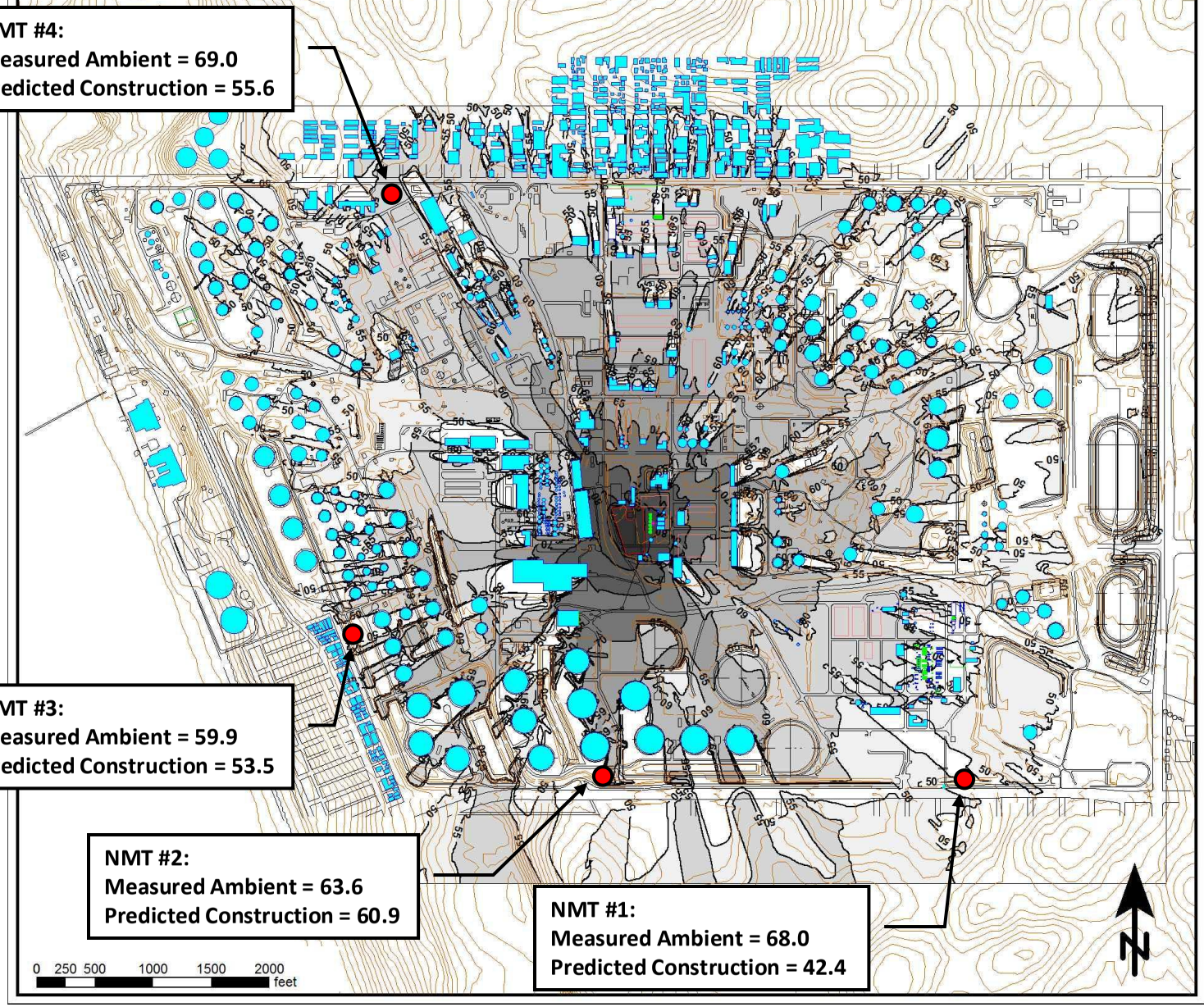


Table 6.1, Construction Equipment Sound Power Emission Levels (February – April, 2014)

Construction Equipment	Equipment Horsepower	Average Runs Hours/Day	Load Factor	Num. of Equipment	SPL 50' dBA	Lw dBA
Backhoe (580 Case)	80	8	0.75	1	80	109.4
Mortar (mixer, gasoline engine)	11	8	0.50	2	79	109.7
Crane Diesel 300 ton	450	8	0.75	1	85	114.4
Tractor Trailer	210	8	0.50	1	84	111.7
Crane, Diesel (20 ton)	125	8	0.75	1	85	114.4
Crane, Diesel (150 ton)	250	8	0.75	1	85	114.4
Crane, Diesel (400 ton)	400	8	0.75	1	85	114.4
Crane, Diesel (1600 ton)	632	10	0.75	1	85	115.4
Man lift (telescoping, propane motor)	66	8	0.50	3	75	107.5
Welder, Diesel (250 amp)	35	8	1.00	3	74	109.5
Air Compressor, Diesel (185 cfm)	50	8	1.00	2	80	113.7
Air Compressor, Diesel (375 cfm)	115	8	1.00	1	80	110.7
Power Unit	380	8	1.00	1	82	112.7
Generator, Diesel (6 kW)	30	8	1.00	2	80	113.7
Forklift (15 Ton)	140	8	0.50	1	80	107.7
Forklift, Diesel (4 ton + whistle)	83	8	0.75	3	80	114.2
Fuel/Lube Truck	260	8	0.50	1	70	97.7
Pickup Truck (½-ton 2WD)	235	8	0.20	4	65	94.7
Car (gasoline engine)	160	8	0.20	2	65	91.7
Stakebed Truck	260	8	0.50	2	70	100.7
Bus 50 passenger	260	8	0.20	4	70	99.7
Light Tower, Diesel (4 kW)	20	10	1.00	10	75	116.7
36 Line Self Propelled Transporter	472	8	1.00	1	85	116.7
Scissor Lifts (propane)	20	8	0.75	1	75	105.4
Impact Hammer			0.20	3	88	117.4
Impact Wrench			0.20	3	85	114.4
			Total Sound Power Emission			126.6

Noise Map 6.1, Predicted CNEL Noise Contours & Measured Ambient CNEL



Chevron

CNEL
in dB(A)

>=	90
85 -	90
80 -	85
75 -	80
70 -	75
65 -	70
60 -	65
55 -	60
50 -	55

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7. Construction Noise Assessment

- The predicted construction CNEL is compared with the measured ambient CNEL in ***Table 7.1***.
- The construction noise CNEL is predicted to increase the overall CNEL by less than 2 dBA.
- Based upon the criteria described in ***Section 4***, the Coke Drum Reliability Project construction does not represent a significant noise impact.

Table 7.1, CNEL Assessment - Predicted Construction CNEL vs. Measured Ambient CNEL

		Community Noise Exposure Level [dBA]			
		Measured Ambient	Predicted Construction	Measured Ambient + Predicted Construction	Overall Increase
NMT #1	South-East Property Line - Manhattan Beach	68.0	42.4	68.0	0.0
NMT #2	South-West Property Line - Manhattan Beach	63.6	60.9	65.5	1.9
NMT #3	West Property Line - Manhattan Beach	59.9	53.5	60.8	0.9
NMT #4	North-West Property Line - El Segundo	69.0	55.6	69.2	0.2

- The “Measured Ambient + Predicted Construction” levels were computed as the logarithmic addition of the “Measured Ambient” levels and the “Predicted Construction” levels.
- The “Overall Increase” levels were computed as the arithmetic difference between the “Measured Ambient + Predicted Construction” levels and the “Measured Ambient” levels.
- As described in ***Section 4***, the project is considered to pose a significant impact on the community noise, if the operations cause the ambient noise level at the property line to increase the CNEL by 3 dBA.
- The construction noise is predicted to increase the overall CNEL by less than 2 dBA and therefore does not represent a significant noise impact.

Coke Drum Transport Noise Assessment Report

Chevron Products Company El Segundo Refinery
Coke Drum Reliability Project – Coke Drum Transport Noise Assessment

Prepared for:
CHEVRON U.S.A. PRODUCTS COMPANY
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Table of *Contents*

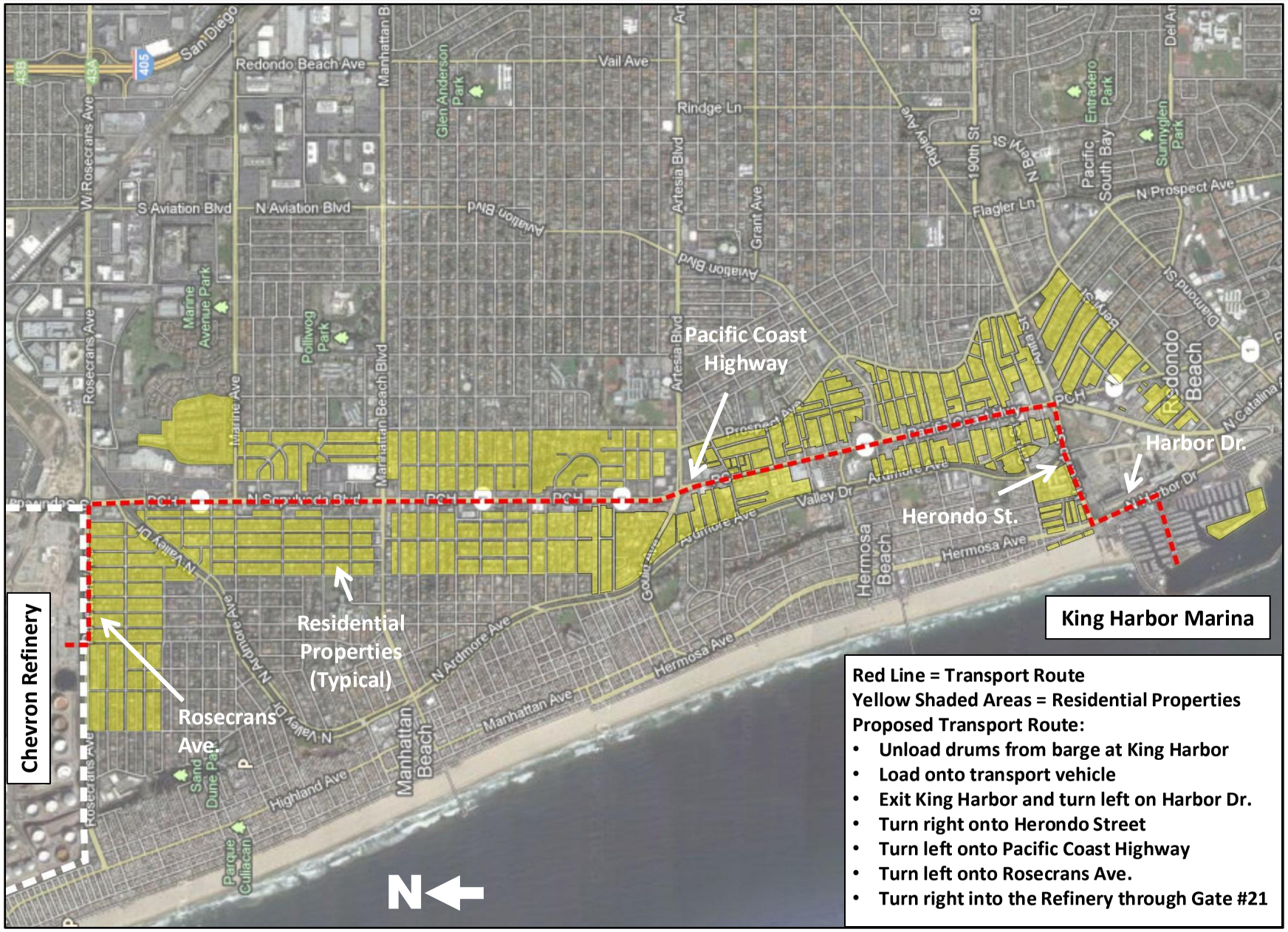
1.0 Administrative Information

1.	Customer:	Chevron U.S.A. Products Company 324 West El Segundo Blvd. El Segundo, California 90245
2.	Customer Project Name:	Coke Drum Reliability Project
3.	Customer Service Order:	0015088396, dated 31-Oct-2011
4.	Navcon Project:	112504, Chevron Coke Drum Reliability Project Coke Drum Transport Noise Assessment
5.	Navcon Contact Information:	Navcon Engineering Network 701 West Las Palmas Drive Fullerton, CA 92835 Ph. 714-441-3488 Web. www.navcon.com

