DOCKETED

Docket Number:	13-AFC-01
Project Title:	Alamitos Energy Center
TN #:	201620-14
Document Title:	AEC AFC 5.4 Geological Hazards and Resources
Description:	Previously TN# 201495-13
Filer:	Tiffani Winter
Organization:	CH2M Hill
Submitter Role:	Applicant Consultant
Submission Date:	2/3/2014 12:47:11 PM
Docketed Date:	2/3/2014

5.4 Geological Hazards and Resources

This section presents an evaluation of the Alamitos Energy Center (AEC) in terms of potential exposure to geological hazards and potential to affect geologic resources of commercial, recreational, or scientific value. Section 5.4.1 describes the existing environment that could be affected, including regional and local geology and geological hazards. Section 5.4.2 identifies potential environmental effects from project development. Section 5.4.3 discusses potential cumulative effects. Section 5.4.4 discusses possible mitigation measures. Section 5.4.5 presents the laws, ordinances, regulations, and standards (LORS) applicable to geological hazards and resources. Section 5.4.6 identifies regulatory agencies and agency contacts and Section 5.4.7 describes the required permits. Section 5.4.8 provides the references used to develop this section.

5.4.1 Setting and Affected Environment

AES Southland Development, LLC (AES-SLD) proposes to construct, own, and operate the AEC—a natural-gas-fired, air-cooled, combined-cycle, electrical generating facility in Long Beach, Los Angeles County, California. The proposed AEC will have a net generating capacity of 1,936 megawatts (MW) and gross generating capacity of 1,995 MW.[1] The AEC will replace and be constructed on the site of the existing Alamitos Generating Station.

The AEC will consist of four 3-on-1 combined-cycle gas turbine power blocks with twelve natural-gas-fired combustion turbine generators, twelve heat recovery steam generators, four steam turbine generators, four air-cooled condensers, and related ancillary equipment. The AEC will use air-cooled condensers for cooling, completely eliminating the existing ocean water once-through-cooling system. The AEC will use potable water provided by the City of Long Beach Water Department (LBWD) for construction, operational process, and sanitary uses but at substantially lower volumes than the existing Alamitos Generating Station has historically used. This water will be supplied through existing onsite potable water lines.

The AEC will interconnect to the existing Southern California Edison 230-kilovolt switchyard adjacent to the north side of the property. Natural gas will be supplied to the AEC via the existing offsite 30-inch-diameter pipeline owned and operated by Southern California Gas Company that currently serves the Alamitos Generating Station. Existing water treatment facilities, emergency services, and administration and maintenance buildings will be reused for the AEC. The AEC will require relocation of the natural gas metering facilities and construction of a new natural gas compressor building within the existing Alamitos Generating Station site footprint. Stormwater will be discharged to two retention basins and then ultimately to the San Gabriel River via existing stormwater outfalls.

The AEC will include a new 1,000-foot process/sanitary wastewater pipeline to the first point of interconnection with the existing LBWD sewer system and will eliminate the current practice of treatment and discharge of process/sanitary wastewater to the San Gabriel River. The project may also require upgrading approximately 4,000 feet of the existing offsite LBWD sewer line downstream of the first point of interconnection, therefore, this possible offsite improvement to the LBWD system is also analyzed in this AFC. The total length of the new pipeline (1,000 feet) and the upgraded pipeline (4,000 feet) is approximately 5,000 feet.

To provide fast-starting and stopping, flexible generating resources, the AEC will be configured and deployed as a multi-stage generating (MSG) facility. The MSG configuration will allow the AEC to generate power across a wide and flexible operating range. The AEC can serve both peak and intermediate loads with the added capabilities of rapid startup, significant turndown capability (ability to turn down to a low load), and fast ramp rates (30 percent per minute when operating above minimum gas turbine turndown capacity). As California's intermittent renewable energy portfolio continues to grow, operating in either load following or

[1] Referenced to site ambient average temperature conditions of 65.3 degrees Fahrenheit (°F) dry bulb and 62.7°F wet bulb temperature without evaporative cooler operation.

partial shutdown mode will become necessary to maintain electrical grid reliability, thus placing an increased importance upon the rapid startup, high turndown, steep ramp rate, and superior heat rate of the MSG configuration employed at the AEC.

