DOCKETED

Docket Number:	07-AFC-06C
Project Title:	Carlsbad Energy Center - Compliance
TN #:	203601
Document Title:	El Segundo Energy Center, LLC, Post Construction Operational Sound Level Study. November 8, 2013.
Description:	N/A
Filer:	April Dearbaugh
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/4/2015 1:51:26 PM
Docketed Date:	2/4/2015

POST-CONSTRUCTION OPERATIONAL SOUND LEVEL STUDY FOR CONDITIONS OF CERTIFICATION NOISE-6

EL SEGUNDO ENERGY CENTER PROJECT (00-AFC-14C)

EL SEGUNDO, CALIFORNIA

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November 8, 2013

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Acronyms

AFC Application for Certification
CEC California Energy Commission
CEQA California Environmental Quality Act
COC Conditions of Certification
COES City of El Segundo
COMB City of Manhattan Beach
CPM Compliance Project Manager
dB decibel
dBA A-weighted decibel
ESGS El Segundo Generating Station
ESEC El Segundo Energy Center
GCS Gas Compressor Station

GTG	Gas Turbine Generator
HRSG	Heat Recovery Steam Generator
Hz	Hertz
ISO	International Organization for Standardization
LAX	Los Angeles International Airport
L_{eq}	equivalent sound level
L_{xx}	percentile-exceeded sound level
SLM	Sound Level Meter
ST-X	Short-Term Noise Measurement Site
STG	Steam Turbine Generator

1.0 INTRODUCTION

El Segundo Energy Center, LLC ("ESEC LLC") constructed the El Segundo Energy Center ("ESEC") project (the "Project") at the existing El Segundo Generating Station facility ("ESGS" or the "Generating Station"). There were two key features of the Project that had potential to change the noise and sound environment: the removal of two large fuel oil storage tanks located on the southern portion of the Generating Station property, and the replacement of Units 1 and 2 with Units 5, 6, 7, and 8. The primary objective of the Project was to replace the oldest existing steam-powered turbine units (Units 1 and 2) with units that have a newer, more efficient Rapid Response Combined-Cycle design and use dry cooling and zero-liquid discharge technology. The new design consists of two trains, each one containing a gas turbine generator ("GTG"), a heat recovery steam generator ("HRSG"), one steam turbine generator ("STG") and an air-cooled heat exchanger for cycle heat rejection. The new design includes Units 5, 6, 7, and 8. Units 5, 6, 7 and 8 began commercial operations on August 1, 2013.

The Project must comply with California Energy Commission ("CEC") Conditions of Certification (collectively, "COCs," and each, individually, a "COC"), including COC NOISE-6. COC Noise-6, as provided in the CEC Commission Decision (CEC-800-2010-015-CMF) on June 2010 (2010 Final Decision), reads as follows:

> **CONDITIONS OF CERTIFICATION**
> **NOISE-6:**
>
> **"**The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the project will not cause resultant noise levels to exceed the ambient median noise level (L_{50}) at residential receivers by 2 decibels or more, and that the noise due to plant operations will otherwise comply with the noise standards of the El Segundo and Manhattan Beach Municipal Codes.
>
> No new pure tone components may be introduced. No single piece of equipment shall be allowed to stand out as a source of noise. Steam relief valves shall be adequately muffled.
>
> A. Determine the ambient noise level (L_{50}) at Residential Receivers. Prior to site mobilization, the project owner shall prepare and submit to the City of El Segundo and City of Manhattan Beach for review and comment, and to the CPM for review and approval, a Pre-Construction Noise Survey Plan. This plan will indicate the survey procedure and methodology for establishing the ambient noise level at nearby residential receivers. At a minimum, the plan will include the following:
>
> - The project owner will conduct a 30-day continuous community noise survey at a residential receptor (on 45th Street in Manhattan Beach), selected by the CPM in cooperation with the City of Manhattan Beach. This pre-construction survey shall be conducted during the period of June 1 to September 30. Hourly L_{eq}, L_{50} and L_{90} values shall be measured.
>
> - Existing ESGS Units 3 and 4 shall be operating normally during the course of the

survey, and the levels of plant operation will be documented during the survey. The plan will establish a range of acceptable ("normal") operating conditions suitable for the purposes of these studies.

- A simultaneous control measurement will be conducted within the project boundary. The site shall be selected to ensure that the dominant noise source will be the surf, requiring a clear line of sight to the surf. A location near the southwest project site corner is preferred to minimize the potential for noise from the existing power plant to influence the surf noise measurements. Wave height and other surf conditions, and any unusual environmental conditions occurring during the survey period shall be documented.

- For each of the days of noise data collected at each receptor, the arithmetic average median noise level (L_{50}) shall be computed for the quietest consecutive 4-hour period. The resultant average median noise levels shall then be averaged arithmetically to calculate the relationship between surf noise levels and ambient noise levels along the northern side of the El Porto Community.

- If the initial 30-day measurement data, in the judgment of the CPM in consultation with the City of Manhattan Beach, fail to demonstrate a consistent relationship of surf and ambient noise levels, the measurement will be repeated until a consistent relationship can be established.

Following approval of the Survey Plan, and prior to site mobilization, the project owner shall implement the survey and present the results in a Pre-Construction Noise Survey Report to the Cities of El Segundo and Manhattan Beach and to the CPM. The Report will include a discussion of the ambient noise level taking into consideration all relevant factors, such as plant operating conditions, surf and wind conditions.

B. Conduct post-construction survey. As soon as feasible, within the time frame described below and after Units 5, 6 and 7 (and 8) first achieve a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct short-term survey noise measurements at monitoring sites ST-1, ST-2, ST-3 and ST-12 (as described in the Application for Certification (AFC), Section 5.12, Figure 5.12-3, as amended May 4, 2001). 'In addition, the Applicant shall conduct a 30-day community noise survey at the same receptor locations used for the 30-day noise measurement cited in Section A above.'

   The post-project community noise survey shall be conducted between June 1 and September 30, using the methods described in Item A, above. The post-construction survey shall also include measurement of one-third octave band sound pressure levels at each of the above locations to ensure that no new pure-tone noise components have been introduced. If environmental conditions prevent completion of the post-construction community noise survey in a timely manner, then the survey shall be completed as soon as conditions allow.

Following the post-construction survey, the project owner shall present the results in a Post-Construction Noise Survey Report to the Cities of El Segundo and Manhattan Beach and to the CPM. The Report will include a discussion of the relationships between surf and ambient noise levels.

C. Implement Tank Removal Noise Mitigation if Required. Mitigation measures shall be implemented to reduce noise levels to a level of compliance if the results from the post-construction noise survey at the residential receptor location indicate that the ambient median noise level (L_{50}) has increased by 2 decibels or more due to facility operation, as determined by the relationship between surf and ambient noise levels obtained from the pre-construction survey. The project owner shall present the proposed mitigation measures to the Cities of El Segundo and Manhattan Beach and to the CPM.

D. Implement Pure Tone Mitigation if Required. If a facility-related pure tone is found to be present at any of the above monitoring sites, mitigation measures shall be implemented to eliminate the pure tone. For the purpose of this condition, the State of California's Model Community Noise Control Ordinance defines a pure tone. The project owner shall present the proposed mitigation measures to the Cities of El Segundo and Manhattan Beach and to the CPM.

E. Implement Plant Noise Mitigation if Required. If the results of noise measurements at ST-1, or ST-12 indicate that the ambient noise level has increased by more than 5 decibels due to facility operation, as compared with the baseline noise measurements conducted on July 20 and 21, 2000, the owner will implement mitigation measures to reduce the noise at those locations to comply with the Municipal Code of the City of El Segundo. The project owner shall present the proposed mitigation measures to the Cities of El Segundo and Manhattan Beach and to the CPM.

Verification:

1. Pre-Construction Survey and Determination of Ambient Noise Level.

   a) At least 60 days prior to site mobilization, the project owner shall provide the Pre-Construction Noise Monitoring Survey Plan to the CPM for review and approval.

   b) Within 30 days of completion of the survey, the project owner shall provide to the CPM for review and approval the results of the pre-construction noise survey.

2. Post-construction Survey. Within 45 days after completing the post-construction surveys, the project owner shall submit a summary report of the survey to the CPM. Included in the report will be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limits, and a schedule, subject to CPM approval, for implementing these measures.