2. Chevron Coke Drum Reliability Project Description

- Chevron Products Company (Chevron) is proposing a project at its El Segundo Refinery to replace the six existing coke drums with six new coke drums of the same size and location within the Refinery. The proposed project is referred to as the Coke Drum Reliability Project and its overall focus is to increase reliability of the coke drum operations. The proposed Project is expected to take advantage of industry changes in coke drum design, which have improved over the more than 40 years since the installation of the existing coke drums. The proposed Project will not change the Refinery crude throughput capacity or Delayed Coker Unit capacity.
- It is anticipated that the six replacement coke drums will be fabricated overseas in Europe or Asia. The completed drums would then be shipped in their entirety to the Port of Los Angeles/Port of Long Beach and from there transported to the Chevron Refinery. The specific route to the Refinery is in the process of being assessed. While not yet finalized, the current projected route is to ship the drums from the port of entry to King Harbor Marina, Redondo Beach by barge and then transport them directly to the Chevron Refinery by public roads. The anticipated road route is shown in ***Map 2.1***. The transit time is expected to be one day from King Harbor to the Refinery with a current plan to move one or two drums per week.

Map 2.1, Proposed Transport Route – King Harbor Marina to Chevron El Segundo Refinery



3. Introduction

- Navcon Engineering Network (Navcon) was contracted by Chevron Products Company to conduct a noise study for the Chevron Coke Drum Reliability Project (Project). The overall effort included an assessment of the noise associated with the transport of the coke drums between King Harbor Marina and the Refinery and an assessment of the construction related noise within the Refinery.
  - The coke drum transport noise assessment is presented in this report, **Navcon Report No. 112504**.
  - The construction related noise assessment is presented in **Navcon Report No. 112504-1**.
- The coke drum transport noise assessment is summarized in ***Section 4***.
- The detailed scope of work included:
  1. The characterization of the coke drum transport vehicle's noise emission (***Section 5***).
  2. The measurement of the ambient noise environment along the transport route (***Section 6***),
  3. The development of a three dimensional noise model of the coke drum transport between King Harbor Marina and the Chevron El Segundo Refinery (***Section 7***),
  4. The generation of predicted noise contours and levels along the coke drum transport route between King Harbor Marina and the Chevron El Segundo Refinery (***Section 8***).
- The project was conducted by Jim Steedman and Hans Forschner of Navcon Engineering under the guidance of Peter A. Will, Project Engineer, Chevron Products Company.

4. Coke Drum Transport Noise Assessment Summary

- The six new coke drums will be transported between the King Harbor Marina and the Chevron El Segundo Refinery along the route shown in ***Map 2.1***. The drums are scheduled to be transported between the hours of 9 PM and 5 AM and will travel at approximately 2 MPH.
- The transport vehicle's sound power emission was determined to be 109 dBA including the sound generated by the pull and push trucks and the two power generators. The sound power emission was incorporated into the 3D noise model and used for the prediction of the transport vehicle's pass-by sound pressure levels along the transport route.
- The nighttime ambient noise measurements are compared with the predicted maximum and hourly averaged pass-by noise levels in ***Noise Maps 8.1 – 8.12*** and ***Table 8.1***.
- The highest noise impact is estimated to be in King Harbor Marina where the predicted maximum noise levels are up to 16.3 dBA higher than the measured maximum ambient noise levels. The predicted pass-by noise levels are up to 9.3 dBA higher than the measured ambient levels on Herondo Street in Redondo Beach.
- The transport vehicle noise impact along Pacific Coast Highway and Rosecrans Blvd. falls within the fluctuations of the local arterial traffic.

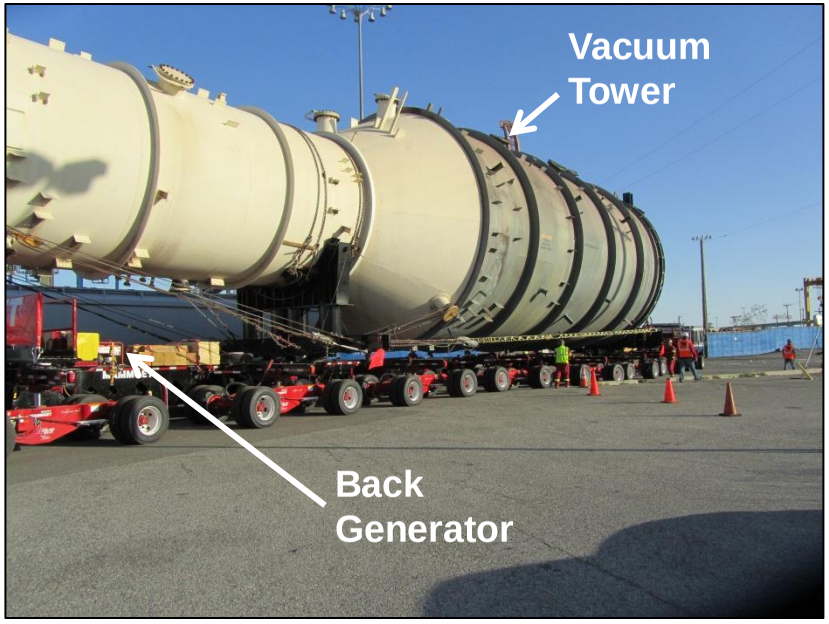
5. Drum Transport Vehicle Noise Characterization

- It is anticipated that the coke drums will be transported between the King Harbor Marina and the Refinery along surface streets (refer to ***Map 2.1***) using a transport vehicle operated by Mammoet USA.
- The Mammoet transport vehicle will be comprised of two custom made 2012 Western Star 4900 SX Trucks each running 600 HP Detroit Engines and a trailer setup in a push-pull configuration. The front truck will pull the transport vehicle. The 2nd truck will be used to push the transport vehicle on uphill slopes otherwise it will be towed by the front truck. The transport vehicle itself is equipped with two power generators which provide power for the vehicle's hydraulic load leveling system. The transport vehicle is shown in ***Photo Set 5.1*****.**
- Navcon conducted a measurement survey on March 7, 2012 at the Long Beach Harbor to characterize the Mammoet transport vehicle idle and pass-by noise emission. The vehicle was carrying a 100' long by 26' diameter vacuum tower with an overall weight of approximately 250 tons. The size and weight of the vacuum tower is comparable to a coke drum. The noise data was collected using two Larson Davis Model 831 sound level analyzers. The sound level analyzers meet the American National Standards Institute S1.4, 1983 specification for Type I (Precision) sound level meters. Each sound level analyzer is calibrated on an annual basis in accordance with the National Institute of Standards Technology (NIST). The system sensitivities were checked prior to and following the survey using a NIST traceable Bruel & Kjaer Model 4230 sound level calibrator.

5. Drum Transport Vehicle Noise Characterization (cont'd)

- The microphones were located 30 ft. from the front and sides of the truck during the idle test.
  - The truck idle noise was steady state (i.e., it did not fluctuate). The average (i.e., Leq) noise level is shown in ***Table 5.1a***. The 1/3 octave band noise spectra are presented in ***Graphic 5.1***.
- The microphones were positioned 30 ft. to the right and to the left of the vehicle centerline during the pass-by noise test. The transport vehicle was moving at approximately 2 to 3 MPH as it passed the microphones.
  - The average and maximum vehicle pass-by noise levels are shown in **Table 5.1b**. The sound pressure level time record is presented in ***Graphic 5.2***. The truck horn was used by the driver to warn personnel aware that the transport was starting to move. Chevron will require the heavy transport contractor to provide another form of communication to eliminate the use of the truck horn and to provide additional noise attenuation for the power generators.
- A noise model of the transport vehicle was developed using the noise modeling software, SoundPLAN. The measured sound pressure level data was then used to back calculate the sound power emission of the transport vehicle. The measured sound pressure levels are compared with the predicted noise contours in ***Noise Map 5.1***. The transport vehicle sound power emission was 109 dBA.

Photo Set 5.1, Mammoet Transport Vehicle Noise Emission Test



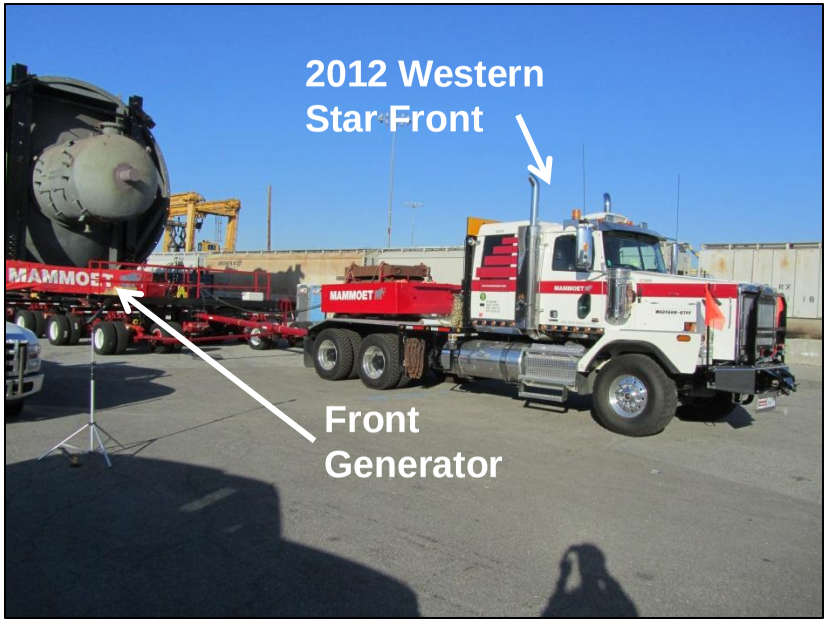


Table 5.1a, Truck Engine Idle Noise Level

Microphone Location	Leq [dBA]	Engine Noise
Passenger Side	76.8	Steady State
Front	77.3	Steady State
Driver's Side	75.4	Steady State

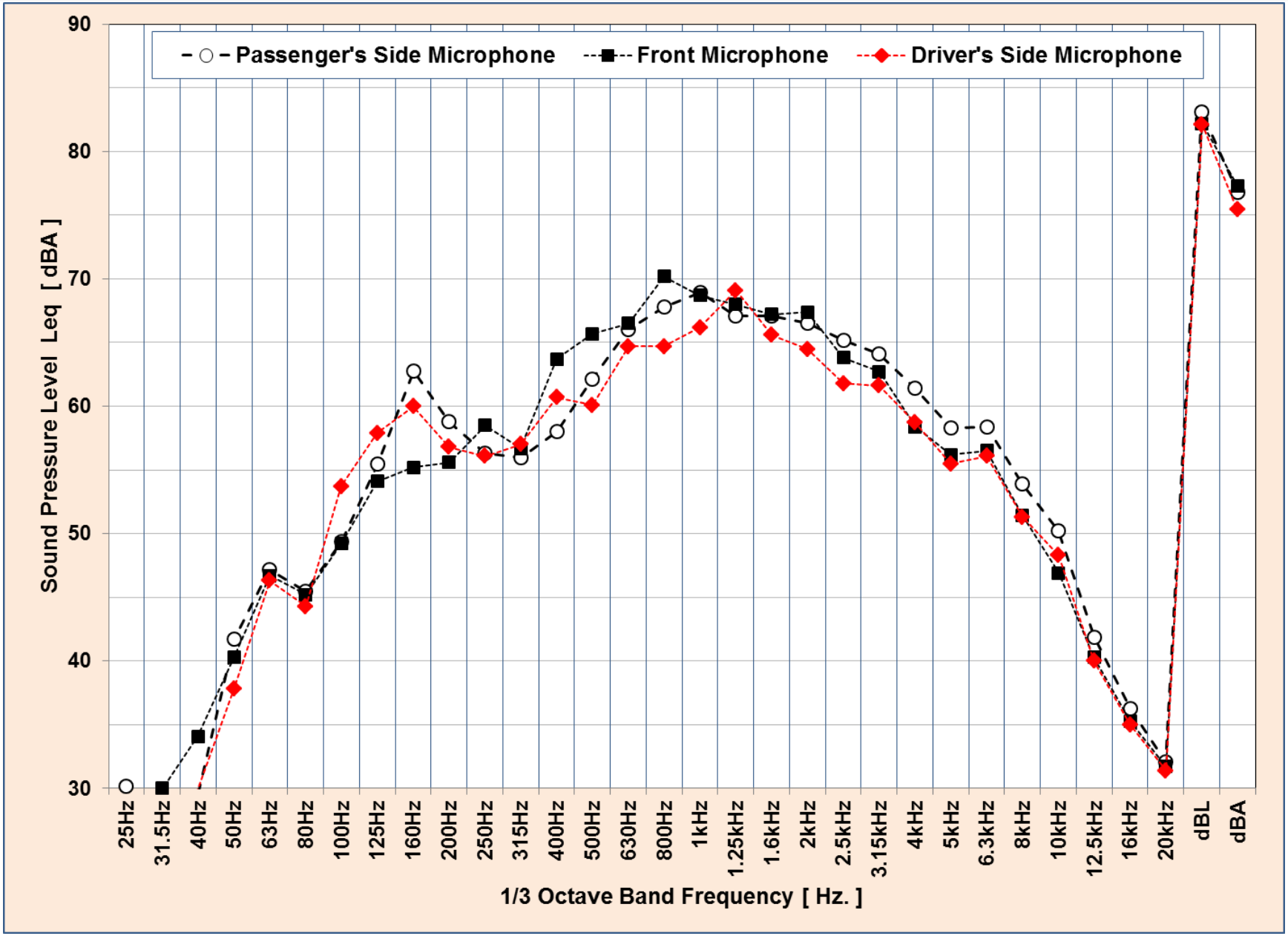
Note: The microphones were located 30 ft. from the truck during the idle tests.

Table 5.1b, Transport Vehicle Pass-By Noise Level

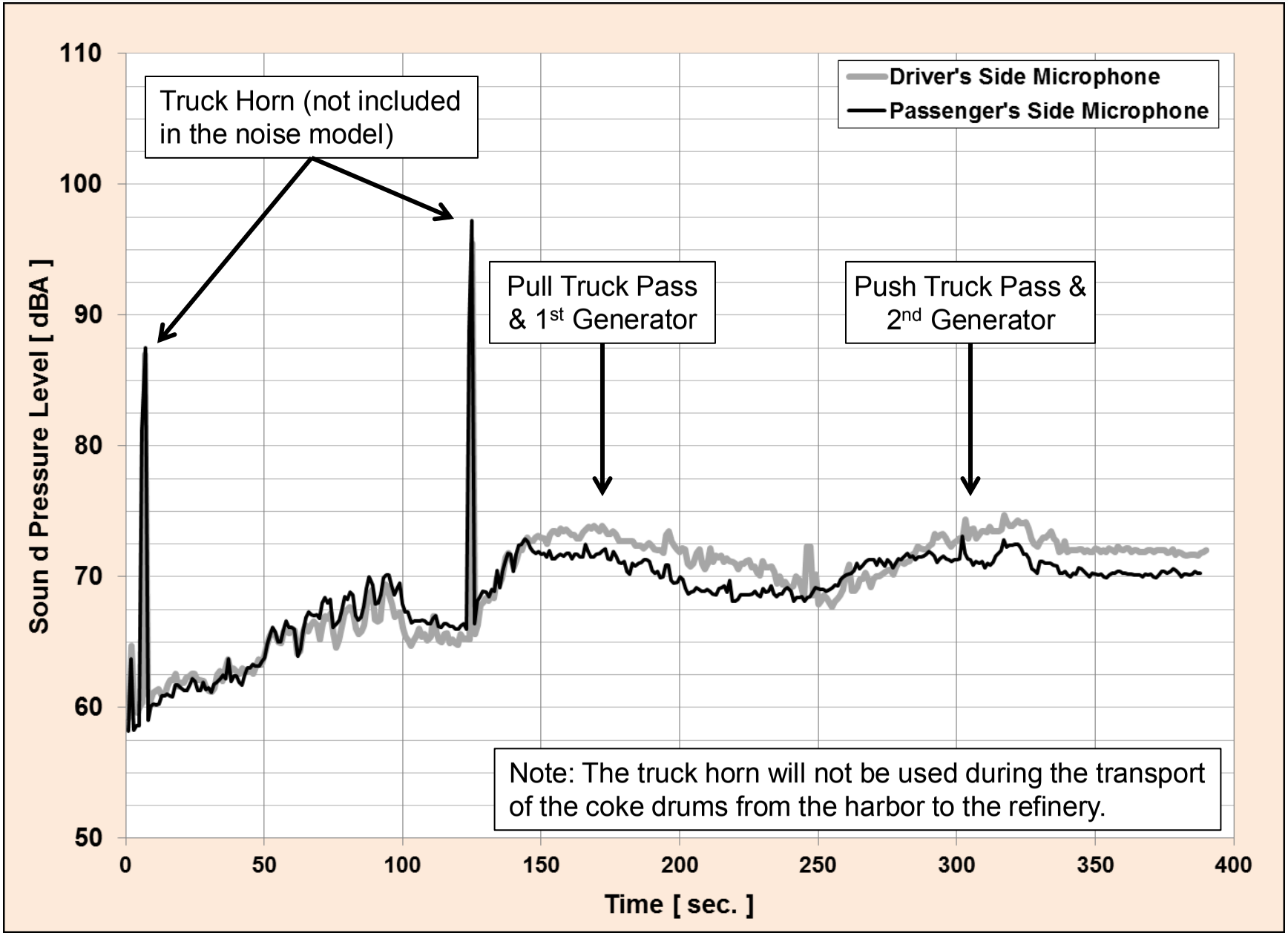
	Without Truck Horn	With Truck Horn
Microphone Location	Lmax [dBA]	Lmax [dBA]
Passenger Side	73	98
Driver's Side	75	98

Note: The microphones were located 30 ft. from the transport vehicle centerline during the pass-by tests. Chevron will require the heavy transport contractor to provide another form of communication to eliminate the use of the truck horn.

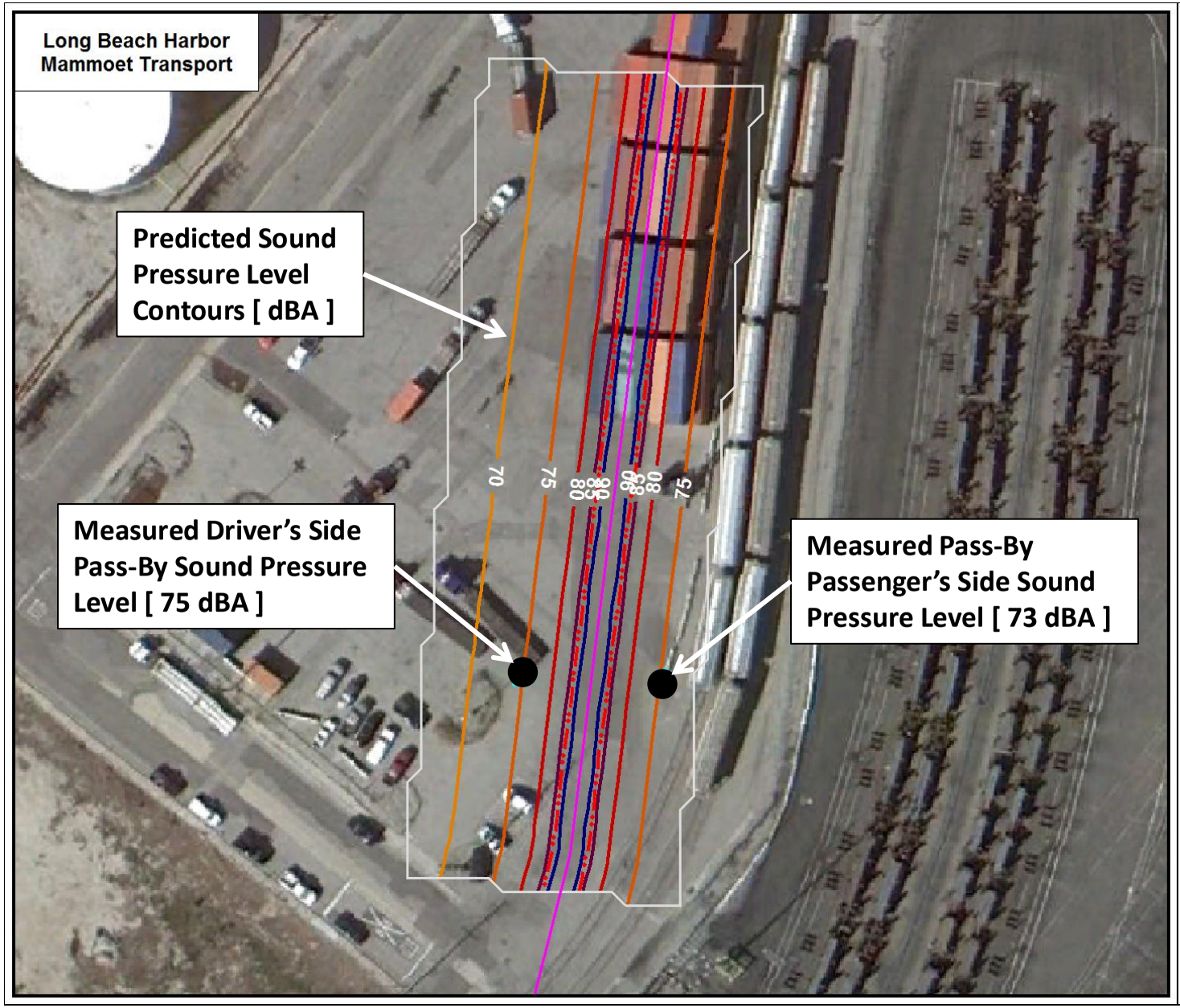
Graphic 5.1, Transport Truck Idle 1/3 Octave Band Sound Pressure Spectra [dBA]