By using proven combined-cycle technology, the AEC can also run as a baseload facility, if needed, providing greater reliability to meet resource adequacy needs for the southern California electrical system. As an in-basin generating asset, the AEC will provide local generating capacity, voltage support, and reactive power that are essential for transmission system reliability. The AEC will be able to provide system stability by providing reactive power, voltage support, frequency stability, and rotating mass in the heart of the critical Western Los Angeles local reliability area. By being in the load center, the AEC also helps to avoid potential transmission line overloads and can provide reliable local energy supplies when electricity from more distant generating resources is unavailable.

The AEC's combustion turbines and associated equipment will include the use of best available control technology to limit emissions of criteria pollutants and hazardous air pollutants. By being able to deliver flexible operating characteristics across a wide range of generating capacity, at a relatively consistent and superior heat rate, the AEC will help lower the overall greenhouse gas emissions resulting from electrical generation in southern California and allow for smoother integration of intermittent renewable resources.

Existing Alamitos Generating Station Units 1–6 are currently in operation. All six operating units and retired Unit 7 will be demolished as part of the proposed project. Construction and demolition activities at the project site are anticipated to last 139 months, from first quarter 2016 until third quarter 2027. The project will commence with the demolition of retired Unit 7 and other ancillary structures to make room for the construction of AEC Blocks 1 and 2. The demolition of Unit 7 will commence in the first quarter of 2016. The construction of Block 1 is scheduled to commence in the third quarter of 2016 and construction of Block 2 is scheduled to commence in the fourth quarter of 2016. The demolition of existing Units 5 and 6 will make space for the construction of AEC Block 3. AEC Block 3 construction is scheduled to commence in the first quarter of 2020 and will be completed in the second quarter of 2022. The demolition of existing Units 3 and 4 will make space for the construction of AEC Block 4. AEC Block 4 construction is scheduled to commence in the second quarter of 2023 and will be completed in the fourth quarter of 2025. The demolition of remaining existing units is scheduled to commence in the third quarter of 2025.

Construction of the AEC will require the use of onsite laydown areas (approximately 8 acres dispersed throughout the existing site) and an approximately 10-acre laydown area located adjacent to the existing site. The adjacent 10-acre laydown area will be shared with another project being developed by the Applicant (Huntington Beach Energy Project [HBEP] 12-AFC-02). Due to the timing for commencement of construction for these two projects, the adjacent laydown area will already be in use for equipment storage before AEC construction begins.

5.4.1.1 Regional Geology

The project site is located along the San Gabriel River drainage on a gently sloping coastal plain northeast of Alamitos Bay in the southeast part of the city of Long Beach. The topography of the site ranges from approximately 8 to 15 feet above mean sea level. The project site is situated in the Los Angeles Basin at the northwest end of the Peninsular Ranges geomorphic province of southern California. Geologically, the Los Angeles Basin and vicinity is a region divided into four structural blocks that include uplifted zones and synclinal depressions. The structural blocks are generally bounded by north-northwest-trending faults with both strike-slip and reverse motions. The project site is positioned near the southwestern edge of the Central block, which is largely a synclinal depression. The Central block is bounded to the southwest by the Newport-Inglewood Fault Zone (NIFZ) which is mapped near the southwest corner of the existing Alamitos Generating Station property (Ninyo & Moore, 2011).

5.4.1.2 Local Geology and Stratigraphy

Available geologic mapping indicates that the project site is underlain by artificial fill and paralic and alluvial fan deposits (Figures 5.4-1a and 5.4-1b). Paralic deposits comprised of unconsolidated silt are mapped along the north western edge of the project site. Alluvial fan and valley deposits comprised of unconsolidated silt and clay are mapped within the northern and eastern portion of the project site. Artificial fill is mapped within the southern portion of the project site. Locally, paralic deposits extend to the west and southeast of the project site, and alluvial deposits extend to the north and east. Beach sediments are mapped to the south of the project site and form the shoreline of the Pacific Ocean from Seal Beach southward to Dana Point. Artificial fill is mapped south of the project site in the vicinity of Alamitos Bay (Saucedo et al., 2003).