3. Mitigation Implementation. If mitigation is required, then upon completion of installation of these measures, the project owner shall submit to the CPM a summary report of a new noise survey, performed as described in paragraph B and showing compliance with this condition."

The purpose of this summary noise analysis is to report the results of the post-construction noise survey, demonstrate compliance of the project with the conditions listed in COC NOISE-6, compare the pre-construction noise levels to the post-construction noise levels, report any potential noise impacts (whether it be pure-tone noise or noise exceeding thresholds established by the CEC or the Cities of El Segundo and Manhattan Beach), and recommend mitigation measures if there is the potential for noise impacts at nearby noise-sensitive receivers.

As explained in this report, the results of the post construction noise survey indicate that the Project complies with the requirements of COC NOISE-6, namely that the project has not caused resultant noise levels to exceed the ambient median noise level (L_{50}) at residential receivers by 2 decibels or more, that noise due to plant operations otherwise complies with the noise standards of the El Segundo and Manhattan Beach Municipal Codes, that no new pure tone components were introduced and that no single piece of equipment was allowed to stand out as a source of noise.

2.0 FUNDAMENTALS OF ACOUSTICS

This section addresses the fundamentals of acoustics and commonly used noise metrics relevant to community noise impact analyses.

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to typical environmental noise exposure levels is annoyance. The responses of individuals to similar noise events are diverse, and influenced by many factors, including the type of noise, the perceived importance of the noise, its appropriateness to the setting, the time of day, the type of activity during which the noise occurs, and the noise sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound's pitch (tone) and is measured in cycles per second (Hertz [Hz]), and amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound pressure measurement is the decibel (dB).

Hz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that oscillates at

100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the healthy human ear.

As mentioned above, sound levels are expressed by reference to a specified national/international standard. This report refers to two acoustical quantities: (1) sound power level is used to express the sound energy radiated from a source; and (2) sound pressure level is used to describe sound at a specified distance or specific receptor location. In expressing sound power as a dB level, the standard reference sound power is 1 picowatt. In expressing sound pressure level on a logarithmic scale, sound pressure is compared to a reference value of 20 micropascals. These terms are different and should not be confused. Sound power level is a measure of the inherent acoustic power radiated by a source, whereas sound pressure level depends on not only the power of the source, but also the distance from the source and the acoustical characteristics of the space surrounding the source (absorption, reflection, etc.).

Outdoor sound levels decrease logarithmically as the distance from the source increases. This decrease is due to wave divergence, atmospheric absorption, and ground attenuation. Sound radiating from a point source in a homogeneous and undisturbed manner travels in spherical waves. As the sound waves travel away from the source, the sound energy is dispersed over a greater area, decreasing the sound pressure of the wave according to the inverse square law. Spherical spreading of the sound wave reduces the noise level at a rate of 6 dB per doubling of distance.

Atmospheric absorption also influences the sound levels received by an observer. The greater the distance traveled by the sound, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound, as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries further) at high humidity and high temperatures; and lower frequencies are less readily absorbed (i.e., sound carries further) than higher frequencies. Over long distances, lower frequencies become dominant as the higher frequencies are more rapidly attenuated. Turbulence, gradients of wind, and other atmospheric phenomena also play a significant role in determining the degree of attenuation. For example, certain conditions such as temperature inversions can channel or focus the sound waves and result in higher noise levels than would otherwise result from simple spherical spreading.

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds that one hears in the environment do not consist of a single frequency but rather a broad band of many frequencies differing in sound level. Because of the broad range of audible frequencies, methods have been developed to quantify these values into a single number. The most common method used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that is reflective of human hearing. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process of discriminating frequencies based on human sensitivity is termed “A-weighting,” and the resulting dB level is termed an “A-weighted” decibel (dBA). A-weighting is widely used in local noise ordinances and state and federal guidelines. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve. Unless specifically noted, the use of A-weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the “A.”

In terms of human perception, a sound level of 0 dBA is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. This threshold is the reference level against which the amplitude of other sounds is compared. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort, progressing to pain at still higher levels. Humans are much better at discerning relative sound levels than absolute sound levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dBA. A 3 to 5 dBA change is readily perceived. An increase (or decrease) in sound level of about 10 dBA is usually perceived by the average person as a doubling (or halving) of the sound's loudness. To provide a frame of reference, common sound levels are presented in Table 1, "Sound Levels of Typical Noise Sources and Noise Environments".

Table 1
Sound Levels of Typical Noise Sources and Noise Environments
(A-Weighted Sound Levels)

Noise Source (at Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)
Military Jet Take-off with After-burner (50 ft.)	140	Carrier Flight Deck	–
Civil Defense Siren (100 ft.)	130	–	–
Commercial Jet Take-off (200 ft.)	120	–	**Threshold of Pain** *32 times as loud
Pile Driver (50 ft.)	110	Rock Music Concert	*16 times as loud
Ambulance Siren (100 ft.) Newspaper Press (5 ft.) Power Lawn Mower (3 ft.)	100		**Very Loud** *8 times as loud
Propeller Plane Flyover (1,000 ft.) Diesel Truck, 40 mph (50 ft.) Motorcycle (25 ft.)	90	Boiler Room Printing Press Plant	*4 times as loud
Garbage Disposal (3 ft.)	80	High Urban Ambient Sound	*2 times as loud
Passenger Car, 65 mph (25 ft.) Living Room Stereo (15 ft.) Vacuum Cleaner (3 ft.)	70	–	**Moderately Loud** *70 decibels (Reference Loudness)
Air Conditioning Unit (100 ft.) Normal Conversation (5 ft.)	60	Data Processing Center Department Store	*1/2 as loud
Light Traffic (100 ft.)	50	Private Business Office	*1/4 as loud
Bird Calls (distant)	40	Lower Limit of Urban Ambient Sound	**Quiet** *1/8 as loud
Soft Whisper (5 ft.)	30	Quiet Bedroom	**Very Quiet**
	20	Recording Studio	
	10	–	**Extremely Quiet**
	0	–	**Threshold of Hearing**

Compiled by URS Corporation (2013).

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, such as car and truck pass-bys. Sound levels are higher than this value only 10 percent of the measurement time. L_{50} represents the median sound level during the measurement interval. Levels will be above and below this value exactly one-half of the measurement time. L_{90} is the sound level exceeded 90 percent of the time, and is often used to describe background noise conditions. Ninety percent of the time, measured levels are higher than this value, and therefore the L_{90} represents the environment at its quietest periods.

Because of the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example, 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB. However, about a 10-decibel increase is required to double the perceived intensity of a sound, and it is interesting to note that a doubling of the acoustical energy (a 3 dB increase) is at the lower limit of readily perceived change. For example, when one fan operates at a given speed, it generates a certain noise level at a given distance. If a second fan of the very same type were placed next to the first, and were operating at the very same speed, the acoustic energy would be doubled because now there would be two sources, but the increase in sound pressure level would be 3 dB. This level of increase is just noticeable to most people.

Masking is the process by which the threshold of audibility for one sound is raised by the presence of another sound. Masking is most effective when the masking sound includes a wide range of frequencies, and is of sufficient sound power (loudness) to compete with or overshadow the sound of concern. Audibility of a sound is determined by the existing background noise level. The higher the background noise level is compared to the second sound, the more likely it is to mask the second sound. The level and spectra of the sound, in addition to the time that the sound occurs within the background noise, determines the amount of masking that may potentially occur. Both surf noise and aircraft noise contain a wide range of frequencies, and have a great deal of sound power (directly related to the energy involved with both the surf and the takeoff of large commercial aircraft).

3.0 SUMMARY OF NOISE ORDINANCES

Following is a brief summary of the applicable City of Manhattan Beach and City of El Segundo noise ordinances.

City of Manhattan Beach Noise Ordinance

The City of Manhattan Beach's ("COMB") exterior noise standards are based upon the L_{50} statistical noise metric. Section 5.48.160 of the COMB Noise Ordinance deals with exterior noise standards. Table 1 of Section 5.48.160 lists exterior noise standards that may not be exceeded for a cumulative period of more than 30 minutes in any hour. Because the project is a power plant, emitting a (nearly) continuous noise level, Section 5.48.160 is the applicable noise standard. The COMB exterior residential noise standard is 50 dBA during daytime hours (7:00 a.m. to 10:00 p.m.), and 45 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.). During daytime hours, the COMB commercial exterior noise standard is 65 dBA, and the industrial exterior noise standard is 70 dBA. The COMB noise ordinance also states that if the 30-minute-per-hour ambient level (L_{50}) exceeds the level in Table 1, then the ambient L_{50} becomes the exterior noise standard which may not be exceeded for a cumulative period of more than 30 minutes in any hour. Subsection F of Section 5.48.160 states in part: "If the measurement location is on a boundary between two (2) different land use classifications, the noise level limit applicable to the more restrictive land use classification plus five (5) dB, shall apply" (Ord. 1957am eff. 12/5/96).

The ESEC Project property (an industrial land use) is located immediately to the north of 45th Street. The El Porto Community (a residential land use) is located immediately to the south of 45th Street. Therefore, subsection F of Section 5.48.160 applies, and the noise level limit would be the existing, ambient, L_{50} noise level plus 5 dBA. This noise level standard is consistent with the analysis presented in the Application for Certification of the ESEC Project ("AFC").

City of El Segundo Noise Ordinance

The City of El Segundo ("COES") Noise Ordinance sets permissible project-related increases above ambient noise levels by land use; 5 dBA above the ambient noise level is the limit for residential, while 8 dBA above the ambient noise level is the limit for commercial and industrial.

4.0 PRE-CONSTRUCTION NOISE MEASUREMENT SURVEY RESULTS

A pre-construction noise measurement survey was conducted in 2003, as part of the requirements for CEC COC NOISE-6. The purpose of the pre-construction ambient noise measurement survey was to quantify the existing acoustical environment, identify environmental noise sources that drive the ambient noise levels at noise-sensitive receivers located near ESGS, and determine the noise level during the quietest consecutive 4-hour period at the nearest noise-sensitive receivers.

To meet the requirement of the 30-day noise survey required in COC NOISE-6, a 42-day, pre-construction, ambient noise measurement survey was conducted at two locations during normal operations. The ambient noise measurement survey was conducted from August 21, 2003 through October 2, 2003 at both the closest residential building ("Residential Site"), located at 4420 The Strand, and at a location near the southwest boundary of the Generating Station property ("Control Site"). The locations of the Residential and Control Sites can be found in **Figure 1**. The sound level meter ("SLM") microphone at the Residential Site was located 6 feet west of third-story bedroom window within line-of-sight of the Generating Station property. The SLM microphone located at the Control Site was attached to the end of a pole, which was attached to the existing handrail located adjacent to a stairway approximately four feet off the ground. The SLM at the Control Site was located immediately west of the southernmost storage tank that has now been removed. All SLMs were set to collect noise data every 15 minutes at both the Residential and Control Sites. The interval noise data that was collected included L_{eq}, L_{50} and L_{90} noise metrics. All long-term noise data collected during the pre-construction noise measurement survey can be found in the El Segundo Power Redevelopment Project Pre-Construction Community Noise Monitoring Report (URS, 2003). All short-term noise data collected during the pre-construction noise measurement survey can be found in the original noise section composed by URS as part of the AFC (URS, 2000).

Hourly surf height, tide height, wind speeds and power output from the then-existing ESGS units were recorded simultaneously with the ambient noise measurement survey conducted from August 21, 2003 through October 2, 2003. This was done to analyze their correlation to the noise data collected at the Residential and Control Sites. The results showed that the combined power output from ESGS Units 3 and 4 demonstrated a very small coefficient of determination, which indicated that there was, effectively, no correlation between the power output at ESGS and the noise levels at the Residential and Control Sites. Additionally, there was no direct correlation between wave heights and wind speeds and the noise level data collected at both the Residential and Control Sites. The only positive correlation was found between the tide heights and noise levels at both sites. It was concluded that there was no individual environmental factor that had a dominant influence on the ambient noise levels during the pre-construction noise measurement survey. Rather, it was a combination of surf height, tide conditions, and wind conditions that cumulatively drove the ambient noise levels at both sites. All hourly surf height, tide height, wind speeds and power output levels data collected during the pre-construction noise measurement survey can be found in the El Segundo Power Redevelopment Project Pre-Construction Community Noise Monitoring Report (URS, 2003).

The noise level during the quietest four-hour period was determined by arithmetically averaging the L_{50} noise data from each consecutive four-hour period at the Residential Site and at the Control Site. **Table 2** lists the overall calculated average L_{50} at the Residential Site and the Control Site during the entire measurement period. The quietest consecutive four-hour average median noise level was calculated to be 57.1 dBA L_{50} at the Residential Site, and 60.5 dBA L_{50} at the Control Site.

In addition to the long-term measurements conducted as part of the pre-construction noise measurement survey required to satisfy COC NOISE-6, 10-minute short-term measurements were conducted between July 20, 2000 and July 21, 2000 on and near the project site. The purpose of these measurements was to quantify the existing acoustical environment in areas of frequent human use. These areas included the bike path and recreational area located near the northwest corner of ESGS property, which are identified as ST-1 and ST-12, respectively. This information can be found in the pre-construction report "El Segundo Power Redevelopment Project, Pre-Construction Community Noise Monitoring Report," 2003. A summary of the pre-construction noise levels at ST-1 and ST-12 can be found in **Table 3.** Additional information regarding the noise measurements, conducted between July 20, 2000 and July 21, 2000, can be found in the noise section composed by URS as part of the AFC (URS, 2000).

Table 2
Pre-Construction, Quietest Four-Hour Period, Median Noise Levels at the Residential Site and the Control Site

Measurement Site	Residential Site, L_{50} (dBA)
Residential Site	57.1
Control Site	60.5

Source: URS Pre-Construction Noise Survey (2003)

Table 3
Pre-Construction Short-Term Noise Measurement Results

Site ID	2000 Measured Existing L_{90} (dBA)	2000 Measured Existing L_{50} (dBA)
ST-1	59.4	60.4
ST-12	64.9	65.9

Source: URS ESEC AFC (2000)

5.0 POST CONSTRUCTION NOISE MEASUREMENT SURVEY RESULTS

5.1 MEASUREMENT SETUP

In order to satisfy the requirements of Sections B and C of CEC COC NOISE-6, a continuous ambient noise measurement survey was conducted from August 16 to September 24, 2013 at the Control Site and the Residential Site, and short-term survey noise measurements were conducted at monitoring sites ST-1, ST-2, ST-3 and ST-12.

The pre-construction Residential Site was used for the long-term noise measurement. This Site is located in the northwest corner of the City of Manhattan Beach, approximately 90 feet south of the Generating Station property line. The applicable residence is located on the northwest side of the El Porto community and immediately south of 45th Street. **Figure 1** depicts the noise measurement site locations in relation to the Generating Station property . The sound level meter ("SLM") was placed in a plastic box on the balcony in order to protect it from any moisture and meteorological elements. A microphone extension cable was attached to the SLM, guided through a hollow metal pole that was attached to a metal tripod, and connected to the microphone preamp that was located approximately 7 feet above the base of the balcony. The microphone had a line of sight to the power plant and the beach. The SLM recorded the noise data in one-second intervals and was serviced every morning in order to change out the battery and download the noise data from the previous 24 hours. The one-second noise data from the Residential Site for the entire duration was processed, and the hourly average noise levels, the statistical noise values, the tide data, the wind data, and the level of power generated are presented in **Appendix A**.

The second long-term noise measurement was conducted on Generating Station property at the pre-construction Control Site. This Site is located near the southwest corner of the Generating Station property. The SLM was mounted on a tripod approximately 5 feet off the ground with a line of sight to the power plant and the beach. The SLM recorded the noise data in one-second intervals and was serviced every morning in order to change out the battery and download the noise data from the previous 24 hours. The one-second noise data from the Control Site for the duration of the long-term, post-construction noise measurement period was processed, and the hourly average noise levels, the statistical noise values, the tide data, the wind data, and the level of power generated are presented in **Appendix B**. Pictures of these long-term measurement setups at the Residential and Control Sites are presented in **Appendix C**.

In addition to the long-term measurements, a series of short-term noise measurements were conducted at five sites both on and near the Project site. The location of these short-term noise measurements, at Sites ST-1 through ST-5, are presented in **Figure 1**.