Graphic 5.2, Transport Truck Pass-By Sound Pressure Level [dBA]



Noise Map 5.1, Transport Vehicle Noise Model Calibration



6. Drum Transport Route Nighttime Ambient Noise Survey

- A measurement survey was conducted along the proposed drum transport route (refer to ***Map 2.1***) the night of February 22-23, 2012 between the hours of 11 PM and 3 AM to characterize the nighttime ambient noise environment. It is anticipated that the drums will be transported along the same route during approximately the same time period.
- Noise measurements were recorded at the 16 locations shown in ***Map 6.1*** using a Larson Davis (LD) Model 831 sound level analyzer. The analyzer meets the American National Standards Institute (ANSI) S1.4, 1983 specification for Type I (Precision) sound level meters and is calibrated on an annual basis in accordance with the National Institute of Standards Technology (NIST). The data acquisition system sensitivity was checked prior to and following the survey using a NIST traceable Bruel & Kjaer Model 4230 sound level calibrator.
- The LD analyzer was configured to record the noise metrics defined in ***Table 6.1*** over measurement periods ranging between 5 minutes and 15 minutes at each location.
- The measured noise data is summarized in ***Table 6.2***.
  - The lowest noise levels were recorded in the King Harbor Marina (Locations 1 – 3). Identifiable noise in the Marina includes traffic along Harbor Drive, ocean waves and barking sea lions.
  - The nighttime ambient noise level along Herondo Street and Pacific Coast Highway (Locations 4 – 13) varies with arterial traffic.
  - Identifiable sounds along Rosecrans Avenue include the refinery together with intermittent arterial traffic and aircraft noise.

Map 6.1, Nighttime Ambient Noise Measurement Locations

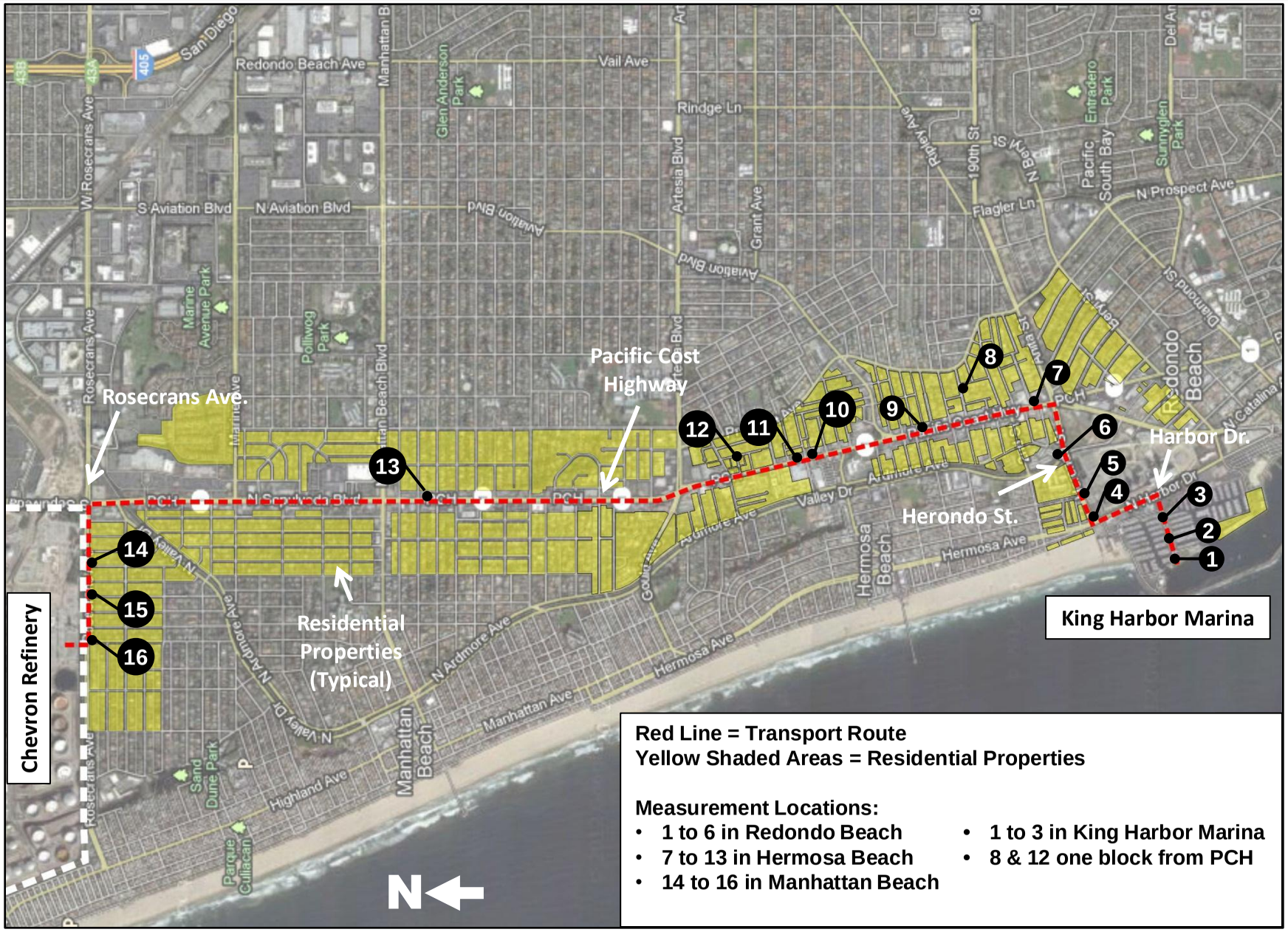


Table 6.1, Noise Measurement Metrics Definitions

Metric	Noise Metric Description
Leq	The steady state sound pressure level which contains the same amount of acoustical energy as the fluctuating level over the sample period. It is the time weighted, mean square sound pressure level.
Lmax	The steady state sound pressure level which is exceeded 0% of the time during the sample period . The **Lmax Level** can be attributed to a single event such as a car passing by or an aircraft fly over.
L1.6	The steady state sound pressure level which is exceeded 1.6% of the time during the sample period (**equivalent to 1 minute per hour**). The L1.6 Level is often used as a measure in community noise regulations.
L8.3	The steady state sound pressure level which is exceeded 8.3% of the time during the sample period (**equivalent to 5 minutes per hour**). The L8.3 Level is often used as a measure in community noise regulations.
L25	The steady state sound pressure level which is exceeded 25% of the time during the sample period (**equivalent to 15 minutes per hour**). The L25 Level is often used as a measure in community noise regulations.
L50	The steady state sound pressure level which is exceeded 50% of the time during the sample period (**equivalent to 30 minutes per hour**). The L50 Level is often used as the base measure in community noise regulations.
L90	The steady state sound pressure level which is exceeded 90% of the time during the sample period (**equivalent to 54 minutes per hour**). L90 Level is often used as a measure of the true “ambient” noise level.
L95	The steady state sound pressure level which is exceeded 95% of the time during the sample period (**equivalent to 57 minutes per hour**).
Lmin	The steady state sound pressure level which is exceeded 100% of the time during the sample period (**equivalent to 60 minutes per hour**). Lmin is the lowest level measured during the sample period.

Table 6.2, Transport Route Nighttime Ambient Noise Levels

Start Time	Noise Measurement Location No.	Description	City	Sound Pressure Levels [dBA] Leq	Lmax	L1.66	L8.33	L25	L50	L90	L95	Lmin
11:53 PM	1	West End of King Harbor Marina	RB	46.4	58.3	52.2	48.0	46.7	45.6	43.5	42.9	41.7
12:08 AM	2	Center of King Harbor Marina	RB	46.2	54.5	51.2	47.7	46.7	45.5	43.9	43.6	42.7
11:35 PM	3	King Harbor Marina Guard Shack	RB	47.0	63.5	52.4	49.2	46.7	45.6	44.4	44.1	43.5
12:24 AM	4	SE Corner of Harbor Drive & Herondo Street	RB	53.8	70.3	63.0	57.7	51.8	48.4	46.1	45.8	45.2
12:37 AM	5	South Side of Herondo St at Monterey Blvd.	RB	59.3	75.1	70.8	63.3	53.7	46.9	42.0	41.6	40.7
12:53 AM	6	501 Herondo at Valley Drive	RB	49.2	59.3	56.8	54.3	49.4	45.2	42.7	42.3	41.5
1:06 AM	7	NE Corner of PCH & 1st Street	HB	65.6	77.0	74.1	70.9	66.1	59.5	53.5	51.5	49.3
1:16 AM	8	SW Corner of 5th Street /& Ocean View Ave	HB	50.3	61.8	57.3	54.5	50.2	47.4	45.7	45.4	44.8
1:30 AM	9	NE Corner of PCH & 8th Street	HB	60.3	72.7	68.9	66.0	60.3	54.3	43.6	42.2	41.1
1:44 AM	10	PCH Between15th & 16th Streets	HB	63.4	74.5	72.4	68.9	63.2	56.2	51.1	50.5	48.0
1:52 AM	11	1707 PCH, between. 17th & 18th Streets	HB	65.3	77.5	75.6	70.8	63.8	55.3	42.7	41.7	40.5
2:05 AM	12	2006 Rhodes St. & 20th St., 1 Block East of PCH	HB	44.5	55.5	51.1	45.7	44.6	43.4	41.8	41.4	40.6
2:20 AM	13	PCH between. 9th +10th Streets	HB	60.5	75.8	71.4	65.7	55.9	50.2	47.4	47.2	46.9
2:52 AM	14	SE Corner of Rosecrans & Pine Ave	MB	56.1	63.7	59.1	56.5	56.2	55.8	55.4	55.2	55.0
2:45 AM	15	SE Corner of Rosecrans Ave. & Poinsettia Ave	MB	57.3	65.2	63.0	59.1	56.8	56.4	55.9	55.8	55.5
2:37 AM	16	SE Corner of Rosecrans Blvd & Pacific Ave	MB	57.9	64.4	60.8	58.0	57.8	57.6	57.2	57.2	56.9

RB = Redondo Beach, HB = Hermosa Beach, MB = Manhattan Beach

7. Three Dimensional Noise Model

- A three dimensional noise model was created using the noise modeling software, SoundPLAN. The model geometry included all acoustically significant buildings and structures along the transport route. The 3D model is shown in ***Figures 7.1 to 7.5***. The transport route is the purple line, the buildings are blue and the walls are green. The ground, buildings and walls were modeled as totally reflective surfaces.

Figure 7.1, 3D Noise Model Geometry – King Harbor Marina to 1st Street

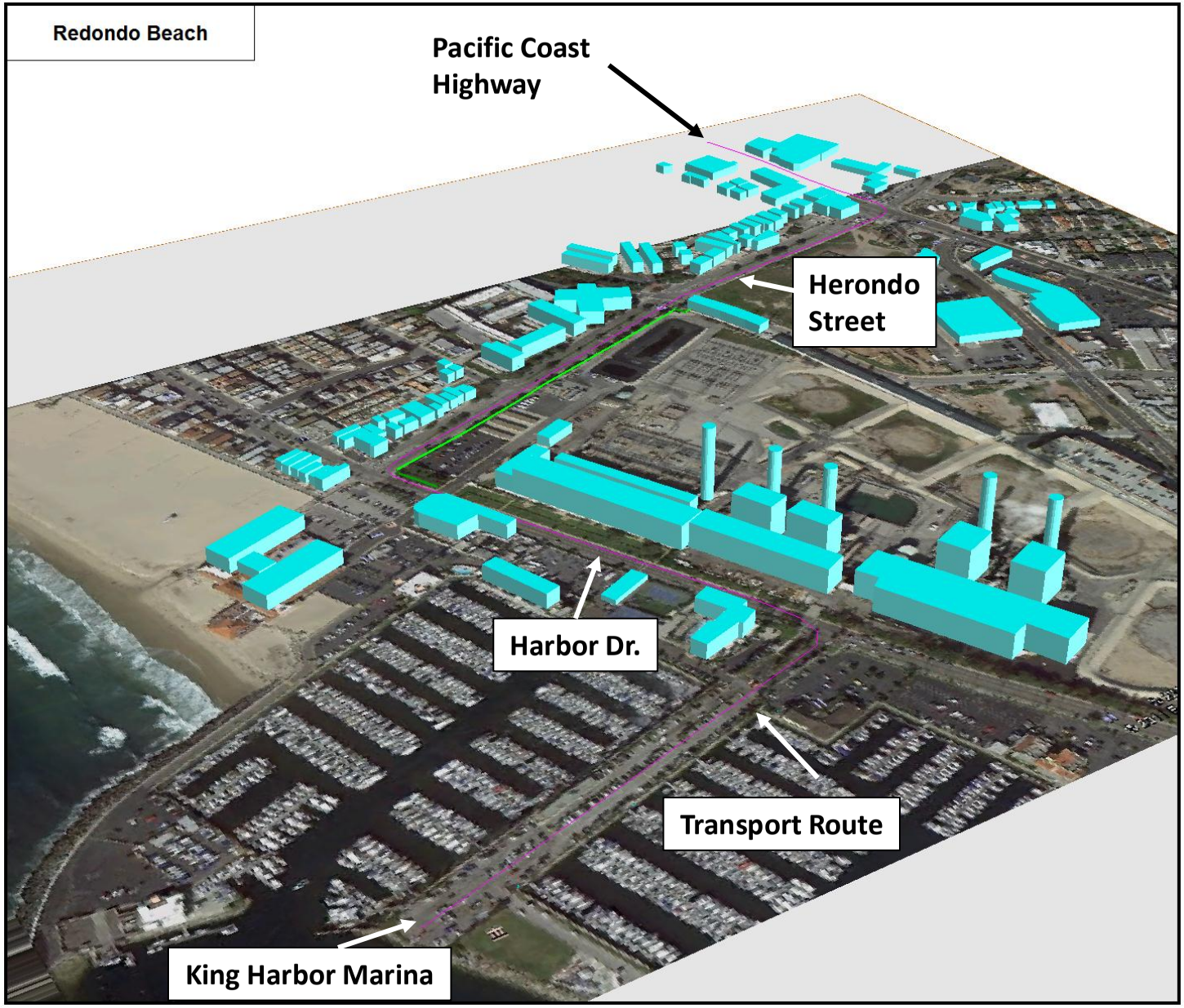


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Figure 7.2, 3D Noise Model Geometry – Redondo Beach PCH from 5th - 9th Street

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Figure 7.3, 3D Noise Model Geometry – Pacific Coast Highway from 15th – 21st Street

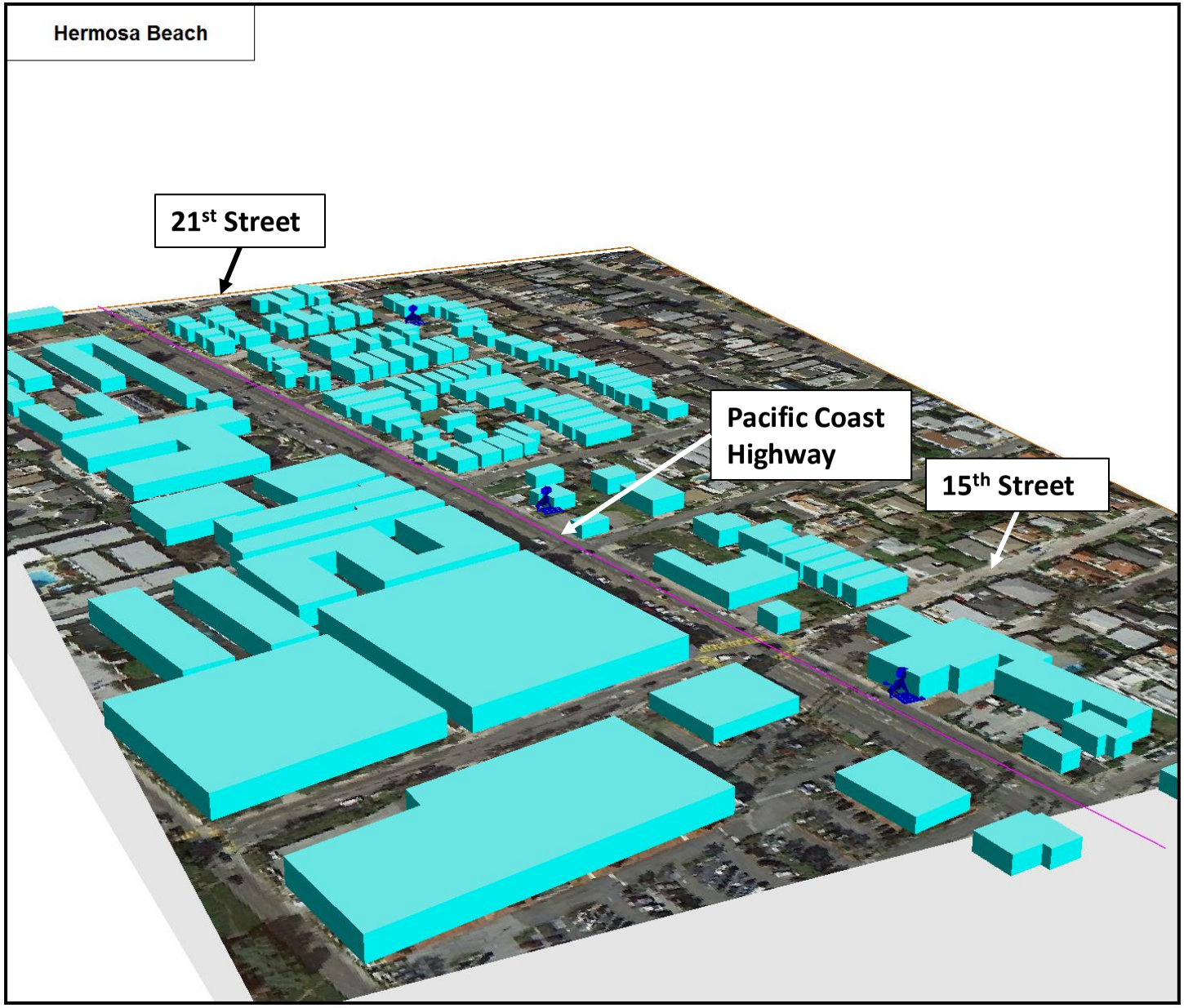

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Figure 7.4, 3D Noise Model Geometry – Pacific Coast Highway from 8th Street to 11th Street

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Figure 7.5, 3D Noise Model Geometry – PCH to Rosecrans Blvd.

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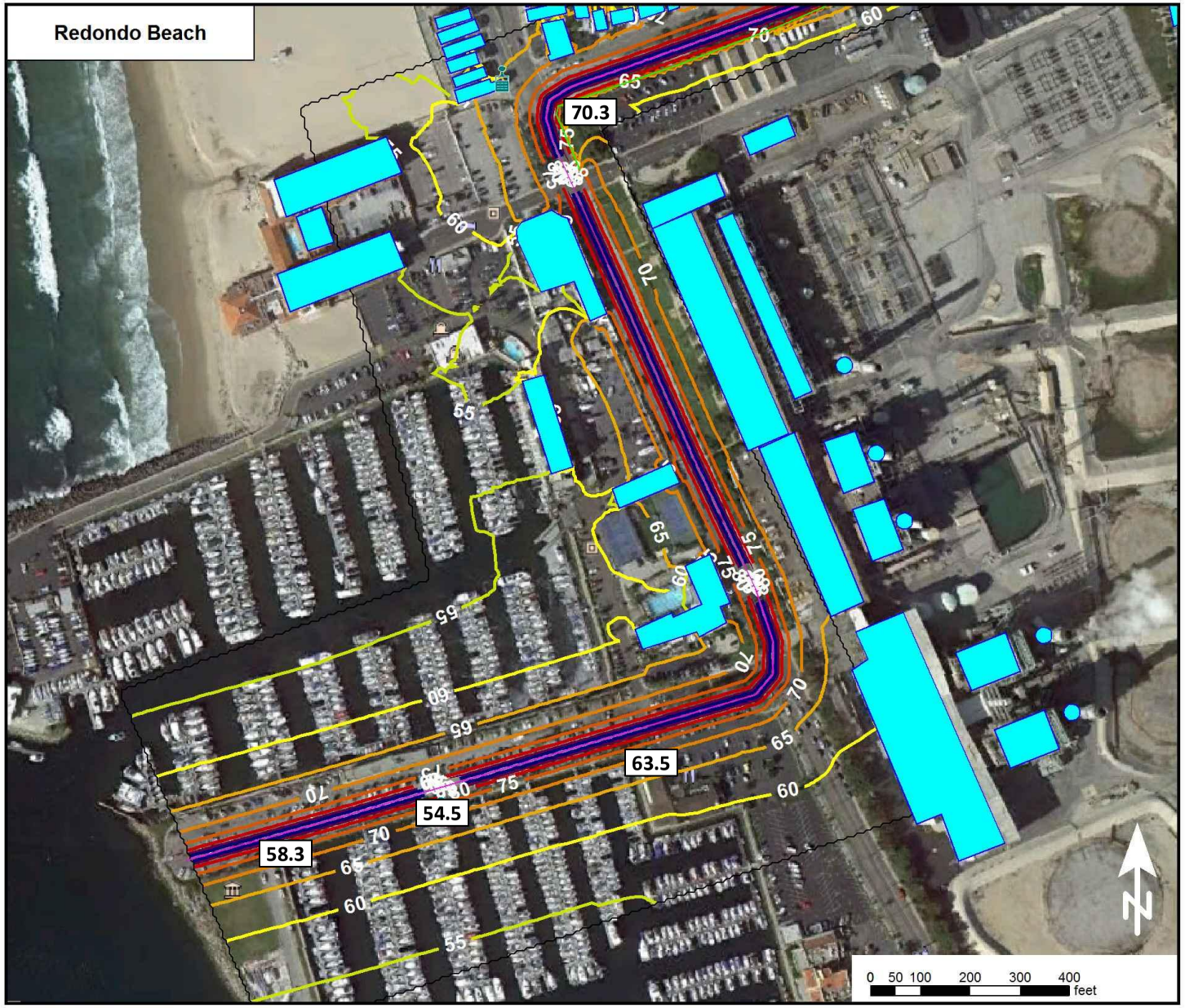
8. Noise Model Predictions