A subsurface geotechnical survey was conducted by Ninyo & Moore in 2011 (see Appendix 5.4A). Ninyo & Moore (2011) indicate that the project site is underlain by fill and alluvial deposits. Fill generally consisting of loose to medium dense, sandy silt and clayey sand and firm, clayey silt was encountered to depths of approximately 6 to 9 feet below ground surface (bgs). Alluvial sediments consisting of interbedded layers of loose to very dense, sand, silty sand, sandy silt, clayey sand and sand with silt and very soft to stiff, clayey silt, silty clay, and silt were encountered below the fill to the depths explored of approximately 63.5 feet (Ninyo & Moore, 2011). Pliocene and Miocene rocks and sediments extend several thousand feet below these upper units and are important for oil and natural gas production (Troxel, 1954). Beneath these units and extending to unknown depths lies the crystalline basement rock of presumed Jurassic age (California Department of Natural Resources, Division of Oil and Gas, 1956).

The California Geologic Survey (CGS) Seismic Hazard Zone report for the area indicates that the historical high groundwater in the vicinity of the site is approximately 10 feet bgs (Ninyo & Moore, 2011). Groundwater was observed during the 2011 subsurface geotechnical survey at depths ranging from approximately 8 to 14 feet below the existing site grades.

The 2011 Ninyo & Moore report is provided in Appendix 5.4A, and has been used as a primary source of information to support this geologic hazards and resources analysis.

5.4.1.3 Seismic Setting

Based on background review and site reconnaissance conducted by Ninyo & Moore (2011), the project site is not transected by known active or potentially active faults. The project site is not within a State of California Earthquake Fault Zone (EFZ). The nearest mapped EFZ is the NIFZ which is approximately 200 feet southwest of the southwest corner of the site property. (See Figure 5.4-2) The mapped buried trace of the NIFZ is approximately 0.5 mile southwest of the proposed project limits (Ninyo & Moore, 2011).

Mapped surface faults are shown on Figure 5.4-2. Blind thrust faults such as the San Joaquin Hills, Puente Hills, and Upper Elysian Park are not mapped. Blind thrust faults are low-angle faults at depth that do not break the surface and are, therefore, not shown on the map. Table 5.4-1 lists selected principal known active faults that may affect the project site. Although blind thrust faults do not have a surface trace, they can be capable of generating damaging earthquakes and are included in Table 5.4-1. These fault zones represent a significant potential seismic hazard to the project site, and the seismicity of the project area can be characterized as seismically active, with potentially large-magnitude earthquakes.

5.4.1.4 Potential Geological Hazards

The following subsections discuss the potential geological hazards that might occur in the project area.

5.4.1.4.1 Ground Rupture

Ground rupture is caused when an earthquake event along a fault creates rupture at the surface. As discussed above, the project site is not transected by known active or potentially active faults. The site is not within a State of California EFZ (CGS, 2007). As mentioned earlier, the nearest mapped EFZ is the NIFZ, which is approximately 200 feet from the southwest corner of the project site. The mapped projection of the fault zone is located approximately 0.5 mile southwest of the proposed project limits (Ninyo & Moore, 2011). Thus, the potential for surface fault rupture affecting the project is relatively low (Ninyo & Moore, 2011).

5.4.1.4.2 Seismic Shaking

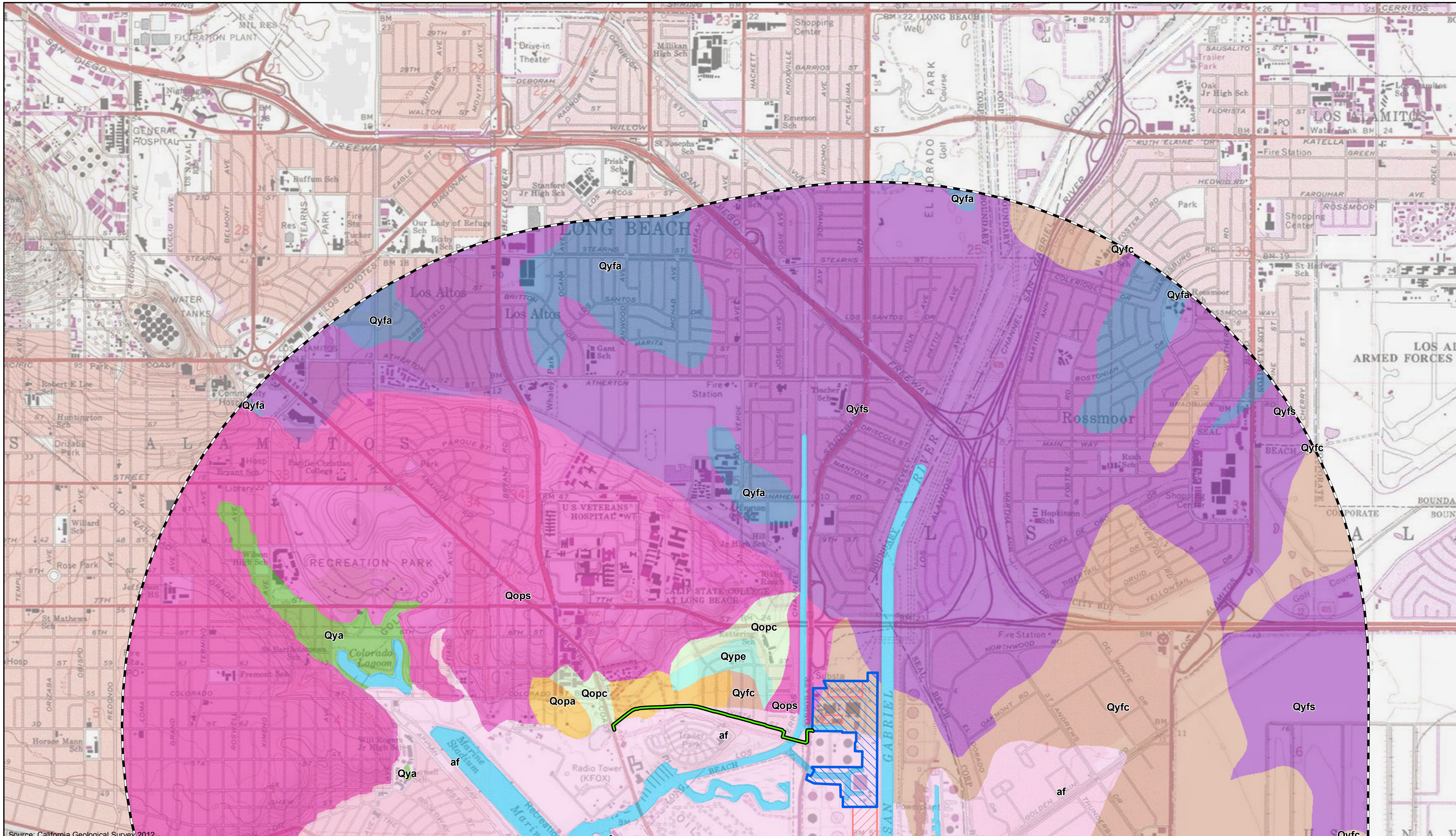
The project area has experienced seismic activity with strong ground motion during past earthquakes, and it is likely that strong earthquakes causing seismic shaking will occur in the future. Ground shaking from a magnitude 7.6 earthquake could occur within an approximately 50-mile radius of the project site (Ninyo & Moore, 2011). Thus, the significant geological hazard at the project site is strong ground-shaking from an earthquake.

TABLE 5.4-1
Regional Principal Active Faults

Fault	Approximate Fault to Site Distance Miles (km)	Maximum Moment Magnitude (Mmax)	Significant Historical Earthquakes
Newport-Inglewood (L.A. Basin)	0.3 (0.4)	7.1	M6.4 Long Beach, 3/10/1933
Palos Verdes	8.6 (13.8)	7.3	—
San Joaquin Hills (Blind Thrust)	10.9 (17.5)	6.6	—
Puente Hills (Blind Thrust)	12.2 (19.6)	7.1	—
Whittier	16.2 (26.0)	6.8	M5.9 Wittier Narrows, 10/1/1987 (Workman Hill fault extension)
Upper Elysian Park (Blind Thrust)	20.7 (33.3)	6.4	—
San Jose	23.1 (37.1)	6.4	M4.7 Upland, 6/28/1988 M5.4 Upland, 2/28/1990
Raymond	24.6 (39.6)	6.5	—
Verdugo	25.6 (41.2)	6.9	—
Hollywood	25.7 (41.3)	6.4	—
Santa Monica	27.4 (44.1)	6.6	—
Elsinore (Glen Ivy)	27.5 (44.3)	6.8	M6 Elsinore, 5/15/1910
Sierra Madre	28.3 (45.6)	7.2	—
Clamshell–Sawpit Canyon	29.3 (47.1)	6.5	M5.8 Sierra Madre, 6/28/1991
Malibu Coast	30.8 (49.6)	6.7	—
Cucamonga	33.1 (53.2)	6.9	—
Coronado Bank	35.6 (57.3)	7.6	—
Anacapa-Dume	37.2 (59.9)	7.5	—
Northridge (East Oak Ridge)	34.6 (55.6)	7.0	M6.7 Northridge, 1/7/1994
San Gabriel	39.7 (63.8)	7.2	—
Santa Susana	44.7 (72.0)	6.7	—
San Jacinto – San Bernardino	47.8 (76.9)	6.7	M6.3 Loma Linda, 7/22/1923
San Andreas – Mojave/1857 Rupture	48.7 (78.3)	7.4	M7.9 Fort Tejon, 1/9/1857

Modified from Ninyo & Moore, 2011.

To evaluate the level of ground shaking that might be anticipated at the project site, a site-specific analysis was performed by Ninyo & Moore. The 2010 California Building Code (CBC) recommends that the design of structures be based on the horizontal peak ground acceleration (PGA) having a 2 percent probability of exceedance in 50 years, which is defined as the Maximum Considered Earthquake (MCE).



Legend

Project Boundary

Parking/Laydown Construction Area

2 Mile Project Buffer

Process/Sanitary Wastewater Pipeline

Geology

Qb	Qopc	Qya	Qype
Qms	Qops	Qyfa	af
Qopa	Qp	Qyfc	water
	Qpe	Qyfs	

0 2,000 Feet

N

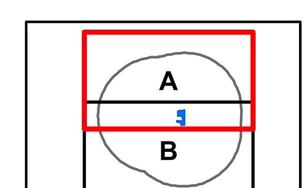
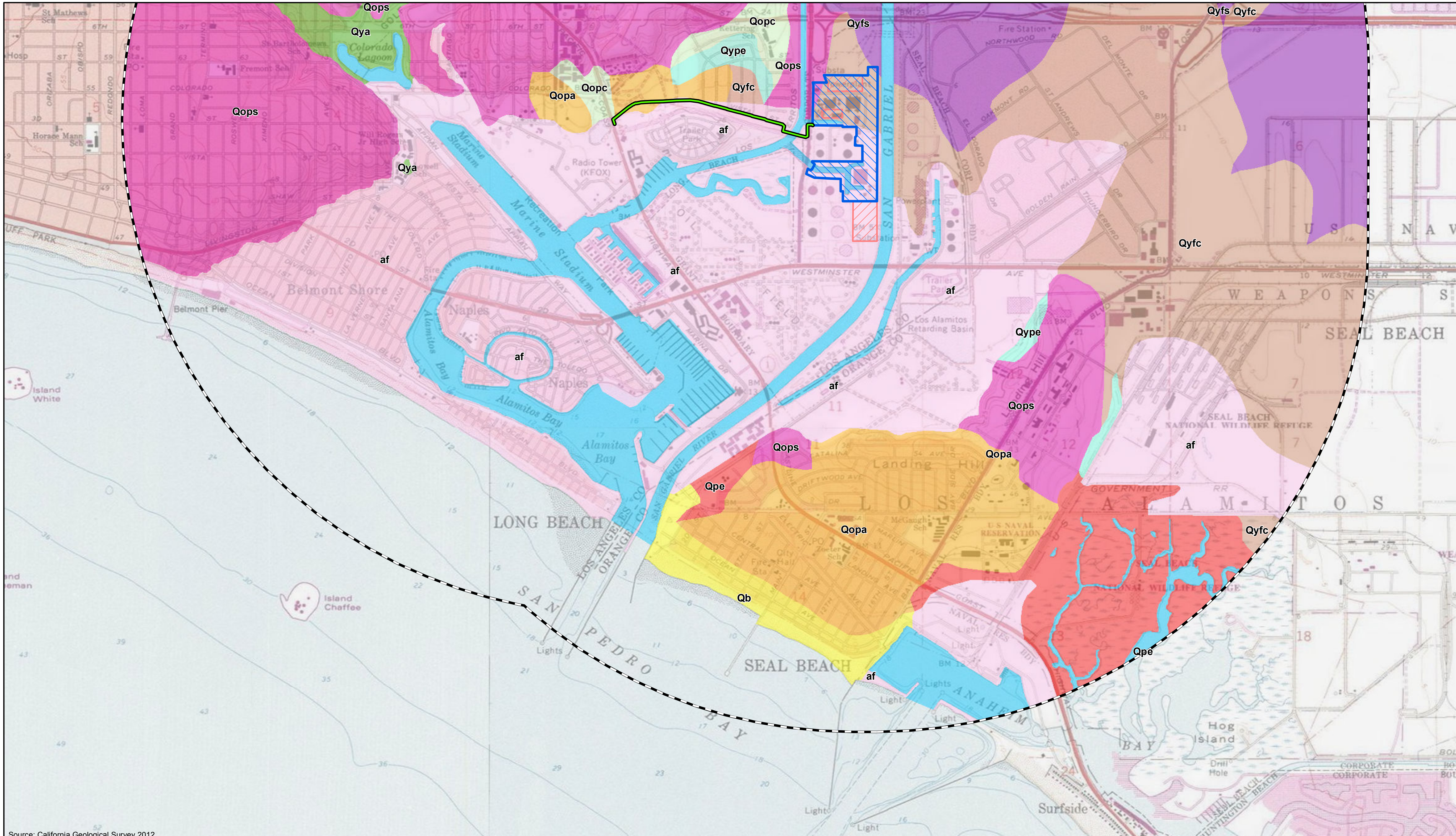


FIGURE 5.4-1A
Surficial Geology Within Two Miles of Project Site
Alamitos Energy Center
Long Beach, California

CH2MHILL



Legend

Project Boundary
Parking/Laydown Construction Area
2 Mile Project Buffer
Process/Sanitary Wastewater Pipeline

Geology

Qb, Qms, Qopa, Qopc, Qops, Qp, Qpe, Qya, Qyfa, Qyfc, Qyfs, Qype, af, water

0 2,000 Feet

N

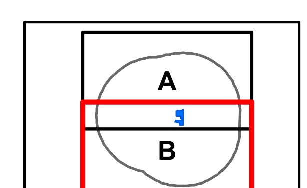
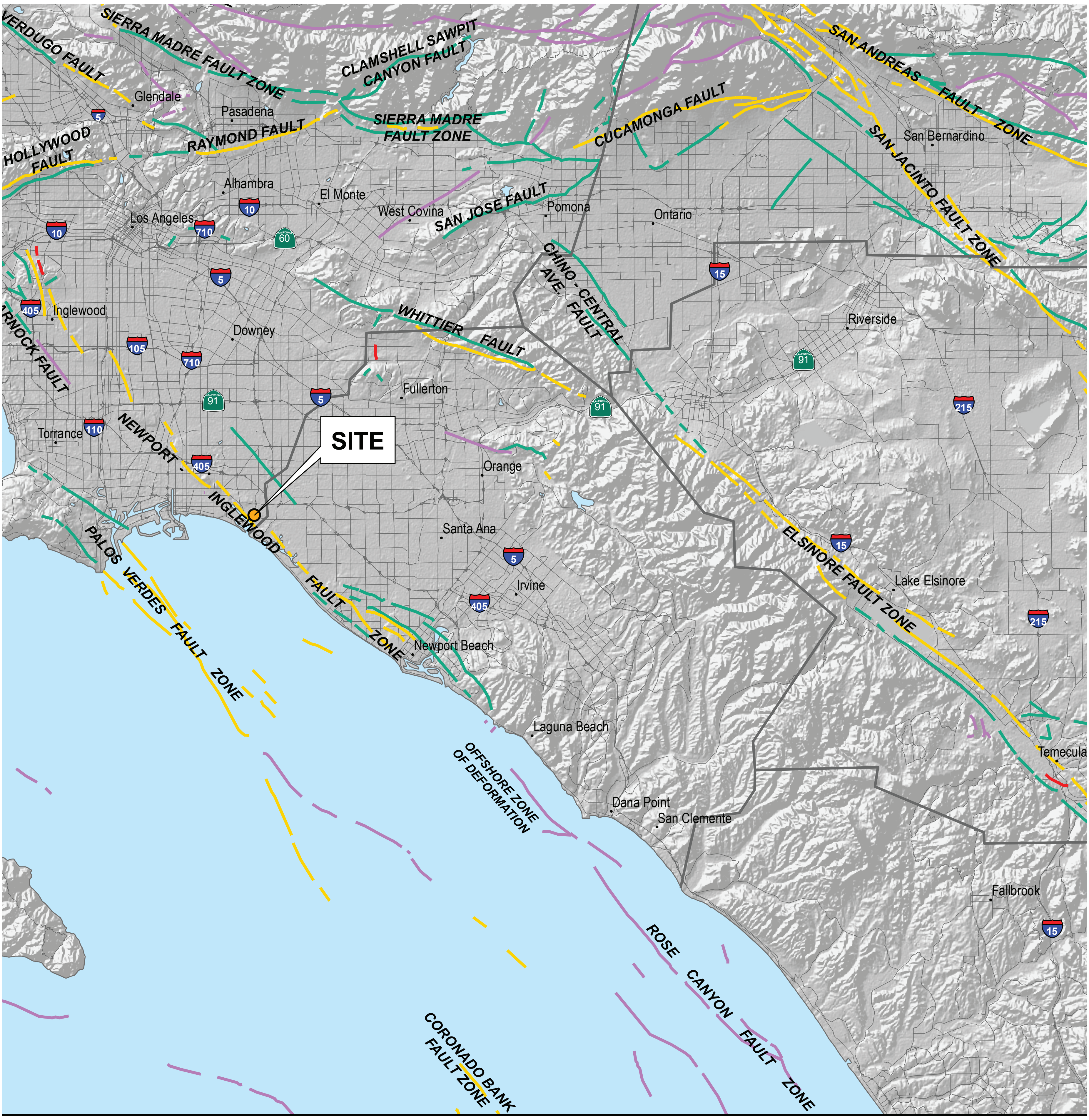


FIGURE 5.4-1B
Surficial Geology Within Two Miles of Project Site
Alamitos Energy Center
Long Beach, California

CH2MHILL

\\ZION\SACGIS\PROJ\ALAMITOS\MAPFILES\GEOLOGY\AEC_GEOLOGY_11X17.MXD KMINO 12/5/2013 11:05:57 AM

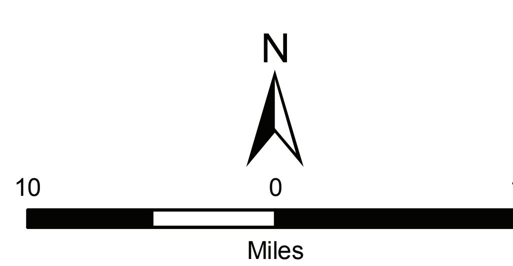


GIS DATA SOURCE: CALIFORNIA GEOLOGICAL SURVEY (CGS); ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
REFERENCE: JENNINGS, 1994, FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREAS

LEGEND

FAULT ACTIVITY:

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- COUNTY BOUNDARIES
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)



NOTE: ALL DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE

FIGURE 5.4-2
Fault Locations
Alamitos Energy Center
Long Beach, California

Using the U.S. Geological Survey (USGS) ground motion calculator, the probabilistic horizontal peak ground acceleration Maximum Considered Earthquake (PGA_{MCE}) for the project site was estimated to be 0.67g. The design peak ground acceleration design basis earthquake (PGA_{DBE}) was estimated to be 0.45g using the USGS ground motion calculator. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures onsite. The guidelines of the governing jurisdictions and the 2010 CBC will be considered in the project design. These potential levels of ground shaking could affect the AEC without appropriate design mitigation as discussed in later sections.

5.4.1.4.3 Liquefaction

During strong ground shaking, loose, saturated, cohesionless soils can experience a temporary loss of shear strength and act as a fluid. This phenomenon is known as liquefaction. Liquefaction depends on the depth to water, grain size distribution, relative soil density, degree of saturation, and intensity and duration of the earthquake. The potential hazard associated with liquefaction is seismically induced settlement.

The project site is mapped in a State of California Seismic Hazard Zone as potentially liquefiable. The evaluation of the potential for liquefaction included the results of cone penetration test (CPT) soundings, exploratory borings, and laboratory test results of representative soil samples. The liquefaction analysis was based on the National Center for Earthquake Engineering Research (NCEER) procedure developed from the methods originally recommended by Seed and Idriss using the computer program LiquefyPro. A depth to groundwater of 5 feet was used in the analysis. A PGA_{DBE} of 0.45g was used in the analysis for a design earthquake magnitude of 7.5. The analysis of soil profiles at the four CPT locations indicated that scattered saturated sandy alluvial layers located between depths of approximately 7 and 56 feet are potentially liquefiable during the design basis earthquake (DBE) event (Ninyo & Moore, 2011).

To evaluate the potential impact from liquefaction, an analysis to estimate the magnitude of dynamic settlement because of liquefaction was performed. Analyses indicate that liquefaction-induced settlement at the project site would be generally less than 1 inch (Ninyo & Moore, 2011).

Lateral spreading of the ground surface during an earthquake usually takes place along weak shear zones that have formed within a liquefiable soil layer. Lateral spread has generally been observed to take place in the direction of a free-face (such as a retaining wall, slope, or channel) but also has been observed to a lesser extent on ground surfaces with gentle slopes. Although the project site includes free-face slopes along the San Gabriel River and Los Cerritos channels, analysis of the sampler blow counts and generally discontinuous nature of the underlying soil layers indicate that the project site is not considered susceptible to significant seismically induced lateral spread (Ninyo & Moore, 2011).

5.4.1.4.4 Compressible/Collapsible Soils

Compressible soils generally consist of soils that undergo consolidation when exposed to new loading, such as fill or foundation loads. Soil collapse is a phenomenon where the soils undergo a significant decrease in volume upon increase in moisture content, with or without an increase in external loads. Buildings, structures, and other improvements may be subject to excessive settlement-related distress when compressible or collapsible soils are present. Subsurface exploration and background review conducted by Ninyo & Moore during geotechnical investigations indicate that the project site is underlain by existing fill soils and interbedded alluvial sediments. Older, undocumented fill soils are considered potentially compressible (Ninyo & Moore, 2011). Additionally, some very soft to soft clayey silt and silty clay alluvial layers that are considered potentially compressible were encountered at variable depths to approximately 50 feet. Because of the high groundwater levels encountered at the site and the reported historically high groundwater, Ninyo & Moore (2011) concluded that the site soils are not susceptible to hydro-collapse.

5.4.1.4.5 Mass Wasting

Mass wasting is an erosional process by which soil or earth material is loosened or dissolved and removed from its original location. Mass wasting depends on steepness of the slope, underlying geology, surface soil strength, and moisture in the soil. Significant excavating, grading, or fill work during construction might introduce mass wasting hazards at the project site. Ground surface disruption will occur during demolition, construction, excavation, grading, and trenching, which create the potential for erosion to occur. To address these issues, a Storm Water Pollution Prevention Plan incorporating best management practices for erosion control will be prepared prior to the start of construction. Additionally, the topographic gradients at the project site are relatively gentle, which would tend to reduce the potential for offsite runoff and erosion. During AEC operation, surface drainage design provisions and site maintenance will manage soil erosion at the site. Therefore, the potential impacts from mass wasting and erosion are considered to be relatively low (Ninyo & Moore, 2011).

5.4.1.4.6 Subsidence

Subsidence can be caused by natural phenomena during tectonic movement, consolidation, hydrocompaction, or rapid sedimentation. Subsidence also can occur from human activities, such as withdrawal of water or hydrocarbons in the subsurface soils. Historical oil and gas withdrawal has resulted in significant ground subsidence in some areas of Long Beach. The City of Long Beach Seismic Safety Element includes information and maps regarding regional subsidence associated with oil and gas withdrawal, including the locations and magnitude of known subsidence (City of Long Beach, 1988). The project site is not in an area of mapped subsidence. Therefore, the potential for subsidence is relatively low. (Ninyo & Moore, 2011).

5.4.1.4.7 Expansive Soils

Expansive soils shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Based on subsurface exploration conducted by Ninyo & Moore (2011), the near-surface soils at the project site predominantly consist of sandy silt and fine-grained sand with silt and clay, which typically have a low to moderate expansion potential.

5.4.1.4.8 Groundwater

Based on the background review conducted by Ninyo & Moore (2011), historical high groundwater levels near the project site have been measured at approximately 10 feet bgs. During subsurface exploration conducted by Ninyo & