

1.0 UPDATED EXPANDED PROJECT DESCRIPTION

The following updated project description was prepared by Pacific Gas and Electric Company (PG&E) in support of the proposed Offshore Central Coastal California Seismic Imaging Project (Project). This update reflects additional revisions to the project that have resulted during the permitting process, including the California State Lands Commission (CSLC) project approval which resulted in the elimination of portions of the originally planned survey area (Survey Box 3) and the extension of the project to a two-year work window. Additional revisions outlined in this updated project description have been developed in response to discussions with National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS) and California Coastal Commission (CCC). All Project related activities will occur within the central area of San Luis Obispo County, California (Figure 1-1). The following summarizes the proposed offshore deep seismic data collection survey operations proposed for 2012.

1.1 PROJECT TITLE

Offshore Central Coastal California Seismic Imaging Project

1.2 PROJECT APPLICANT'S NAME AND ADDRESS

Pacific Gas & Electric Company
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1.3 PURPOSE AND OBJECTIVES

The purpose of the proposed survey is to conduct additional seismic studies in the vicinity of the Diablo Canyon Power Plant (DCPP) and known offshore fault zones near DCPP. These seismic studies will provide additional insights of any relationships or connection between the known faults as well as enhance knowledge of offshore faults near DCPP. The proposed deep (10 to 15 kilometers [km] or 6 and 9 miles [mi]), high energy seismic survey (HESS) (energy >2 kilo joules) would complement the shallow (< 1 km/0.6 mi), low energy (< 2 kilo joules) 3D seismic reflection survey. The first and second phases of low energy 3D seismic surveys were conducted offshore DCPP by PG&E in November 2010 and January 2011, respectively. The third and last phase of the low energy 3D seismic surveys is being conducted in late summer 2012.

The objectives of the proposed high energy 3D seismic survey are to:

- Record high resolution wide 2D and 3D seismic reflection profiles of major geologic structures and fault zones in the vicinity of DCPP.
- Obtain improved deep (>1 km [>0.6 mi]) imaging of the Hosgri and Shoreline fault zones in the vicinity of the DCPP to constrain fault geometry. (Scheduled for 2013 survey activities)



Figure 1-1. Proposed Project Survey Area

- Obtain improved (>1 km [>0.6 mi] depth) imaging of the intersection of the Hosgri and Shoreline fault zones northwest of Point Buchon.
- Obtain improved (>1 km [>0.6 mi] depth) imaging of the intersection of the Hosgri and Los Osos fault zones in Estero Bay.
- Augment current regional seismic data base for subsequent use and analysis.

The Project is being undertaken due to public concerns with operating a nuclear power plant in a seismically active area of California after the Fukushima Daiichi emergency. PG&E will obtain as much seismic information as possible, while minimizing environmental impacts consistent with the permits required by federal, state, and local agencies to conduct the studies. The Project timeframe is limited to fall months (November 1 to December 31 for active marine seismic survey operations) due to whale and fish migration as well as nesting bird constraints. The survey will also be conducted over a period of two years to reduce the extent of annual exposure of marine resources to high-energy seismic sound levels.

The current Project scope has been designed to minimize environmental impacts to the greatest extent feasible and has been modified to further recognize agency input and specific concerns regarding resident species of marine mammals within the survey area. PG&E is proposing to conduct the studies 24-hours per day, 7 days per week (24/7). This schedule is designed to reduce overall air emissions, length of time for operation in the water thereby reducing impacts to marine wildlife, commercial fishing, and other area users. PG&E will work with environmental agencies to appropriately address the balancing of public health and safety and environmental concerns during the conduct of these studies.

1.4 PROJECT LOCATION

The proposed Project would be conducted within the coastal (onshore and nearshore) and offshore marine waters between Morro Bay and San Luis Bay, offshore San Luis Obispo County, California (Figure 1-1). The proposed survey will cross all the major geologic units in the study area and image their structure at depth using high-resolution 2D and 3D seismic reflection profiling techniques. The offshore and onshore survey sound source transects, as well as the nearshore/onshore geophone locations, have been developed to address the project objectives as well as ongoing input from the California Public Utilities Commission's Independent Peer Review Panel (IPRP), the survey contractor (Lamont-Doherty Earth Observatory – Columbia University) and geoscientists from the University of Nevada – Reno, the Scripps Institute of Oceanography, and specialty private consulting firms.

1.5 3D SEISMIC DATA ACQUISITION TARGET AREAS FOR 2012

The proposed 3D seismic survey race track to be completed during the 2012 survey period will be Box 4 which is located within Estero Bay (See Figure 1-2). Boxes 1 and 2 have been deferred and will be scheduled for the 2013-2014 work window. Refinement of the Box 1 and 2 survey components will be completed following the 2012 survey and will be subject to a supplemental review process. Box 3 was eliminated from the survey plan based on input from the IPRP process and associated CSLC permit approval.

The offshore survey would be conducted in both federal and state waters and water depths within the proposed survey areas ranging from 0 to over 400 m (1,300 ft); the State

three-mile limit is the teal line in Figure 1-1. The Point Buchon Marine Protected Area (MPA) lies adjacent to portions of the survey area. The Monterey Bay National Marine Sanctuary (MBNMS), a federally-protected marine sanctuary that extends northward from Cambria to Marin County, is located north and outside of the Project area. The 2012 survey area includes:

Survey Box 4. (Estero Bay)

- Area: 334.48 km² (129.14 mi²)
- Total survey line length is 1,417.6 km (880.9 mi)
- Dip line survey across the Hosgri and Los Osos fault zones in Estero Bay

Figure 1-2 shows the proposed survey transit lines for Box 4. These lines depict the survey lines as well as the turning legs. The full seismic array is firing during the straight portions of the track lines, as well as the initial portions of the run out sections and later portions of run in sections. During turns and most of the initial portion of the run ins, there will only be one air gun firing (mitigation air gun). Assuming a daily survey rate of approximately 8.3 km/hr (4.5 knots for 24/7 operations) Survey Box 4 is expected to be completed in approximately 9.25 days. When considering mobilization, demobilization, equipment maintenance, weather, marine mammal activity, and other contingencies, the proposed 2012 survey is expected to be completed in 32.25 days. For an in-depth look into the project schedule, refer to Section 1.8 - Project Schedule.