- The noise model predictions are based on the algorithms and procedures described in ISO 9613-1 "Acoustics -- Attenuation of sound during propagation outdoors -- Part 1: Calculation of the absorption of sound by the atmosphere",1993 and ISO 9613 -2 "Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation", 1996.
- Noise contours were generated for both the predicted maximum (Lmax) and hourly averaged (Leq) pass-by noise level.
  - The predicted maximum (Lmax) pass-by noise levels are presented in ***Noise Maps 8.1 to 8.6***.
  - The predicted hourly averaged (Leq) pass-by noise levels are presented in ***Noise Maps 8.7 to 8.12***.
  - The measured Lmax and Leg levels are also shown on the noise maps.
- The predicted maximum and hourly averaged pass-by noise levels are compared with the measured nighttime ambient noise levels in ***Table 8.1***.

Noise Map 8.1, Predicted Lmax Pass-by Contours, King Harbor Marina to Harbor Drive



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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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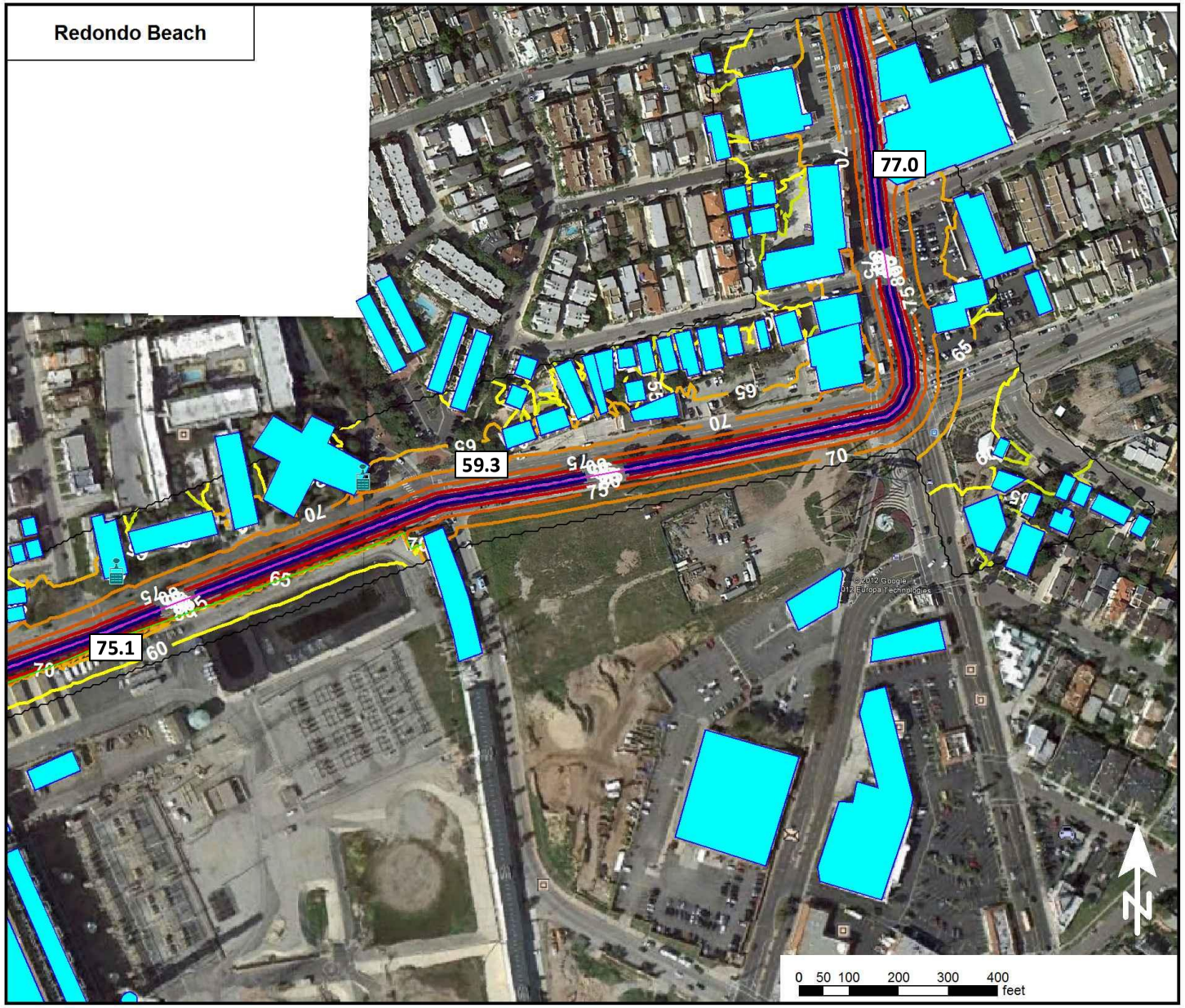
Noise Map 8.2, Predicted Lmax Pass-by Contours, Herondo St. to Pacific Coast Highway



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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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Noise Map 8.3, Predicted Lmax Pass-by Contours, Pacific Coast Highway (5th to 9th Street)

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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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Noise Map 8.4, Predicted Lmax Pass-by Contours, Pacific Coast Highway (15th to 21st Street)

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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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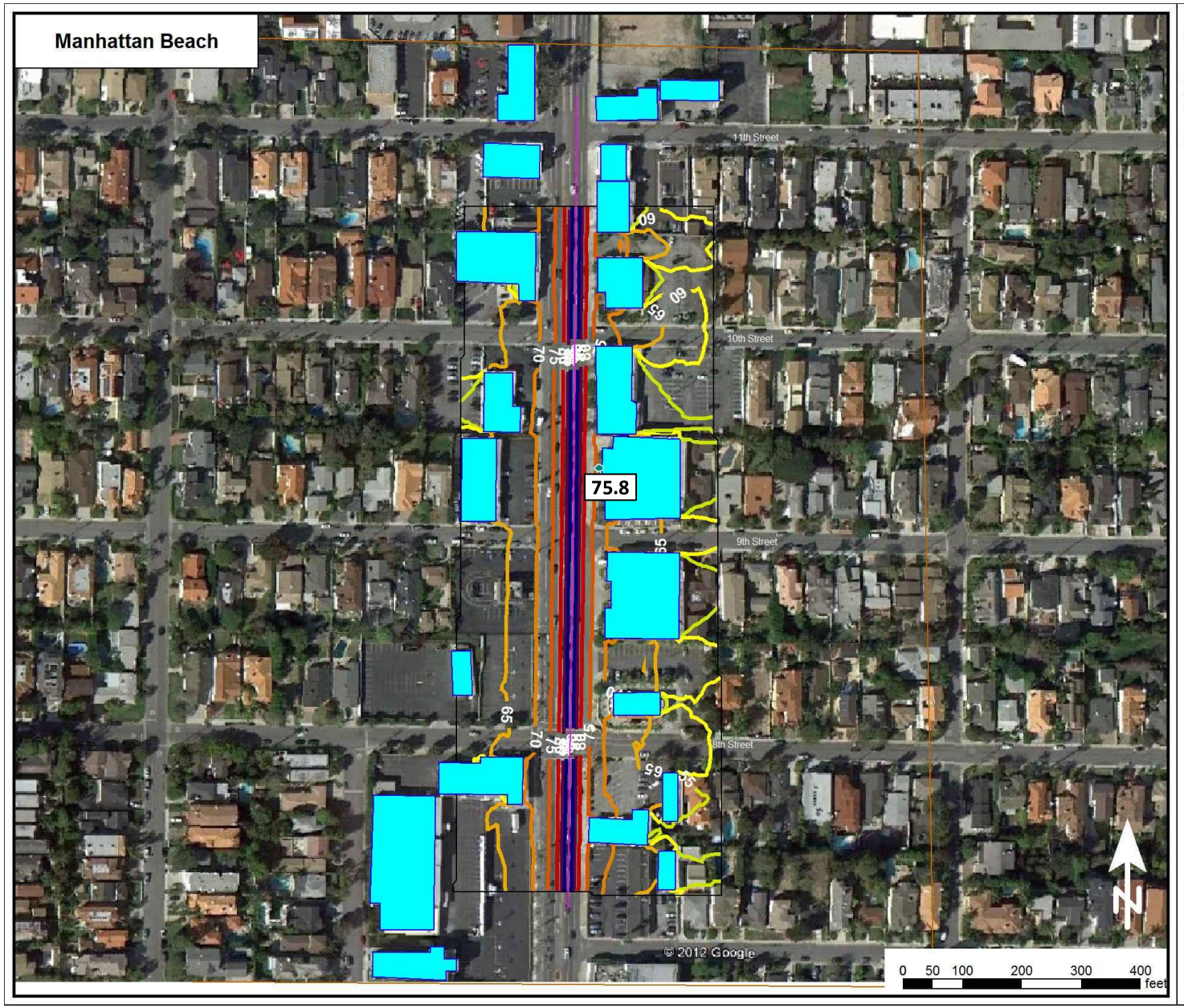
Noise Map 8.5, Predicted Lmax Pass-by Contours, Pacific Coast Highway (8th to 11th Street)



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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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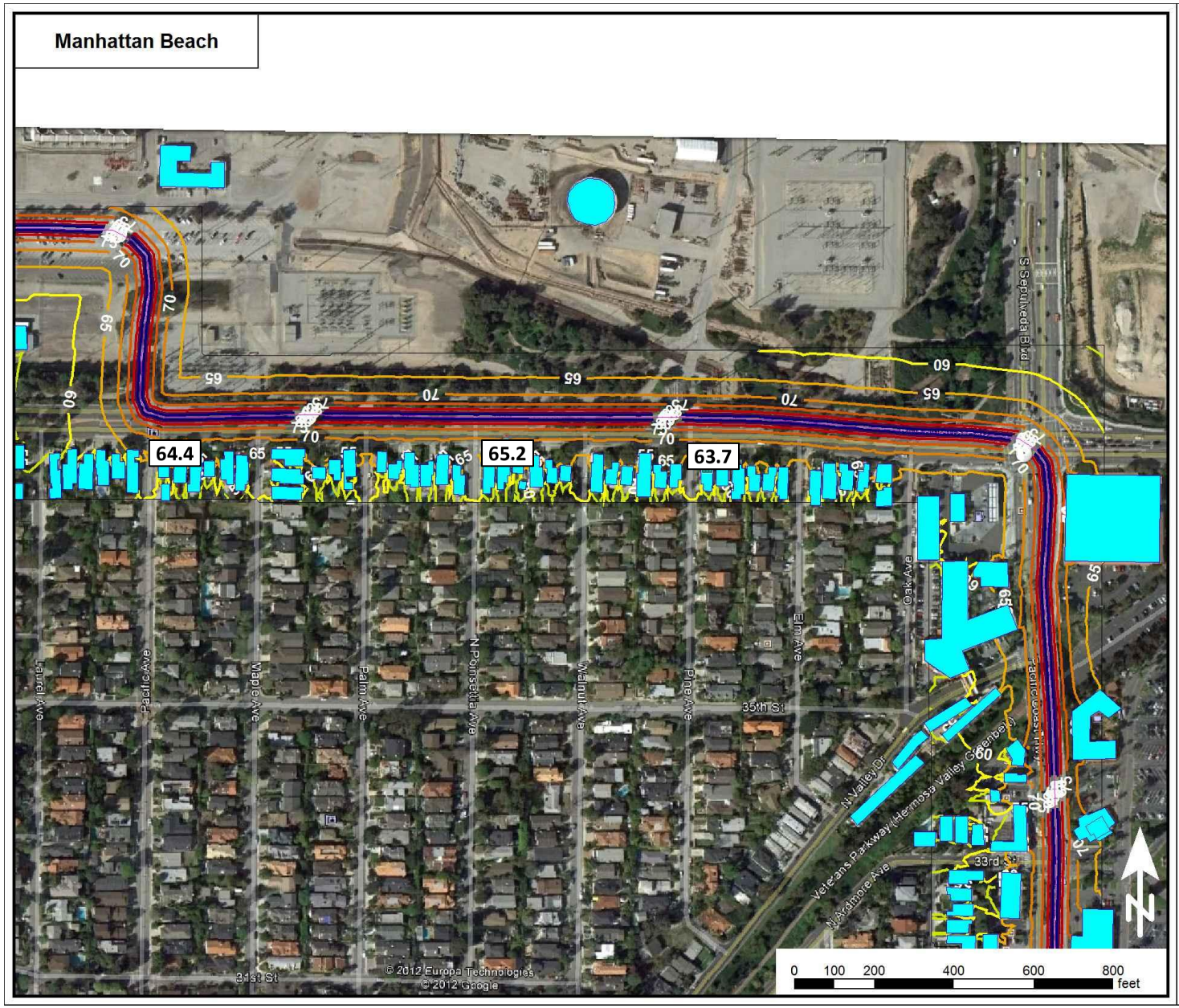
Noise Map 8.6, Predicted Lmax Pass-by Contours, Pacific Coast Highway to Rosecrans Blvd.



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Coker Drum Transport Noise Assessment

XX.X **Measured Lmax Level [dBA]**

Noise level
Lmax
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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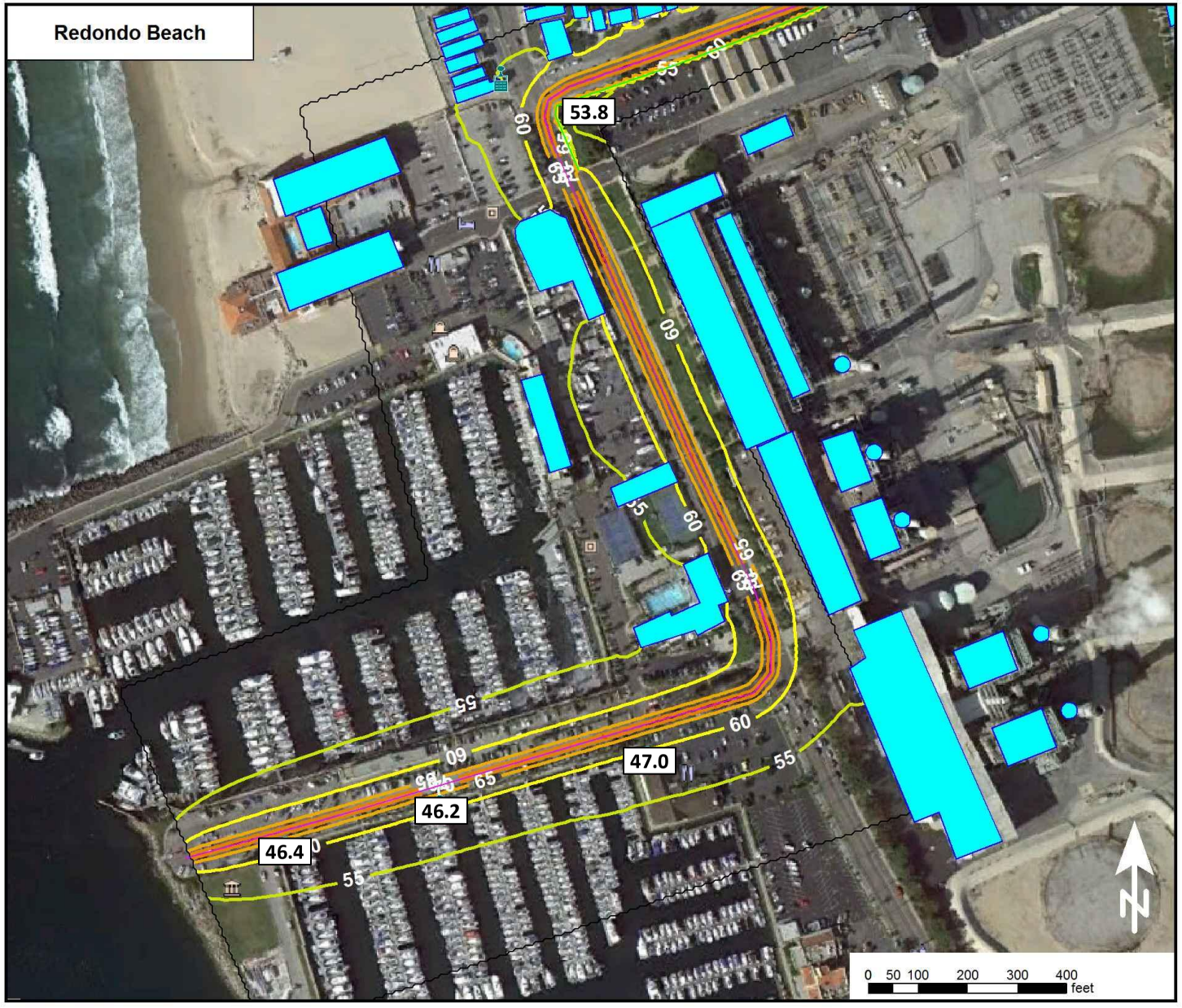
Noise Map 8.7, Predicted Leq Pass-by Contours, King Harbor Marina to Harbor Drive



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Coker Drum Transport Noise Assessment

XX.X **Measured Leq Level [dBA]**

Noise level
Leq,hr
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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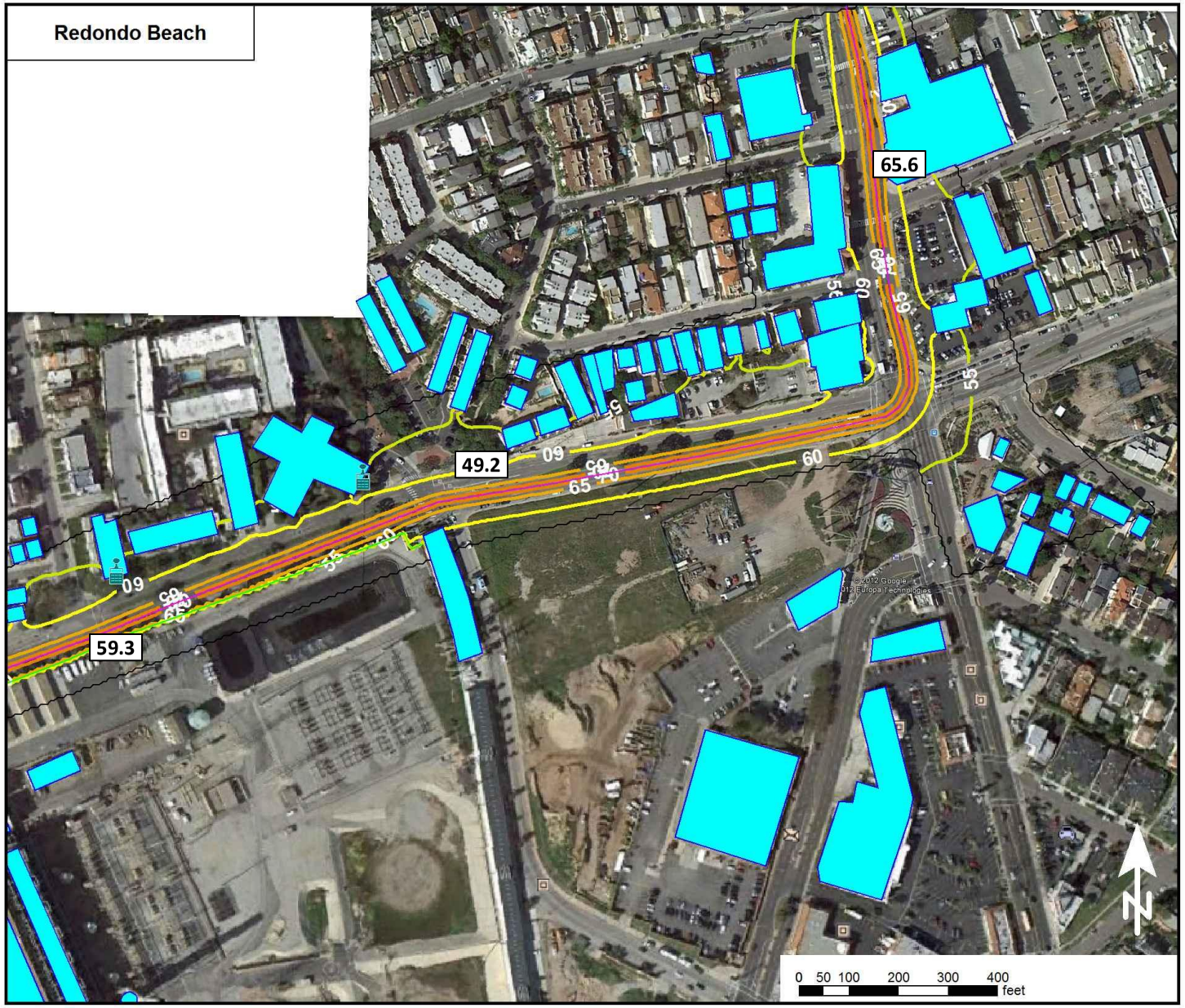
Noise Map 8.8, Predicted Leq Pass-by Contours, Herondo St. to Pacific Coast Highway



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Coker Drum Transport Noise Assessment

XX.X **Measured Leq Level [dBA]**

Noise level
Leq,hr
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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Noise Map 8.9, Predicted Leq Pass-by Contours, Pacific Coast Highway (5th to 9th Street)

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Coker Drum Transport Noise Assessment

XX.X **Measured Leq Level [dBA]**

Noise level
Leq,hr
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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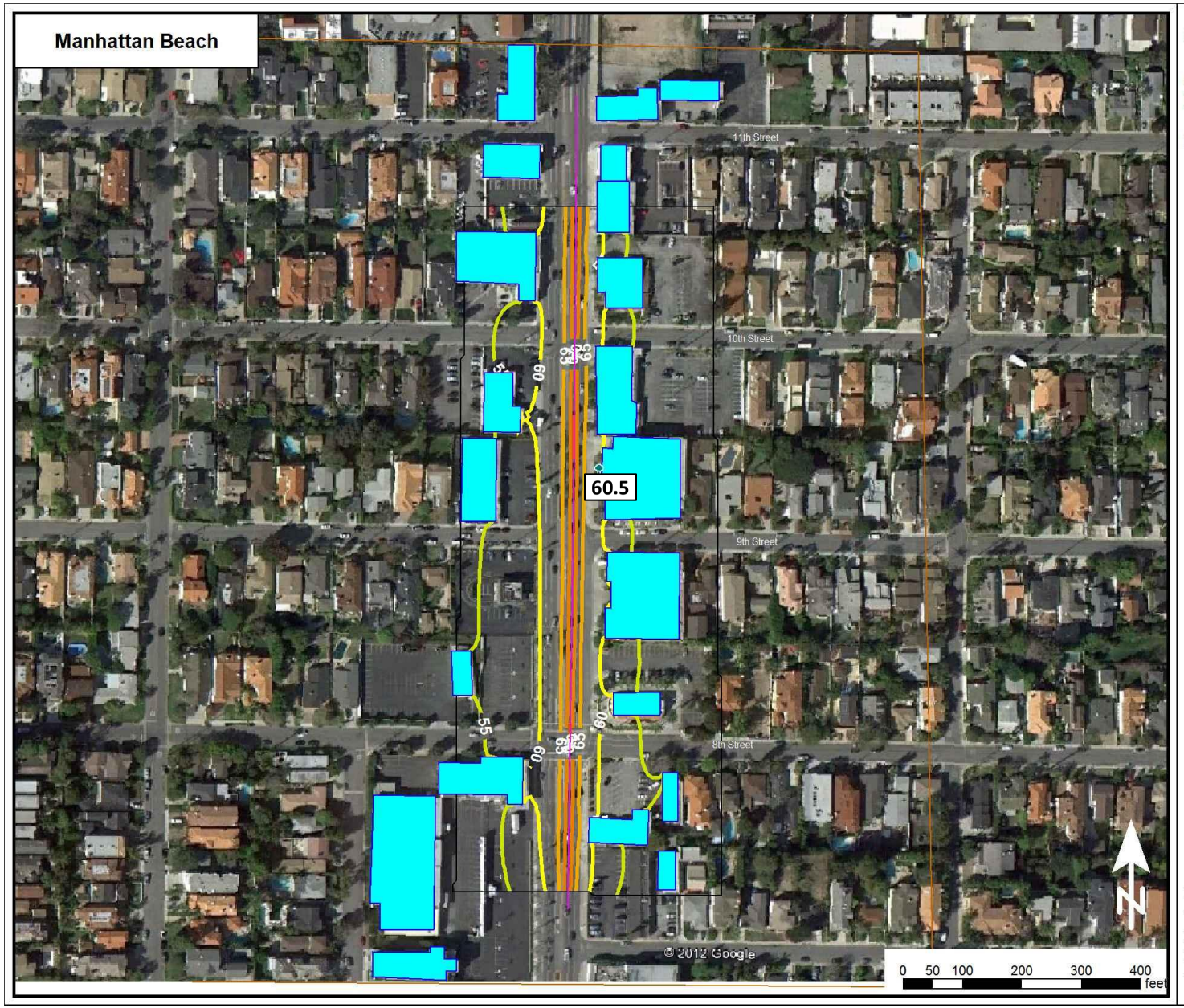
Noise Map 8.10, Predicted Leq Pass-by Contours, Pacific Coast Highway (15th to 21st Street)

Noise Map 8.11, Predicted Leq Pass-by Contours, Pacific Coast Highway (8th to 11th Street)



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Coker Drum Transport Noise Assessment

XX.X **Measured Leq Level [dBA]**

Noise level
Leq,hr
in dB(A)

- = 90
- = 85
- = 80
- = 75
- = 70
- = 65
- = 60
- = 55

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Noise Map 8.12, Predicted Leq Pass-by Contours, Pacific Coast Highway to Rosecrans Blvd.

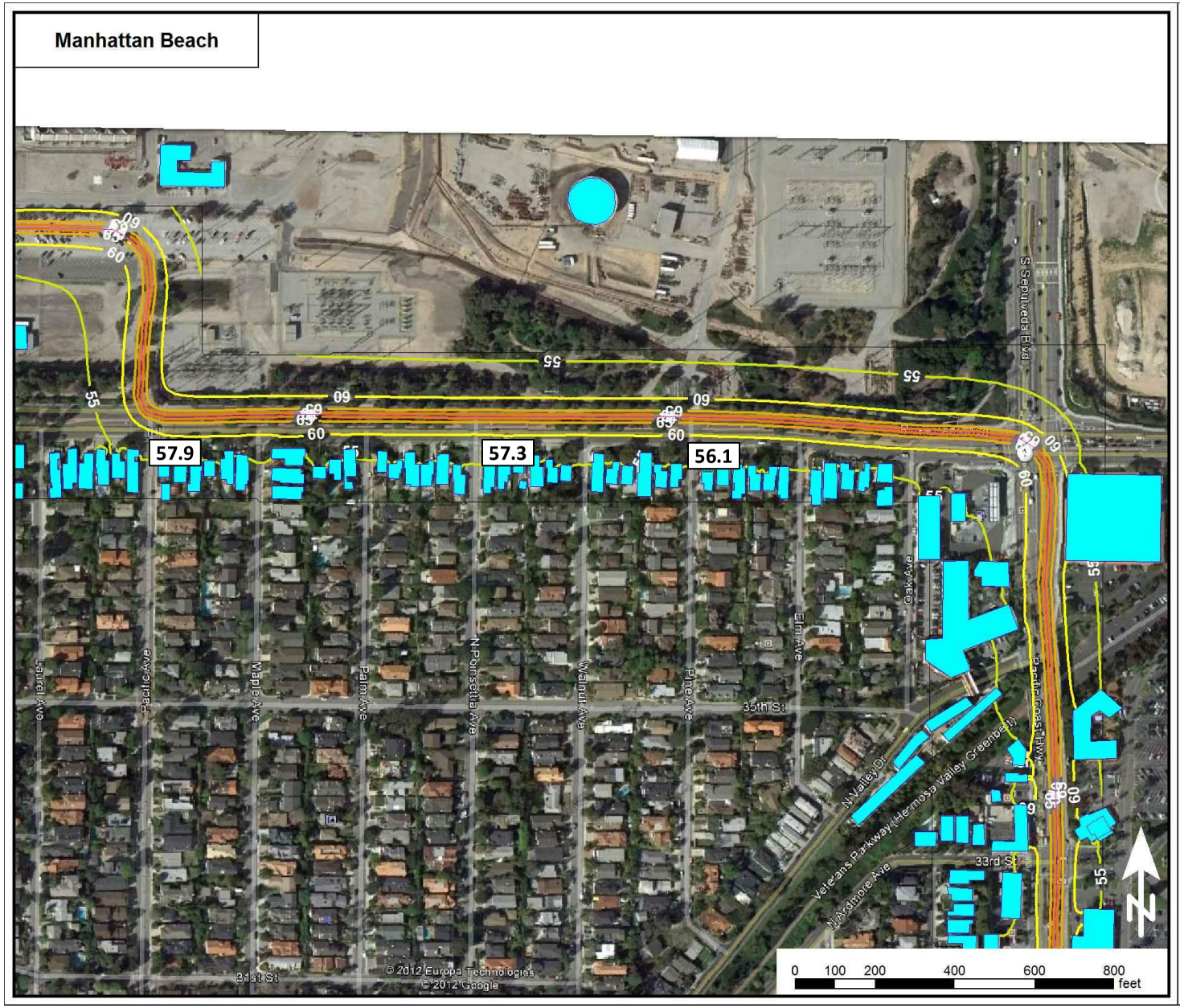

Table 8.1, Predicted Transport Noise Levels vs. Measured Ambient Levels

Noise Measurement Location			Measured Ambient [dBA]		Predicted Levels [dBA]		Predicted - Ambient [dBA]	
No.	Description	City	Leq, dBA	Lmax, dBA	Leq	Lmax	Leq	Lmax
1	West End of King Harbor Marina	RB	46.4	58.3	59.7	71.3	13.3	13.0
2	Center of King Harbor Marina	RB	46.2	54.5	59.6	70.8	13.4	16.3
3	King Harbor Marina Guard Shack	RB	47.0	63.5	58.0	67.4	11.0	3.9
4	SE Corner of Harbor Drive & Herondo Street	RB	53.8	70.3	55.6	65.1	1.8	-5.2
5	South Side of Herondo St at Monterey Blvd.	RB	59.3	75.1	56.9	65.6	-2.4	-9.5
6	501 Herondo at Valley Drive	RB	49.2	59.3	58.7	68.6	9.5	9.3
7	NE Corner of PCH & 1st Street	HB	65.6	77.0	65.3	79.4	-0.3	2.4
8	SW Corner of 5th Street /& Ocean View Ave	HB	50.3	61.8	46.6	59.9	-3.7	-1.9
9	NE Corner of PCH & 8th Street	HB	60.3	72.7	61.9	74.5	1.6	1.8
10	PCH Between15th & 16th Streets	HB	63.4	74.5	63.7	76.4	0.3	1.9
11	1707 PCH, between. 17th & 18th Streets	HB	65.3	77.5	62.2	74.0	-3.1	-3.5
12	2006 Rhodes St. & 20th St., 1 Block East of PCH	HB	44.5	55.5	42.3	56.7	-2.2	1.2
13	PCH between. 9th +10th Streets	HB	60.5	75.8	62.6	74.5	2.1	-1.3
14	SE Corner of Rosecrans & Pine Ave	MB	56.1	63.7	57.4	65.3	1.3	1.6
15	SE Corner of Rosecrans Ave. & Poinsettia Ave	MB	57.3	65.2	56.7	65.6	-0.6	0.4
16	SE Corner of Rosecrans Blvd & Pacific Ave	MB	57.9	64.4	56.0	65.1	-1.9	0.7

- RB = Redondo Beach, HB = Hermosa Beach, MB = Manhattan Beach
- The "Predicted – Ambient" levels are the arithmetic difference between the "Predicted" levels and the "Measured" levels. Positive values indicate that the predicted levels are greater than the ambient; negative values indicate that the predicted levels are less than the ambient.