The post-construction spectral and pure-tone analysis is discussed in Section 7 of this report, and the data for this analysis is presented in **Appendix D**. The ambient noise measurement data sheets for post-construction, long-term measurements at the Residential and Control Sites can be found in **Appendix E**, and the ambient noise measurement data sheets for the post-construction, short-term measurements can be found in **Appendix F**. The certificates of calibration for the equipment used during the post-construction noise measurement survey can be found in **Appendix G**.

5.2 QUIETEST 4-HOUR PERIODS

For each of the days of noise data collected at the Residential Site and the Control Site, the arithmetic-averaged median noise level (L_{50}) was computed for the quietest consecutive 4-hour period. To prevent the data selection complications that occur when the quietest consecutive 4-hour period is split between two separate calendar days (i.e., beginning at 2300 hours on one day and ending at 0300 hours the next day), the 24-hour periods were chosen to begin and end during the 0900 hour (9 a.m.). The 0900 hour was selected as the dividing line between "days," because the quietest 4-hour period never falls on the 0900 hour.

The quietest 4-hour periods for each of the first 30 days is presented in Table 4. This table also includes the average median noise level from the Residential Site and the Control Site, the average tide height, the average wave height, the average wind speed, and the average total output of Units 4 through 8 in megawatts. The 30 sets of quietest, 4-hour noise levels at the Residential Site were averaged arithmetically to result in an average quiet ambient noise level of 60.5 dB A L_{50}. The corresponding quietest, average, 4-hour noise level at the Control Site was 61.4 dBA L_{50}. These results are presented in Table 5.

5.3 2013 RESULTS VS. 2003 RESULTS

The results of the post-construction noise measurement survey shows that the ambient noise levels at both the Residential Site and the Control Site increased compared to those results in 2003. The average median noise level at the Residential Site increased from 57.1 dBA L_{50} in 2003 to 60.5 dBA L_{50} in 2013. This represents an increase of 3.4 dB L_{50} at the Residential Site. The average median noise level at the Control Site increased from 60.5 dBA L_{50} in 2003 to 61.4 dBA L_{50} in 2013. This represents an increase of 0.9 dB L_{50} at the Control Site.

Table 4
Quietest 4-Hour Average Data Summary

Date (date at 09:00 when 24 hour period commences)	Quietest Consecutive 4-hours	Residential Site Sound Level (dBA L_{50})	Control Site Sound Level (dBA L_{50})	Average Tide (feet)	Average Wave (feet)	Average Wind (mph)	Average Power Output (MW)
15-Aug	03:00 - 07:00	57.8	58.2	-0.1	1.4	2.3	0.0
16-Aug	16:00 - 20:00	58.2	-	2.8	2.0	10.0	502.4
17-Aug	17:00 - 21:00	60.3	61.6	3.2	2.9	9.8	250.8
18-Aug	18:00 - 22:00	59.5	61.1	3.5	2.4	5.5	435.0
19-Aug	19:00 - 23:00	57.7	59.8	3.5	1.8	7.5	556.0
20-Aug	19:00 - 23:00	60.1	60.5	3.3	3.1	12.0	400.9
21-Aug	21:00 - 01:00	60.0	60.8	2.8	2.8	7.0	271.3
22-Aug	22:00 - 02:00	60.7	-	2.2	2.9	2.8	86.5
23-Aug	21:00 - 01:00	60.6	62.6	1.8	3.0	4.5	0.6
24-Aug	22:00 - 02:00	60.2	62.2	1.1	2.0	3.8	0.6
25-Aug	12:00 - 16:00	60.6	61.7	2.0	1.8	10.3	88.4
26-Aug	10:00 - 14:00	62.0	62.8	1.5	2.3	7.3	474.7
27-Aug	10:00 - 14:00	62.6	63.1	1.2	2.7	8.0	294.7
28-Aug	22:00 - 02:00	62.9	62.3	-1.4	2.7	3.3	99.5
29-Aug	22:00 - 02:00	63.0	62.5	-1.5	3.6	2.3	222.2
30-Aug	15:00 - 19:00	61.1	62.2	2.0	2.4	8.3	266.6
31-Aug	00:00 - 04:00	60.3	61.2	-1.9	2.7	5.5	0.4
1-Sep	01:00 - 05:00	59.9	60.7	-2.0	2.4	4.8	0.4
2-Sep	01:00 - 05:00	61.5	60.4	-2.0	2.9	1.5	22.7
3-Sep	01:00 - 05:00	60.3	61.2	-1.9	3.4	0.0	0.4
4-Sep	02:00 - 06:00	59.9	61.1	-1.9	3.5	0.8	24.5
5-Sep	02:00 - 06:00	60.7	61.6	-1.6	3.2	0.0	22.3
6-Sep	02:00 - 06:00	60.4	61.6	-1.3	2.7	3.0	21.0
7-Sep	03:00 - 07:00	61.1	62.1	-1.2	3.0	3.5	0.5
8-Sep	23:00 - 03:00	61.2	62.0	1.2	3.1	4.3	0.5
9-Sep	10:00 - 14:00	60.3	61.5	2.6	2.5	8.3	29.5
10-Sep	00:00 - 04:00	59.8	60.7	0.5	1.7	3.5	0.4
11-Sep	12:00 - 16:00	59.9	61.1	2.4	2.0	10.0	134.3
12-Sep	20:00 - 24:00	61.0	61.8	-1.6	3.2	6.3	492.2
13-Sep	22:00 - 02:00	61.4	62.1	-2.0	3.6	3.0	21.5

Table 5
Post-Construction Quietest Four-Hour Periods Median Noise Levels at the Residential Site and the Control Site

Measurement Site	Residential Site, L_{50} (dBA)
Residential Site	60.5
Control Site	61.4

An analysis was then conducted of the noise levels that were measured when the Generating Station was either not operating, or operating at a minimal level. During the 2003 noise monitoring survey, when the plant was operating at minimal power, it was generating approximately 70 MW of power. There were a total of 348 hours during the 2003 survey when the Generating Station was operating at less than 80 MW of power. The minimum level at which the Generating Station ever operated during the survey was 56 MW. The average median noise level was calculated for these hours for both the Residential Site and the Control Site, and the results are presented in Table 6. The table lists the number of hours operating a minimal level; the maximum, average, and minimum power level during these hours; and the average median noise level measured for all of these hours, for both the Residential Site and the Control Site.

Table 6
Pre-Construction Median Ambient Noise Levels With the Plant At Minimal Power

Hours	Maximum Power (MW)	Average Power (MW)	Minimum Power (MW)	Residential Site Noise Level (dBA L_{50})	Control Site Noise Level (dBA L_{50})
348	79.2	71.1	56.1	58.9	61.6

During the 2013 noise monitoring survey, when the Generating Station was operating at minimal power, it was generating much less than 80 MW of power. The Generating Station operated at minimal power for a total of 497 hours during the 2013 survey. The minimum level the Station ever operated during this survey was 0 MW. The average median noise level at both the Residential Site and the Control Site was calculated for these hours, and the results are presented in Table 7. The table lists the number of hours operating a minimal level; the maximum, average, and minimum power level during these hours; and the average median noise level measured for all of these hours for both the Residential Site and the Control Site. The increase in the ambient noise level was calculated and the results are presented in Table 8. The results show that the ambient levels during minimal power level operations increased by 2.6 dBA L_{50} at the Residential Site, and 1.0 dBA L_{50} at the Control Site.

Table 7
Post-Construction Median Ambient Noise Levels At Minimal Power

Hours	Maximum Power (MW)	Average Power (MW)	Minimum Power (MW)	Residential Site Noise Level (dBA L_{50})	Control Site Noise Level (dBA L_{50})
497	76.2	8.7	0	61.5	62.6

Table 8
Differences in Ambient Noise Levels

Year	Residential Site Noise Level (dBA L_{50})	Control Site Noise Level (dBA L_{50})
2013	61.5	62.6
2003	58.9	61.6
Increase	2.6	1.0

The increases in the ambient noise level were then compared to the increases in the overall levels measured at the two sites, and the results are presented in Table 9. The results of the analysis show that of the 3.4 dB increase at the Residential Site, at least 2.6 dB of that increase is due to the change in the ambient noise level. The analysis also shows that the increase of 0.9 dB at the Control Site is due entirely to the increase in the ambient noise level.

Table 9
Distribution of Increases in Measured Noise Levels

Site	2003 Average Quietest 4-hour Level (dBA L_{50})	2013 Average Quietest 4-hour Level (dBA L_{50})	Increase in Quietest 4-hour Level (dBA L_{50})	Increase in Ambient Noise Level (dBA L_{50})	Increase due to Plant Operations (dBA L_{50})
Residential Site	57.1	60.5	3.4	2.6	0.8
Control Site	60.5	61.4	0.9	1.0	-0.1

5.4 ENVIRONMENTAL NOISE SOURCES

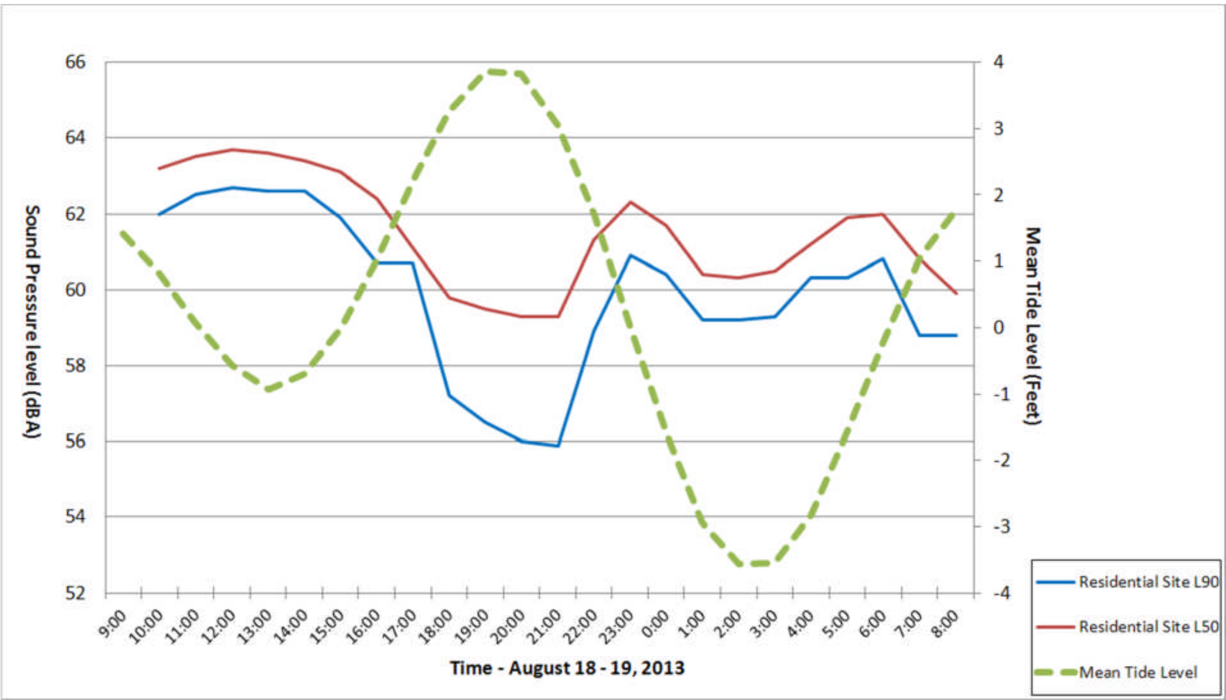
During the ambient noise measure survey, surf noise was found to be the predominant environmental noise source at the Residential Site. This source was the primary cause of both the measured the background noise level (L_{90}) and the median noise level (L_{50}). In addition to the noise measurement data, average tide heights, wave heights, wind speeds and directions were recorded on an hourly basis throughout the post-construction measurement survey. The tide data were collected from the NOAA Tides and Currents website (http://tidesandcurrents.noaa.gov/), and the wave data were taken from the Coastal Data Information Program website (http://cdip.ucsd.edu/). This environmental data was compared to the noise measurement data in order to determine whether there was any correlation between them. The hourly background noise level (L_{90}) data and the median noise level (L_{50}) data were plotted against the mean tide data and results of this analysis are presented **Figures 2 and 3**.

The data in **Table 2** was from August 18 – 19, 2013, and the data from **Table 3** was from September 4 – 5, 2013. These data were taken to show the conflicting relationship between the tide levels and the measured noise levels. The data illustrate that the mean tide level, in terms of feet, has no consistent relationship to the amount of noise generated by the surf. The data in **Figure 2** illustrates that as the mean tide level decreases, the L_{90} and L_{50} noise levels increase. In addition, as the mean tide level increases, the L_{90} and L_{50} noise levels at the Residential Site decrease. In **Figure 3**, as the mean tide level increases and decreases, there appears to be little to no consistent relationship between mean tide level and the L_{90} and L_{50} noise levels at the Residential Site.

The data in **Table 4** was from September 4 – 5, 2013, and the data from **Table 5** was from September 2 – 3, 2013. Again, these data were taken to show the conflicting relationship between the wave heights and the measured noise levels. **Figure 4** illustrates that the L_{90} and L_{50} noise levels decrease and increase as wave heights decrease and increase, respectively. In **Figure 5**, the opposite is true. As wave height increases, the L_{90} and L_{50} noise levels decrease. As the wave height maintains a similar average height after 6:00 p.m., the L_{90} and L_{50} noise levels fluctuate. This illustrates that average wave height has no consistent relationship to measured ambient noise levels at the Residential Site.

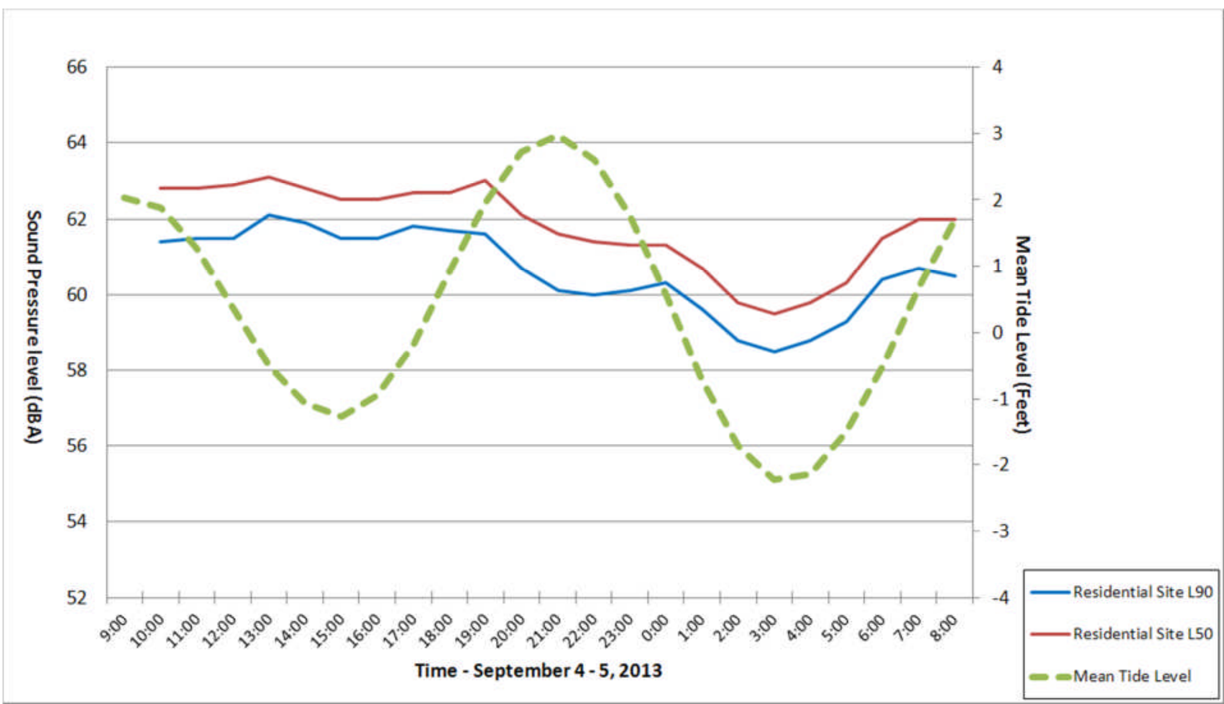
Figure 1. Ambient Noise Measurement Locations

Figure 2
Mean Tide Level – August 18-19, 2013



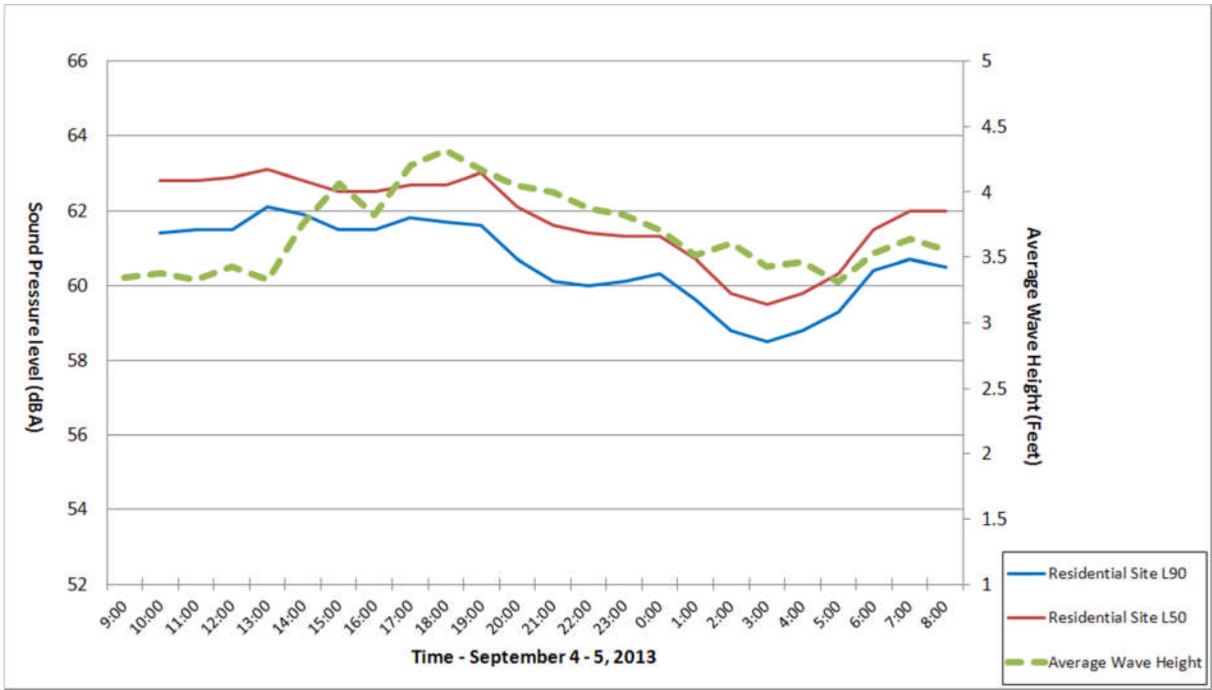
Source: URS Post-Construction Noise Survey (2013) and tide data taken from NOAA Tides and Currents website (http://tidesandcurrents.noaa.gov/)

Figure 3
Mean Tide Level – September 4-5, 2013



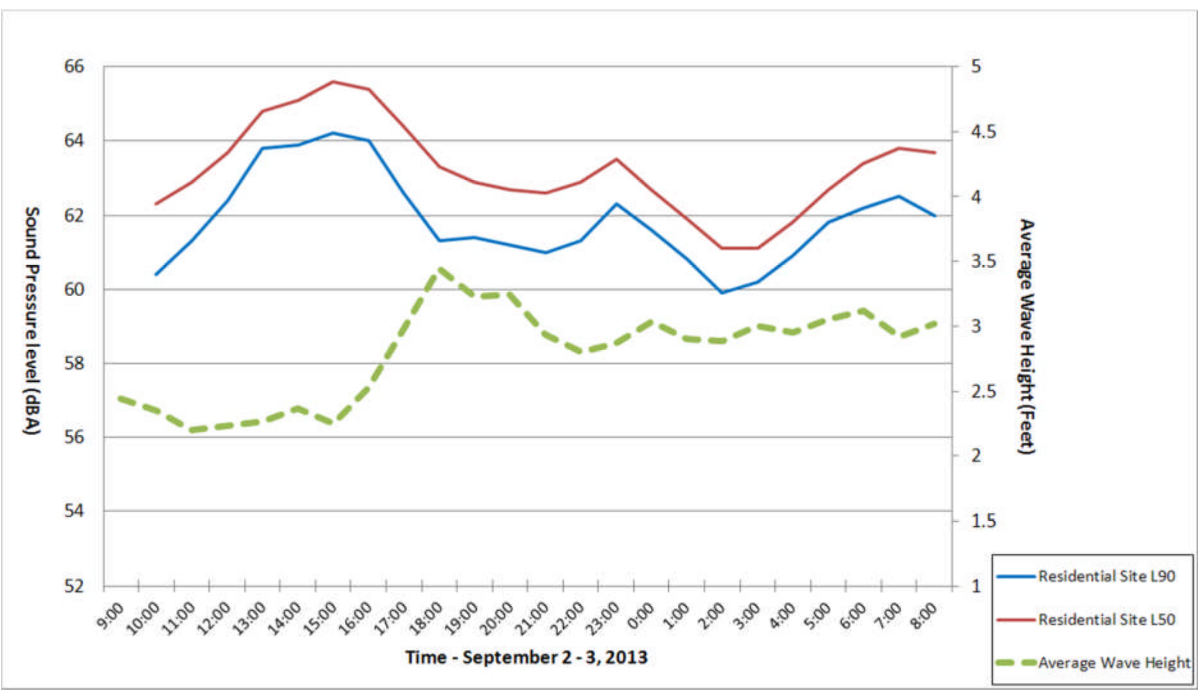
Source: URS Post-Construction Noise Survey (2013) and tide data taken from NOAA Tides and Currents website (http://tidesandcurrents.noaa.gov/)

Figure 4
Average Wave Height – September 4-5, 2013



Source: URS Post-Construction Noise Survey (2013) and wave data taken from Coastal Data Information Program website (http://cdip.ucsd.edu/)

Figure 5
Average Wave Height – September 2-3, 2013



Source: URS Post-Construction Noise Survey (2013) and wave data taken from Coastal Data Information Program website (http://cdip.ucsd.edu/)

Average wind speeds were recorded throughout the entire post-construction noise measurement survey. The wind data was collected from NOAA (ftp://tgftp.nws.noaa.gov/data/observations/metar/cycles). In order to determine if there was any relationship between wind speeds and ambient noise levels at the Residential Site, the L_{90} and L_{50} noise levels under the highest wind speeds throughout the entire post-construction noise measurement survey were compared to the same noise levels under minimal wind conditions. **Tables 10 and 11** list the hourly wind speeds, L_{90}s, and L_{50}s at the Residential Site. As with the tide data, these data were obtained to show the conflicting relationship between the wind speed and the measured noise levels. During both periods listed in the tables, wind headings originate from the west. The noise levels are actually higher during the nighttime hours under minimal wind conditions than they are during the daytime hours under the highest recorded wind conditions. Based on this analysis, wind speeds and noise levels did not show a consistent relationship with each other at the Residential Site. The wind data for the Residential and Control Sites can be found in **Appendices A and B**, respectively.

Table 10
Average Wind Speed – August 21, 2013

Date and Time (Hour-Starting)	Wind Speed (mph)	L_{90} (dBA)	L_{50} (dBA)
8/21/2013 13:00	13.0	62.4	63.3
8/21/2013 14:00	15.0	62.4	63.5
8/21/2013 15:00	16.0	62.6	63.2
8/21/2013 16:00	17.0	62.4	63.0
8/21/2013 17:00	14.0	62.4	63.0
8/21/2013 18:00	14.0	62.3	63.0
8/21/2013 19:00	12.0	61.0	62.1
8/21/2013 20:00	11.0	59.5	60.7
Average	**14.0**	**62.0**	**62.8**

Source: URS Post-Construction Noise Survey (2013) and wind data taken from LAX.

Table 11.
Average Wind Speed – August 27, 2013

Date and Time (Hour-Starting)	Wind Speed (mph)	L_{90} (dBA)	L_{50} (dBA)
8/27/2013 0:00	5.0	62.6	63.4
8/27/2013 1:00	4.0	62.8	63.7
8/27/2013 2:00	0.0	63.1	64
8/27/2013 3:00	0.0	63	63.7
8/27/2013 4:00	0.0	62.8	63.7
8/27/2013 5:00	6.0	62.7	63.7
8/27/2013 6:00	4.0	62.6	63.6
8/27/2013 7:00	0.0	63.1	64.1
Average	**2.4**	**62.7**	**63.7**

Source: URS Post-Construction Noise Survey (2013) and wind data taken from LAX.

After analyzing mean tide level, average wave height, and wind speed and direction data that was collected during the post-construction noise measurement survey, it has been determined that there is no consistent relationship between any of these single environmental factors and the ambient background noise level.

Cumulatively, mean tide level, average wave height, wind speeds and direction, in addition to aircraft noise originating from arrivals and departures at LAX, traffic on Vista del Mar/Highland Ave., and people on the beach, all play a role in determining the ambient background noise level.

Appendices A and B contain tables that list the tide heights, wave heights, and wind conditions for each hour for the Residential and Control Sites, respectively, throughout the entire post-construction measurement survey.

A comparison analysis was conducted of recorded sound levels when the generating station was operating at 80% capacity or better. The nighttime L_{90} and L_{50} noise levels measured during the quietest four-hour period with the Generating Station operating at 80% capacity are then compared to the measured nighttime average L_{90} and L_{50} levels during the quietest four-hour period without the plant operations in order to determine the increase in noise due to the implementation of the Project. Throughout the entire measurement period, the operational power generating units were usually only idling after 10:00 PM. When idling, the Generating Station rarely generates more than 25 MW total. The quietest four-hour period was determined by arithmetically averaging the L_{90} noise data during each nighttime four-hour period at the Residential Site. **Table 12** lists the measured average L_{90} at the Residential Site during each nighttime four-hour period. The results of the analysis show that the quietest nighttime L_{90} four-hour period occurred between the hours of 10:00 p.m. and 2:00 a.m. at the Residential Site, and the average L_{90} was 59.8 dBA.

Table 12
Post Construction Quietest Nighttime Four-Hour Periods at Residential Site

Start and Ending Time	Residential Site, L_{90} (dBA)
10:00 p.m. - 2:00 a.m.	59.8
11:00 p.m. - 3:00 a.m.	59.9
12:00 a.m. - 4:00 a.m.	59.9
1:00 a.m. - 5:00 a.m.	60.0
2:00 a.m. - 6:00 a.m.	60.2
3:00 a.m. - 7:00 a.m.	60.4

Source: URS Post-Construction Noise Survey (2013)

The average L_{90} and L_{50} levels measured throughout the entire post-construction noise measurement survey at the Residential Site were used to establish new existing ambient noise levels. On the night of September 23, 2013, and into the early morning of September 24, 2013, the plant was operating at a level of at least 80% capacity. The noise measurement data collected during the nighttime hours of September 23 were not used when calculating the nighttime existing ambient noise levels. The measured average L_{90} and L_{50} levels at the Residential Site without the plant operating were calculated and the results are presented in **Tables 13 and 14**, respectively. In addition, these tables list the measured L_{90} and L_{50} levels when the plant was operating at 80% capacity during the quietest four-hour period. The data show that operation of the plant at 80% capacity resulted in increases of 0.4 dBA and 0.3 dBA in L_{90} and L_{50}, respectively, over the average ambient L_{90} and L_{50} values measured throughout the entire post-construction noise measurement survey without the plant operating.

Table 13
Increase in L_{90} over Existing Ambient Noise Level due to Operation at the Residential Site during Post-Construction Noise Measurement Survey

Start and End Time	Residential Site, Average L_{90} during Quietest 4 Hours (dBA) – Generating Station Not Operating	Residential Site, Average L_{90} during Quietest 4 Hours (dBA) – Operating at 80% Capacity	Difference in Sound Levels (dBA)
10:00 p.m. - 2:00 a.m.	59.8	60.2	0.4

Source: URS Post-Construction Noise Survey (2013)

Table 14
Increase in L_{50} over Existing Ambient Noise Level due to Operation of Generating Station at 80% Capacity during Post-Construction Noise Measurement Survey

Start and End Time	Residential Site, Average L_{50} during Quietest 4 Hours (dBA) – ESGS Not Operating	Residential Site, Average L_{50} during Quietest 4 Hours (dBA) – ESGS Operating at 80% Capacity	Difference in Sound Levels (dBA)
10:00 p.m. - 2:00 a.m.	61.2	61.5	0.3

Source: URS Post-Construction Noise Survey (2013)

As part of the pre-construction noise measurement survey, short-term measurements were conducted near the northwest corner of the ESGS property as identified by ST-1 and ST-12 in the Pre-Construction Noise Monitoring Report (URS, 2000). Section E of the CEC COC NOISE-6 requires that measurements be conducted at the same locations as part of the post-construction noise measurement survey to determine whether ESGS continues to comply with the Municipal Code of the City of El Segundo.

The pre-construction short-term measurement locations ST-1 and ST-12 are represented by the measurements conducted at ST-5 and ST-2, respectively, as part of the post-construction noise measurement survey. Previously, ST-1 and ST-12 were conducted in areas now occupied by equipment and the sea wall. **Figure 1** depicts the locations of the post-construction noise measurements conducted at ST-5 and ST-2. These measurements were conducted on the bike path. **Table 15** lists the measured post-construction noise levels at each measurement location when Generating Station was operating at 80% capacity.

Table 15
Post-Construction Short-Term Noise Measurement Results

Site ID	2013 Measured Existing L_{90} (dBA)	2013 Measured Existing L_{50} (dBA)
ST-5 (previously ST-1)	64.2	64.7
ST-2 (previously ST-12)	63.9	64.4

Source: URS Post-Construction Noise Survey (2013)

6.0 COMPLIANCE SUMMARY

Pre-construction noise measurements were conducted in 2003 and post-construction noise measurements were conducted in 2013. Comparing **Table 2** (pre-construction nighttime 4 hour periods) to **Table 12** (post-construction nighttime 4 hour periods) illustrates that observed ambient noise levels in the vicinity of the Residential Site were greater in 2013. However, analyses of the correlation between power levels and sound levels demonstrates that little of this increase could be attributed to power plant operations. The most conclusive analysis involves estimating the before and after contribution of the Generating Station to L_{90} and L_{50} noise levels at the Residential Site. This was done by subtracting the level without the Generating Station operating from the level with the Generating Station operating at 80% capacity. The results of these calculations are presented in **Tables 16 and 17** for the L_{90} and L_{50} levels, respectively. The increases in L_{90} and L_{50} at the Residential Site are 0.4 and 0.3 dBA, respectively. Based on the measured L_{90} and L_{50} values, the calculated operational Generating Station contributions at the Residential Site are 49.6 and 49.7 dBA L_{eq}, respectively.

Table 16
Post-Construction Increase in L_{90} during Quietest 4 Hours

Residential Site, Average L_{90} during Quietest 4 Hours (dBA) – ESGS Not Operating	Residential Site, Average L_{90} during Quietest 4 Hours (dBA) – ESGS Operating at 80% Capacity	Increase in L_{90} due to Operation of ESGS (dBA)	Calculated Operational Generating Station Contribution at Residential Site (dBA L_{90})
59.8	60.2	0.4	49.6

Source: URS Post-Construction Noise Survey and URS calculations (2013)

Table 17
Post-Construction Increase in L_{50} during Quietest 4 Hours

Residential Site, Average L_{50} during Quietest 4 Hours (dBA) – ESGS Not Operating	Residential Site, Average L_{50} during Quietest 4 Hours (dBA) – ESGS Operating at 80% Capacity	Increase in L_{90} due to Operation of ESGS (dBA)	Calculated Operational Generating Station Contribution at Residential Site (dBA L_{90})
61.2	61.5	0.3	49.7

Source: URS Post-Construction Noise Survey and URS calculations (2013)

The calculated operational Generating Station contributions at the Residential Site were then added to the 2003 pre-construction noise measurement results in order to determine whether the ESGS operational noise would cause the 2003 L_{90} and L_{50} to increase by more than 2 dBA. These results are presented in **Tables 18 and 19**, respectively, and show that the increases in L_{90} and L_{50} at the Residential Site would be 0.9 and 0.7 dBA, respectively. Based on the 2003 measured L_{90} and L_{50} values and the calculated operational ESGS noise contributions, the new L_{90} and L_{50} noise levels at the Residential Site would be 56.9 and 58.1 dBA, respectively. These represent increases in the 2003 L_{90} and L_{50} values of less than 1 dBA.

Table 18
Increase Relative to Pre-Construction L_{90} during Quietest 4 Hours

2003 Measured Average L_{90} at Residential Site (dBA)	Calculated Operational ESGS Contribution at Residential Site (dBA L_{90})	2003 Measured Average L_{90} Plus Calculated Operational ESGS Contribution (dBA L_{90})	Increase in 2003 L_{90} due to Implementation of Project (dBA)
56.0	49.6	56.9	0.9

Source: URS Pre-Construction Noise Survey (2003) and URS calculations (2013)

Table 19
Increase Relative to Pre-Construction L_{50} during Quietest 4 Hours

2003 Measured Average L_{50} (dBA)	Calculated Operational ESGS Contribution at Site (dBA L_{50})	2003 Measured Average L_{50} Plus Calculated Operational ESGS Contribution (dBA)	Increase in 2003 L_{50} due to Implementation of Project (dBA)
57.4	49.7	58.1	0.7

Source: URS Pre-Construction Noise Survey (2003) and URS calculations (2013)

COC NOISE-6 requires that the Project not cause resultant noise levels to exceed the ambient median noise level (L_{50}) at residential receivers by 2 decibels or more, The preceding analyses demonstrate that the increases in L_{50} noise levels caused by the Project are less than 1 dBA.

COC NOISE-6 also requires that the Project comply with applicable noise ordinances of the City of Manhattan Beach. The analyses also demonstrate that the project satisfies the requirements of the noise ordinances of the City of Manhattan Beach.

Short-term measurements were conducted as part of the pre-construction and post-construction noise measurement surveys. In 2000, measurements were conducted at ST-1 and ST-12, which were located at the now-removed recreational area. The recreational area was located between the bike path and the northwest corner of Generating Station. In 2013, during the post-construction noise measurement survey, the measurements were conducted on the bike path because equipment and the sea wall occupied the ST-1 and ST-12 locations. Short-term Site ST-5 (2013) represents ST-1 in COC NOISE-6, and Site ST-2 (2013) represents ST-12. The measured L_{90} and L_{50} values at these two sites for the 2000 and 2013 measurement surveys is presented in **Tables 20 and 21**, respectively. The change in noise level at each measurement location due to the implementation of the Project is also included. The change in L_{90} from the pre-construction (2000) to post-construction (2013) noise measurements is an increase of 4.8 dBA at ST-5 (representing ST-1) and a decrease of 1 dBA at ST-2 (representing ST-12). The change in L_{50} from the pre-construction to post-construction noise measurements is an increase of 4.3 dBA at ST-5 (representing ST-1) and a decrease of 1.5 dBA at ST-2 (representing ST-12).

Table 20
Change in L_{90} at Short-Term Measurement Locations

Site ID	2000 Pre-Construction Measured L_{90} (dBA)	2013 Post-Construction Measured Existing L_{90} (dBA)	Change in Noise Level (dBA L_{90})
ST-5 (representing ST-1 in COC NOISE-6)	59.4	64.2	+4.8
ST-2 (representing ST-12 in COC NOISE-6)	64.9	63.9	-1.0

Source: URS ESEC AFC (2000) and Post-Construction Noise Survey (2013)

Table 21
Change in L_{50} at Short-Term Measurement Locations

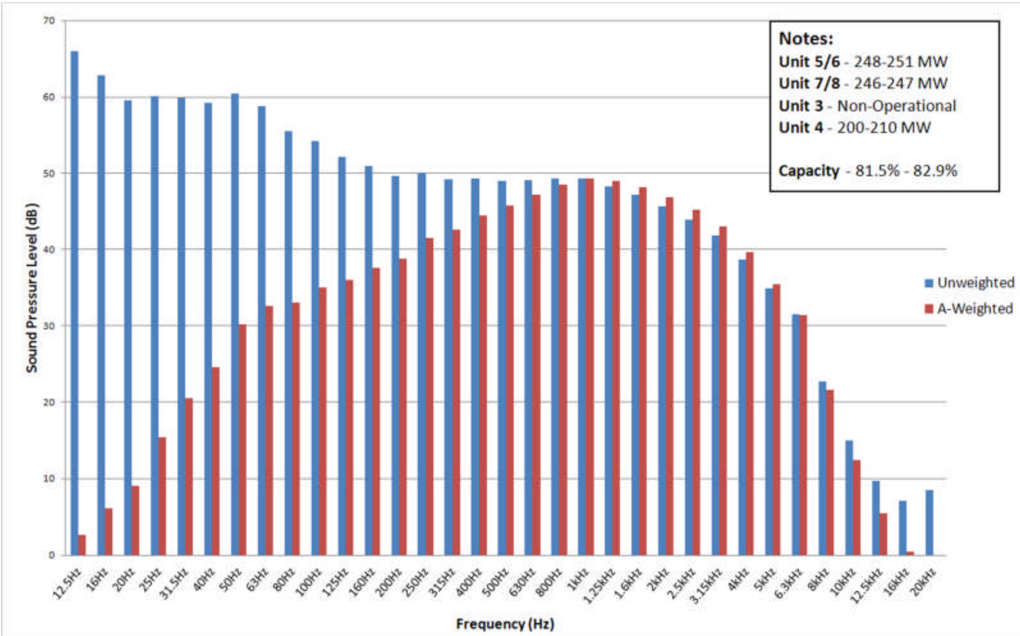
Site ID	2000 Pre-Construction Measured L_{50} (dBA)	2013 Post-Construction Measured Existing L_{50} (dBA)	Change in Noise Level (dBA L_{50})
ST-5 (representing ST-1 in COC NOISE-6)	60.4	64.7	+4.3
ST-2 (representing ST-12 in COC NOISE-6)	65.9	64.4	-1.5

As described in Section 1 above, and as part of COC NOISE-6 Section E, the CEC has determined there would be potential noise impacts at the pre-construction noise measurement locations ST-1 and ST-12 if the post-construction measurements show increases in the L_{50} of 5 dBA or greater. The increases in L_{90} and L_{50} are less than 5 dBA at both locations. The implementation and operation of the Project has resulted in a less-than-significant increase in sound levels at the locations ST-1 and ST-12 that satisfies the requirements of COC NOISE-6, including compliance with the City of El Segundo noise ordinance.

7.0 PURE TONE NOISE ANALYSIS

To satisfy the requirements of Section B of COC NOISE-6 and ensure that no new pure-tone noise components have been introduced due to the Project implementation, an ambient noise survey was conducted on and near the Project site. Short-term, one-third octave band sound pressure level measurements were conducted at several locations regularly through the post-construction noise measurement survey to verify the absence of pure tones due to the operation of the new onsite equipment. **Figure 1** depicts the locations of all five short-term measurement locations. The one-third octave band data from a short-term measurement conducted at ST-4 from September 23 and 24, 2013 is shown in **Figure 6** in terms of unweighted and A-weighted spectra. ST-4 was the short-term measurement site located on the south side of the Generating Station and immediately north of the Residential Site on the south side of 45th Street in Manhattan Beach. **Table 22** lists the L_{eq}, L_{max}, L_{50}, L_{90}, and L_{min} values from this measurement at ST-4. One-third octave band data from additional short-term measurements conducted through the entire post-construction noise measurement survey can be found in **Appendix D**.

Figure 6
El Segundo Generating Station
One-Third Octave Band Measurement Data at ST-4



Source: URS Post-Construction Noise Survey (2013)

Table 22
El Segundo Generating Station
Noise Measurement Results at ST-4

L_{eq}	L_{max}	L_{50}	L_{90}	L_{min}
57.7	69.0	57.4	55.7	52.6

Source: URS Post-Construction Noise Survey (2013).

Based on the data shown in **Figure 6**, the one-third octave band spectra data found in **Appendix D**, and the absence of formal or informal noise complaints in regards to pure-tone noise during Generating Station operations, it can be concluded that no pure tones are present. The analysis of all one-third octave spectra L_{eq} indicates that no pure tones are produced on a consistent basis as defined by ISO 1996-2:2007(E) Annex D.

The results of the operational noise survey indicate that Generating Station operational noise levels satisfy the requirements of COC NOISE-6.

8.0 IMPLEMENTATION OF PLANT NOISE MITIGATION

The post-construction noise measurement survey analysis and results demonstrate that the Project complies with and satisfies the requirements of COC NOISE-6, and no mitigation measures are necessary.

9.0 REFERENCES

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