1.6 PROJECT ACTIVITIES

The proposed survey involves both marine and some limited onshore activities. The offshore components consist of operating a geophysical survey vessel and support/monitoring vessels within the areas shown in Figure 1-2. The geophysical survey vessel would tow a series of sound-generating air guns and sound-recording hydrophones along pre-determined shore-perpendicular transects to conduct deep (10 to 15 km [6 to 9 mi]) seismic reflection profiling of major geologic structures and fault zones in the vicinity of DCP.

Onshore operations will involve the installation of passive acoustical receivers on the Morro Strand. Installation and retrieval of these seismic receivers would be concurrent with the proposed offshore operations.

1.6.1 Mobilization and Demobilization

The offshore 3D marine survey equipment and vessels are highly specialized and typically not available in California. The proposed seismic survey vessel (*R/V Marcus G. Langseth [R/V Langseth]*) is currently operating on the west coast and is available to conduct the proposed survey work. The *R/V Langseth* would transit south prior to the start of survey operations (November 1 through December 31, 2012). Once the vessel has arrived in the Project area, the survey crew, any required equipment, and support provisions would be transferred to the vessel. The proposed survey vessel is supported by a chaseboat (*R/V Nushagak Spirit or equivalent*) and scout/shore support boat (*M/V Enterprise or equivalent*). An additional scout/monitoring vessel, *M/V Michael Uhl (M/V Uhl)*, is available locally and will be utilized to support operations as necessary. Upon completion of the offshore survey operations, the survey crew would be transferred to shore and the survey vessel would transit out of the Project area.

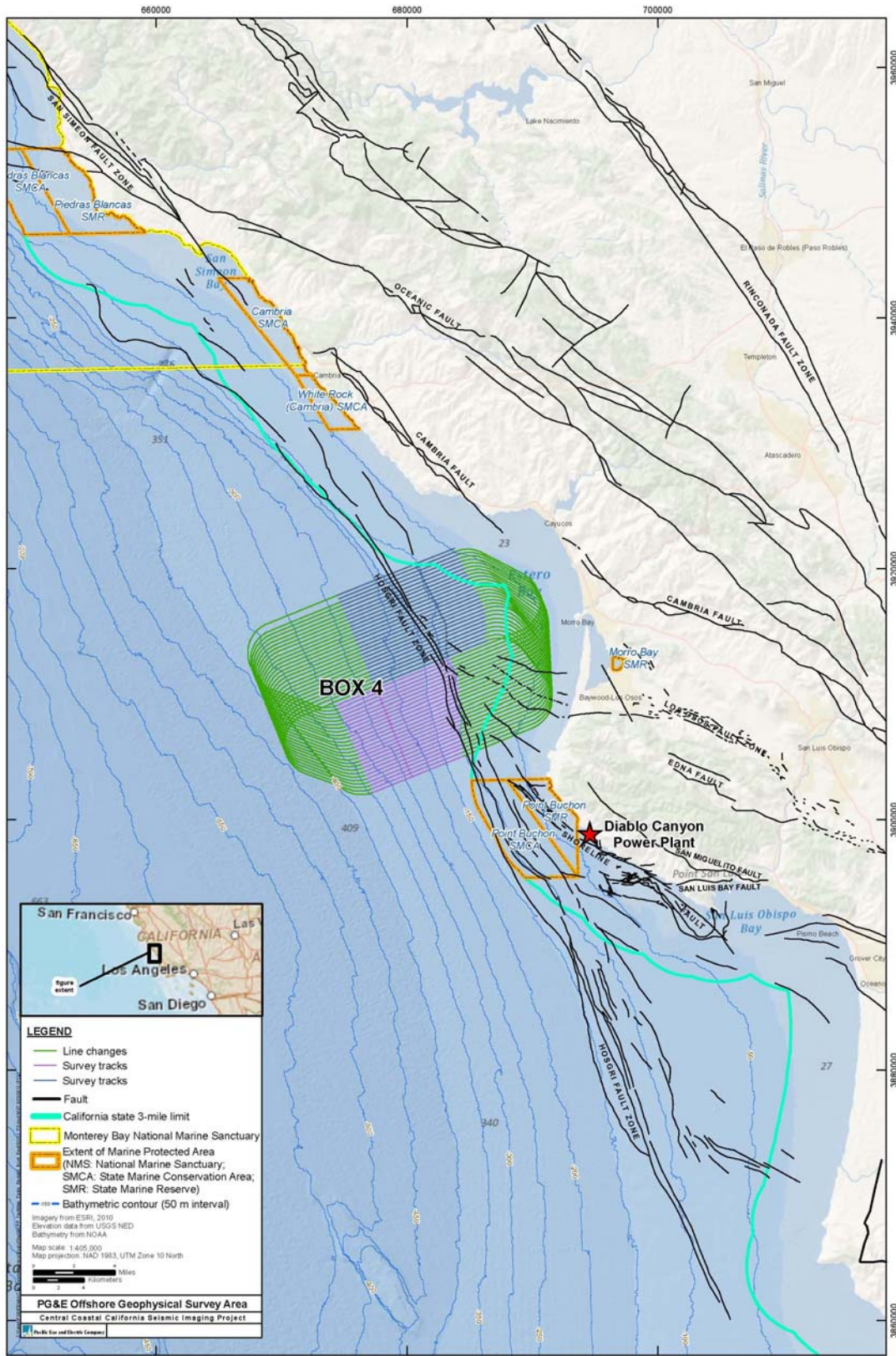


Figure 1-2. Proposed 2012 Project Survey Track Line Map

1.6.2 Offshore Survey Operations

The proposed offshore seismic survey would be conducted with geophysical vessels specifically designed and built to conduct such surveys. PG&E has selected the *R/V Langseth*, which is operated by the Lamont-Doherty Earth Observatory (Columbia University). The following outlines the general specifications for the *R/V Langseth* geophysical survey vessel and the support vessels needed to complete the offshore survey.

- Primary vessel – *R/V Langseth* is 71.5 m [235 ft] in length and is outfitted to deploy/retrieve hydrophone streamers and air gun arrays, air compressors for the air gun array, and survey recording facilities.
- Chase boat – *R/V Nushagak Spirit* is 33.5 m (110 ft) in length and will be deployed in front of the *R/V Langseth* to observe potential obstructions, additional marine mammal monitoring and support deployment of seismic equipment.
- Third vessel – *M/V Enterprise* is approximately 24.3 m [80 ft] in length and would act as a scout boat and support vessel for the *R/V Langseth*.
- Support work vessel – The *M/V Uhl* is approximately 30.5 m [100 ft] in length and would be used as a standby vessel to support marine operations.

Survey Vessel Specifications. The *R/V Langseth* would tow the air gun and hydrophone streamers array along predetermined lines (Figure 1-2). When the *R/V Langseth* is towing the air gun and streamer array the vessel will “fly” the appropriate USCG approved day shapes (mast head signals used to communicate with other vessels) and display the appropriate lighting to designate the vessel has limited maneuverability. The turning radius is limited to 3 degrees per minute (2.5 km [1.5 mi]). Thus, the maneuverability of the vessel is limited during operations with the streamers.

The *R/V Langseth* has a length of 71.5 m (235 ft), a beam of 17.0 m (56 ft), and a maximum draft of 5.9 m (19.4 ft). The *R/V Langseth* was designed as a seismic research vessel, with a propulsion system designed to be as quiet as possible to avoid interference with the seismic signals. The ship is powered by two Bergen BRG-6 diesel engines, each producing 3,550 hp, which drive the two propellers directly. Each propeller has four blades, and the shaft typically rotates at 750 revolutions per minute (rpm). The vessel also has an 800 hp bowthruster, which is not used during seismic acquisition. The operation speed during seismic data acquisition is typically 7.4 to 9.3 km/h (4.6 to 5.7 miles/h). When not towing seismic survey gear, the *R/V Langseth* typically cruises at 18.5 km/h (11.5 miles/h). Other details of the *R/V Langseth* include the following:

- Owner: National Science Foundation
- Operator: Lamont-Doherty Earth Observatory of Columbia University
- Flag: United States of America
- Date Built: 1991 (Refitted in 2006)
- Gross Tonnage: 3834
- Accommodation Capacity: 55 including ~35 scientists

Air Gun Description. The survey will be shot using two tuned air-gun arrays, consisting of two sub-arrays with 1,650 cubic inches (in^3). The array would consist of a mixture of Bolt 1500LL and Bolt 1900LLX air guns. The subarrays would be configured as two identical linear arrays or “strings” (Figure 1-3). Each string would have ten air guns; the first and last air guns in the strings are spaced 16 m apart. Nine air guns in each string would be fired simultaneously (for a total volume of approximately $3,300 \text{ in}^3$), whereas the tenth is kept in reserve as a spare, to be turned on in case of failure of another air gun. The subarrays would be fired alternately during the survey. Each of the two subarrays would be towed approximately 140 m (459 ft) behind the vessel and would be distributed across an area of approximately 12 by 16 m (40 by 50 ft) behind the primary vessel, offset by 75 m (250 ft). Discharge intervals depend on both the ship’s speed and Two Way Travel Time (TWTT) recording intervals. For a 16-second TWTT, air guns will be discharged approximately every 37.5 meters (123 ft) based on an assumed boat speed of 4.5 knots. The firing pressure of the subarrays is 1,900 pounds per square inch (psi). During firing, a brief ($\sim 0.1 \text{ s}$) pulse of sound is emitted. The air guns would be silent during the intervening periods.

The tow depth of the air gun array would be 9 m (29.5 ft). Because the actual source is a distributed sound source (9 air guns) rather than a single point source, the highest sound levels measurable at any location in the water would be less than the nominal single point source level. In addition, the effective (perceived) source level for sound propagating in near-horizontal directions would be substantially lower than the nominal omni-directional source level because of the directional nature of the sound from the air gun array (i.e. sound is directed downward).

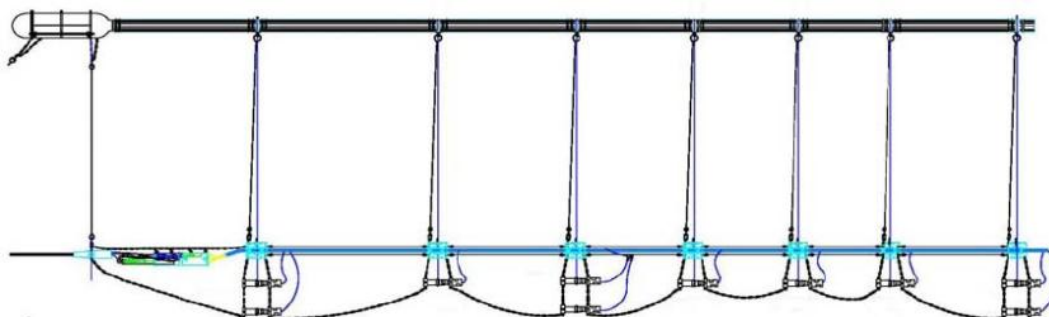


Figure 1-3. One Linear Air Gun Array or String with Ten Air Guns, Nine of Which Would Be Operating.

Details regarding the proposed 18-air gun array (2 Strings) specifications are as follows:

- Energy Source: Eighteen 2,000 psi Bolt air guns of $40\text{-}360 \text{ in}^3$
- Source output (downward): 0-pk is 42 bar-m (252 dB re $1 \mu\text{Pa} \cdot \text{m}$); pk-pk is 87 bar-m (259 dB)
- Towing depth of energy source: 9 m (29.5 ft)
- Air discharge volume: $\sim 3,300 \text{ in}^3$
- Dominant frequency components: 0-188 Hertz (Hz)

Compass Birds would be used to keep the air guns at a depth of 9 m (29.5 ft) and the vessel speed during data collection would range from 7.4 to 9.3 km/h (4 to 5 nautical miles per hour [knots]). The sound source would be generated by the discharge of the air guns approximately every 37.5 m (123 ft) which is based on an assumed vessel speed of 8.3 km/h (4.5 knots). The expected timing of the shots is once every 15 to 20 seconds.

Hydrophone Streamer Description. The *R/V Langseth* will tow four hydrophone streamers with a length of approximately 6 km (3.7 mi). The intended tow depth is approximately 10 m (32.8 ft). Each streamer would consist of Sentry Solid Streamer Sercel cable. Flotation is provided on each streamer, as well as Streamer Recovery Devices (SRD). The SRD are activated when the streamer sinks to a pre-determined depth (e.g. 50 m [164 ft]) to aid in recovery.

A series of seven hydrophones is present along each streamer for acoustic measurement. The hydrophones would consist of a mixture of Sonardyne Transceivers. Each streamer will contain three groups of paired hydrophones, with each group approximately 2,375 m (7,800 ft) apart. The hydrophones within each group would be approximately 300 m (984 ft) apart. One additional hydrophone will be located on the tail buoy attached to the streamer cable. In addition, one Sonardyne Transducer would be attached to the air gun array. Compass Birds would be used to keep the streamer cables and hydrophones at a depth of approximately 10 m (33 ft). One Compass Bird would be placed at the front end of each streamer. The Figure 1-4 depicts the configuration of both the streamer and air gun array used by the *R/V Langseth*.

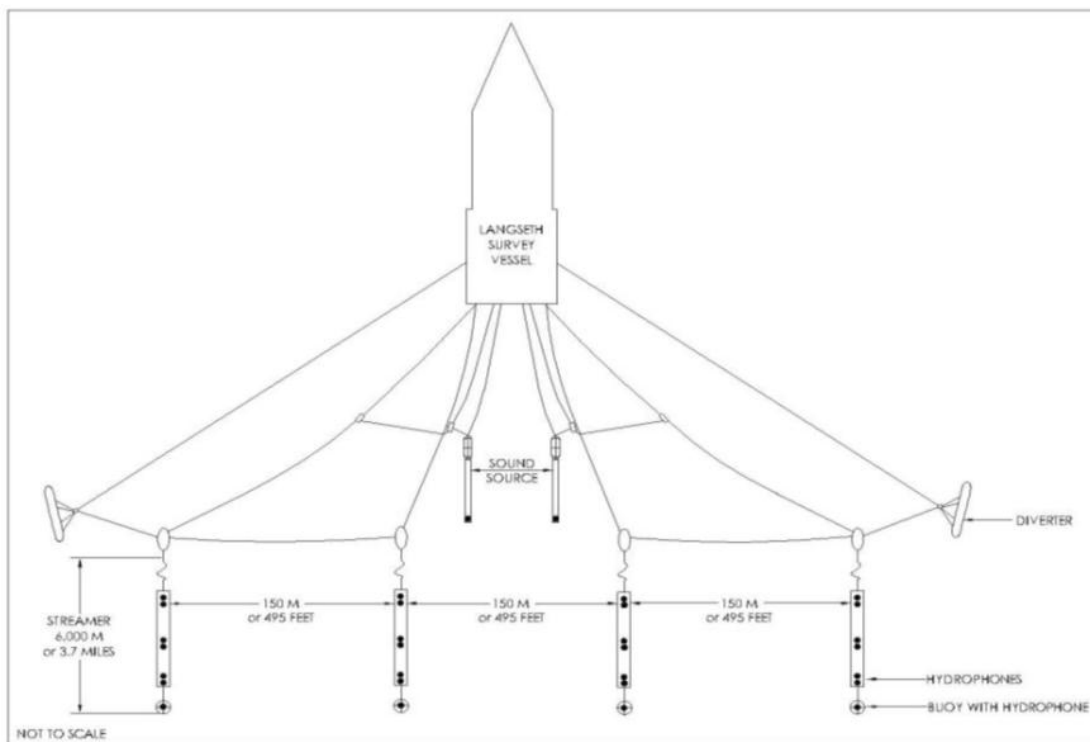


Figure 1-4. *R/V Langseth* Air Gun and Streamer Deployment

Details regarding the proposed hydrophone streamer and acoustic recording equipment specifications are provided in Table 1-1.

Table 1-1. Summary of Offshore Streamer Features

<u>Hydrophone Type</u>	<u>Sonardyne XSRS Transceiver 7885 (Standard)</u>
Length of Individual Unit (approximate)	85.8 centimeters (33.8 inches)
Diameter of Individual Unit (approximate)	7.5 centimeters (3.0 inches)
Weight of Individual Unit in Air (approximate)	7.3 kilograms (16.0 pounds)
Number of Units per String	5
<u>Hydrophone Type</u>	<u>Sonardyne XSRS Transceiver 8005 (Long Life)</u>
Length of Individual Unit (approximate)	91.1 centimeters (35.9 inches)
Diameter of Individual Unit (approximate)	8.9 centimeters (3.5 inches)
Weight of Individual Unit in Air (approximate)	10.4 kilograms (22.9 pounds)
Number of Units per String	2
<u>Hydrophone Type</u>	<u>Sonardyne HGPS Transducer 7887 (Right Angle)</u>
Length of Individual Unit (approximate)	56.3 centimeters (22.2 inches)
Diameter of Individual Unit (approximate)	9.4 centimeters (3.7 inches)
Weight of Individual Unit in Air (approximate)	9.6 kilograms (21.2 pounds)
<u>Depth Sensor</u>	<u>ION Model 5011 Compass Bird</u>
Length of Individual Unit (approximate)	120 centimeters (48.2 inches)
Weight of Individual Unit in Air (approximate)	8.32 kilograms (18.3 pounds)
Number of Units per Streamer (approximate)	4
Number of Units per String	1
<u>Streamer Type</u>	<u>Thompson Marconi Sentry</u>
Streamer Depth (approximate)	10 meters (33 feet)
Group Interval (approximate)	12.5 meters (41 feet)
Group Length (approximate)	12.5 meters (41 feet)
Number of Groups	468
Length of Streamer	6 kilometers (3.7 miles)
Source: Columbia University	

Acoustic Measurements. The strength of the air gun pulses can be measured in a variety of ways, but National Marine Fisheries Service (NMFS) commonly uses “root mean square” (in dB re 1 μ Pa [rms]), which is the level of the received air gun pulses averaged over the duration of the pulse. The rms value for a given air gun pulse is typically 10 dB lower than the peak level, and 16 dB lower than the peak-to-peak level (McCauley *et al.*, 1998, 2000).

The noise modeling for the proposed 3D seismic survey was conducted based on the results of mathematical modeling conducted by Greeneridge Sciences, Inc. (2011). The model results are based upon the air gun specifications provided for *R/V Langseth* and seafloor characteristic available for the Project area. Safety and Exclusion zone dimensions are based on NMFS definitions for Incidental Harassment Authorizations (IHA). The Safety Zone is the distance within which received sound levels are modeled to be greater than 160 db and the Exclusion Zone is the distance within which received sound levels are modeled to be greater than 180 db. Distances to received levels of 120, 154, 160, 170, 180, 187, and 190 dB re 1 μ Pa (rms) are also detailed in Table 1-2.

Table 1-2. Calculated Radii for Upslope, Downslope and Alongshore Propagation Paths

Sound Pressure Level (SPL) (dB re 1 uPa)	Upslope Distance (In Shore)			Downslope Distance (Offshore)			Alongshore Distance		
	M ¹	SM ²	NM ³	M ¹	SM ²	NM ³	M ¹	SM ²	NM ³
190	250	0.16	0.13	280	0.17	0.15	320	0.20	0.17
187	390	0.24	0.21	370	0.23	0.20	410	0.25	0.22
180	1,010	0.63	0.55	700	0.43	0.38	750	0.47	0.40
170	2,990	1.86	1.61	1,760	1.09	0.95	1,760	1.09	0.95
160	6,210	3.86	3.35	4,450	2.77	2.40	4,100	2.55	2.21
154	8,570	5.33	4.63	7,820	4.86	4.22	6,780	4.21	3.66
120	24,650	15.32	13.31	251,320	156.16	135.70	94,870	58.95	51.23

M¹ = Meters; SM² = Statute miles; NM³ = Nautical Miles

Multibeam Echosounder and Sub-bottom Profiler. Along with the air gun operations, two additional acoustical data acquisition systems will be operated from the *R/V Langseth* continuously during the survey. The ocean floor will be mapped with a Kongsberg EM-122 multibeam echosounder (MBES) and a Knudsen 320B sub-bottom profiler (SBP).

The Kongsberg EM-122 MBES operates at 10.5 to 13 kHz (usually 12 kHz) and is hull-mounted on the *R/V Langseth*. The transmitting beam width is 1 or 2-degree fore–aft and 150-degree athwartship. The maximum source level is 242 dB re 1 μPa (rms). Each “ping” consists of eight (in water >1,000 m/3,300 ft deep) or four (<1000 m/3,300 ft) successive fan-shaped transmissions, each ensonifying a sector that extends 1 degree fore–aft. Continuous-wave (CW) pulses increase from 2 to 15 ms long in water depths up to 2,600 m (8,350 ft), and frequency-modulated (FM) chirp pulses up to 100 ms long are used in water >2,600 m (8,350 ft). The successive transmissions span an overall cross-track angular extent of about 150 degree, with 2 ms gaps between the pulses for successive sectors. (See Table 1-3)

The Knudsen 320B SBP is normally operated to provide information about the sedimentary features and the bottom topography that is being mapped simultaneously by the MBES. The beam is transmitted as a 27-degree cone, which is directed downward by a 3.5-kHz transducer in the hull of the *R/V Langseth*. The maximum output is 1,000 watts (204 dB), but in practice, the output varies with water depth. The pulse interval is 1 sec, but a common mode of operation is to broadcast five pulses at 1-sec intervals followed by a 5-sec pause.

Both the Kongsberg EM-122 MBES and Knudsen 320B SBP are operated continuously during survey operations. Given relatively shallow water depths of the survey area (20 – 300 m), the number of ‘pings’ or transmissions would be reduced from 8 to 4, and the pulse durations would be reduced from 100 ms to 2-15 ms for the Kongsberg EM-122. Power levels of both instruments would be reduced from maximum levels to account for water depth. Actual operating parameters will be established at the time of the survey. Additional details are provided in Table 1-3.

Table 1-3. R/V Langseth Sub-bottom Profiler Specifications

Maximum source output (downward)	204 dB re 1 μ Pa·m; 800 watts
Dominant frequency components	3.5 kHz
Bandwidth	1.0 kHz with pulse duration 4 ms 0.5 kHz with pulse duration 2 ms 0.25 kHz with pulse duration 1 ms
Nominal beam width	30 degrees
Pulse duration	1, 2, or 4 ms

Gravimeter (BGM-3). The *R/V Langseth* will employ a Bell Aerospace BGM-3 gravimeter system (Figure 1-5) to measure very tiny fractional changes within the Earth's gravity caused by nearby geologic structures, the shape of the Earth, and by temporal tidal variations. The BGM-3 has been specifically designed to make precision measurements in a high motion environment. Precision gravity measurements are attained by the use of the highly accurate Bell Aerospace Model XI inertial grade accelerometer.



Figure 1-5. Bell BMG Marine Gravity Meter

Magnetometer (G-882). The *R/V Langseth* will employ a Bell Aerospace BGM-3 geometer which contains a Model G-882 cesium-vapor marine magnetometer (Figure 1-6). Magnetometers measure the strength and/or direction of a magnetic field, generally in units of nanotesla (nT) in order to detect and map geologic formations. These data would enhance earlier marine magnetic mapping conducted by the USGS (Sliter et al., 2009).

The G-882 is designed for operation from small vessels for shallow water surveys, as well as for the large survey vessels for deep tow applications (4,000 psi rating, telemetry over steel coax available to 10 km). Power may be supplied from a 24 to 30 VDC battery power or a 110/220 VAC power supply. The standard G-882 tow cable includes a Vectran strength member and can be built to up to 700 m (2,297 ft) (no telemetry required). The shipboard end of the tow cable is attached to a junction box or on-board cable. Output data is recorded on a computer with an RS-232 serial port.



Figure 1-6. Geometrics G-882 Magnetometer

1.6.3 Onshore Survey Operations

Onshore, a linear array of Zland nodals (or equivalent Iseis Sigma nodes) will be deployed along a single route on the Morro Strand to record onshore sound transmitted from the offshore air gun surveys. The autonomous, nodal, cable-less recording systems (geophones) (Figure 1-7a) would be deployed by foot into the soil adjacent to existing roads, trails and beaches (Figure 1-7b). Route location is shown in Figure 1-8. Ninety nodes would be placed at 100 m (328 ft.) intervals along the Strand for a total route length of ~ 9 km (5.6 mi). The nodal systems are carried in backpacks and pressed into the ground at each receiver point. Each nodal would be removed following completion of the data collection. PG&E estimates that the onshore receiver activities would be conducted over a 2 to 3-day period, concurrent with the offshore surveys.



 <p>* Includes a 5 inch spike, is 6 inches high, 5 inches in diameter, and weighs 5 lbs.</p>	
<p>Zland Nodal Land Recording System</p>	<p>Iseis Sigma Nodal Land Recording System</p>

Figure 1-7a. Example of Autonomous Wireless Recording Systems



Figure 1-7b. Typical Wireless Iseis Sigma Nodal Land Recording System Installation
(Battery Pack is located on the left and Recording System on Right)

1.7 PROJECT PERSONNEL AND EQUIPMENT

1.7.1 Equipment Requirements

The following vessels and equipment are being evaluated for use in the proposed offshore survey.

- *R/V Marcus G. Langseth*
 - Two air gun arrays;
 - Four hydrophone streamers;
 - Multi Beam Echo Sounder and Sub Bottom Profiler; gravity and magnetic sensors.
- Chase boat – *R/V Nushagak Spirit* or equivalent
- Support vessel – *M/V Enterprise* or equivalent
- Support vessel - *M/V Michael Uhl*

The following is a preliminary estimate of anticipated vehicle and equipment needs for the proposed onshore geophone placement.

- 1 to 2 equipment van/truck for equipment transport and data recording/processing.

1.7.2 Personnel Requirements

It is estimated that 77 personnel would be required for the proposed offshore survey program. Additional project-related personnel may also participate. The 89 personnel breakdown is as follows:

- *R/V Marcus G. Langseth* crew: 55 (Based on Coast Guard registration)
- *R/V Nushagak Spirit* 6
- *M/V Enterprise* 6
- *M/V Michael Uhl* crew: 5
- Administrative/computer support: 5

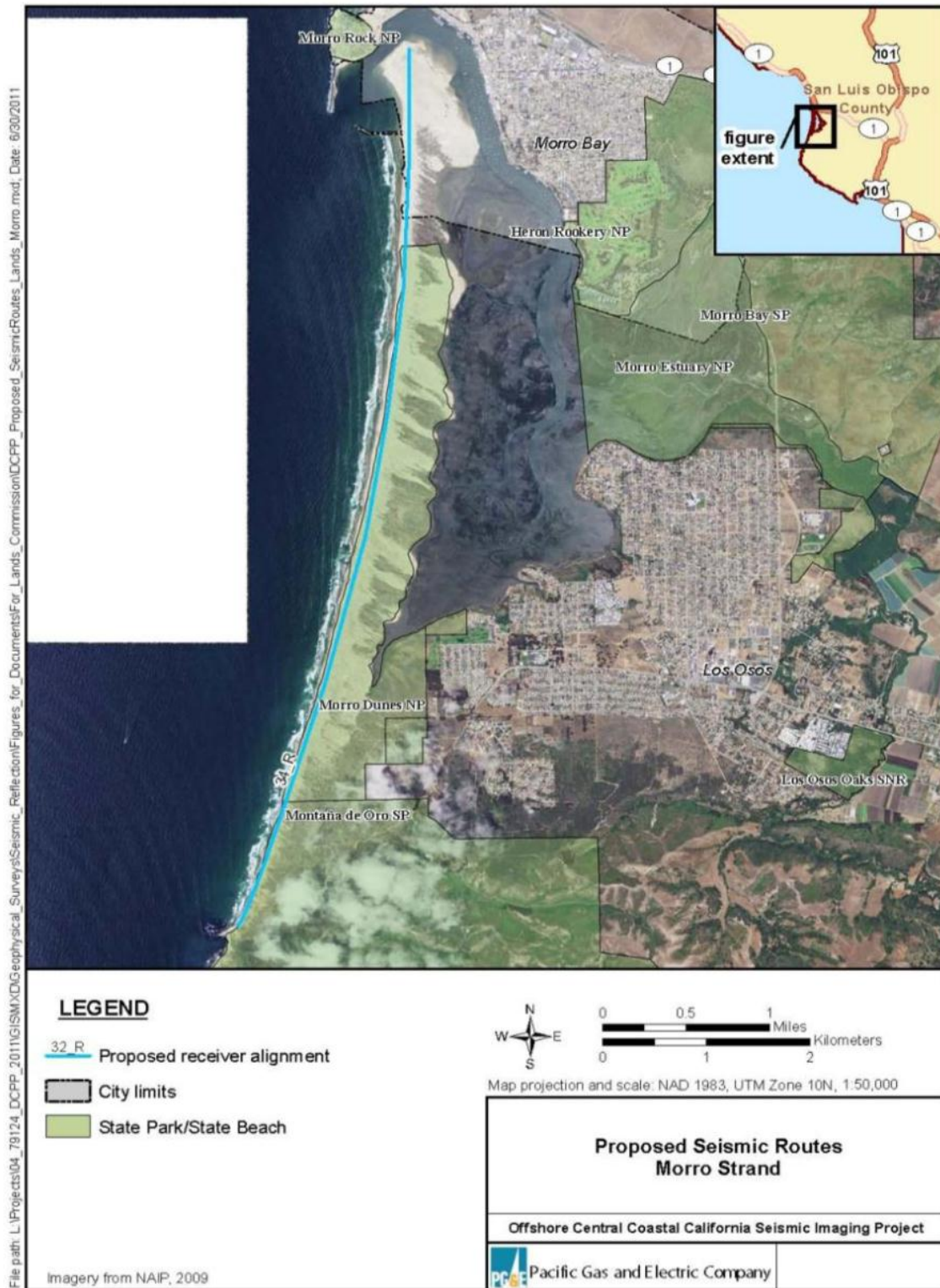


Figure 1-8. Proposed Onshore Seismic Lines

Onshore survey operations are expected to require approximately 6 crew members. In addition, biological and cultural resource monitors would accompany each team in sensitive resource areas. These teams would operate at intervals of 0.8 to 4.8 km (0.5 to 3 mi) throughout the proposed Project area.

1.8 2012 PROJECT SCHEDULE

The proposed activities, including mobilization and demobilization, are expected to take 32.25 operational days to complete, assuming 24/7 operations. This estimate includes time for instrument deployment, profiling, instrument recovery, and demobilization. Mobilization operations during 2012 work window will be initiated no earlier than November 15 and completed no later than December 31, 2012.

Below is an estimated schedule for the Project:

- Mobilization to Project Site - 6 days
- Offshore Equipment Deployment - 3 days
- Pre-activity marine mammal surveys - 5 days (concurrent to equipment mobilization and deployment)
- Onshore geophone deployment – 2 - 3 days (concurrent with offshore deployment activities)
- Equipment Calibration and Sound Check - 5 days
- Seismic Survey
 - Survey Box 4 (Survey area within Estero Bay) - 9.25 days
- Streamer and air gun preventative maintenance - 1 days
- Additional shutdowns (marine mammal presence, crew changes, and unanticipated weather delays) - 2 days
- Demobilization - 6 days

TOTAL: 32.25 days (for 24/7 operation). Note that the total of 32.25 days is based on adding the above non-concurrent tasks.

Placement of the onshore receiver lines would be completed prior to the start of offshore survey activities and would remain in place until the offshore activities can be completed.

1.9 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

During marine survey operations, key concerns would be the potential impacts to marine wildlife due to exposure to high sound levels associated with the use of the air guns or from direct collisions with the survey vessels. The proposed marine seismic survey activities have the potential to disturb or displace small numbers of marine mammals. These potential effects will not exceed what is defined in the 1994 amendments to the Marine Mammal Protection Act (MMPA) as “Level B” harassment (behavioral disturbance). The mitigation measures to be implemented during this survey are based on Level B harassment criteria using the sound level of 160 dB re 1 μ Pa (rms), and will, as such, minimize any potential risk of injury, such as damage to the auditory organs. No take by injury or death is likely given the nature of the activities and proposed monitoring and mitigation measures.

In addition, PG&E would implement a Marine Wildlife Contingency Plan (MWCP) which includes measures designed to reduce the potential impacts on marine wildlife, particularly marine mammals, from the proposed operations. This program would be implemented in compliance with measures developed in consultation with NMFS/USFWS and would be based on anticipated exclusion and safety zones derived from modeling of the selected energy source levels. These exclusion and safety zones would be reviewed in context with Incidental Harassment Authorization (IHA) to be conducted by NMFS/USFWS as part of the Project review under the Federal Endangered Species Act and MMPA.

1.9.1 High Energy Seismic Survey Impact Reduction Measures

PG&E is utilizing acoustic models to predict sound levels associated with the air gun array, and this information was used to establish a safety zone and exclusion zone for marine mammals and turtles equating to the distances to the 160 to 180 dB re 1 μ Pa, respectively. The MWCP that PG&E plans to implement includes these zones to ensure protection of potential effected species. Measures that are also included in the plan are:

- NMFS in cooperation with PG&E will conduct an aerial survey approximately 5 days prior to seismic survey to obtain pre-survey information on the numbers and distribution of marine mammals in the seismic survey area. Additionally aerial surveys will be conducted during active air gun survey operations.
- NMFS-certified protected species observers (PSO) would be stationed on primary survey vessel, on the scout vessel, and on the aircraft (if necessary).
- A scout vessel would be deployed with PSO's to monitor marine wildlife within the survey exclusion and safety zone.
- If marine mammals or other sensitive wildlife are observed within or around the exclusion zone, avoidance measures will be taken including decreasing speed of vessel and a power down or shut down if necessary.
- Use of power up, ramp up, and shutdown procedures would be observed for air gun operations.
- Mitigation air gun would be used during survey turns outside of the 3D survey area as well as during shut down or standby periods.
- Passive Acoustic Monitoring (PAM) will be available to supplement visual monitoring in conditions of poor visibility or low lighting where it doesn't interfere with survey operations.
- If nighttime survey operations are located within the 40 m (131 ft) depth contour, PSO's will visually monitor the area forward the vessel with the aid of infrared goggles/binoculars and the forward looking infrared system available on the R/V Langseth. Mitigation measures, such as avoidance, power down, and/or shut down, would be implemented, if a sea otter is observed within the vessels' path.

In addition, the proposed survey timing (November 1 through December 31) has been developed in consideration of the generally lower presences of migrating and summer season whales in the Project area. PG&E proposes that the surveys are conducted on a 24/7 schedule to reduce overall length of operations thereby lessening impacts to commercial and recreational fisheries.

1.9.2 Onshore Geophysical Survey Impact Reduction Measures

PG&E proposes the following measures to reduce impacts on sensitive wildlife during the onshore survey operations. A Worker Environmental Awareness Training Program (WEAP) would be prepared and presented to all personnel at the beginning of the project. This program was designed to discuss sensitive species and habitats, and why it is important to avoid disturbing them during project activities. A qualified biologist would perform pre-activity surveys along with daily monitoring to document sensitive species and compliance with avoidance measures. Seismic surveys would be designed to avoid California Department of Fish and Game (CDFG) sensitive species and the following federally listed species:

- Morro Bay kangaroo rat
- Morro shoulderband snail
- Western snowy plover
- California least tern
- California clapper rail

1.10 Comprehensive Monitoring Program

In addition to those mitigation and monitoring programs developed by PG&E in support of the seismic survey project implementation, PG&E has agreed to participate in a Comprehensive Monitoring Program. This program has been developed in consultation with numerous resource agencies and research groups including NMFS, USFWS, CDFD, The Nature Conservancy, Ocean Science Trust, Cal Poly San Luis Obispo, and Moss Landing Marine Laboratories. These programs are summarized below.

- **Harbor Porpoise Monitoring Program.** PG&E has agreed to fund a Harbor Porpoise Monitoring Program that will be conducted by the NMFS. The program involves a direct collaboration between NMFS, U.S. Geological Survey (USGS), Brandon Southall (SEA, Inc.), and possibly others. Monitoring would involve a 3-pronged approach to collect data before, during, and after the seismic surveys. The program includes the use of PODs and high-frequency acoustic recording packages (HARPS).
- **Sea Otter Monitoring Program.** PG&E has agreed to fund a Sea Otter Monitoring Program that will be conducted by the USFWS, California Department of Fish and Game Marine Wildlife Veterinary Care and Research Center (MWVCRC), the Monterey Bay Aquarium Sea Otter Research and Conservation Department, and University of California and Santa Cruz and Davis. The monitoring program will provide a real-time monitoring infrastructure with which to detect and measure levels of harassment caused by the surveys, as required by the USFWS, while at the same time providing useful information on behavioral response thresholds as a function of sound exposure for sea otters. This program was initiated on October 1, 2012.
- **Stranding Response Plan.** PG&E has agreed to support a Stranding Response Plan developed by the NMFS, USFWS and CDFG. This plan will be implemented in close coordination with the Harbor Porpoise and Sea Otter Monitoring Programs.

Data from the program will also be used in the evaluation of impacts under the Adaptive Management Program.

- **Aerial Survey Program.** NMFS will conduct aerial surveys in conjunction with the proposed seismic survey operations as outlined in the HESS Guidelines and in accordance with the requirements established by the CSLC FEIR mitigation measures (CSLC, 2012). In addition to these aerial surveys, NMFS/USFWS will be conducting low level aerial surveys designed to monitor southern sea otter and Morro Bay harbor porpoise movements in response to the seismic survey operations. Baseline aerial surveys will commence on October 1, 2012.
- **Adaptive Management Program.** Data generated during pre-activities surveys and ongoing operational monitoring activities will actively be used during the proposed seismic survey to adjust or redirect operations should significant adverse impacts be observed to marine resources in the project area. This program will rely on data generated during the Harbor Porpoise and Sea Otter Monitoring Programs along with vessel based PSO observations.
- **Study of the Effects of the Seismic Survey on Fishes.** PG&E has agreed to fund a two-component study to examine the short- and long-term effects of the seismic survey on fish abundance (and invertebrates). Components of the study include: (1) Remote Operated Vehicle (ROV) surveys to assess the abundance of common rockfishes and other demersal fish and invertebrate species in sites before, during, and after the seismic survey; and (2) funding the California Collaborative Fisheries Research Program (CCFRP), which is an existing program between the fishing communities of Half Moon Bay, Moss Landing/Monterey, Morro Bay, Port San Luis and the academic institutions of Moss Landing Marine Labs and Center for Coastal Marine Sciences at Cal Poly, San Luis Obispo to study the long-term effects of the HESS on fish abundance in shallower waters. The CCFRP involves both Catch per Unit Effort (CPUE) and Commercial Trap surveys.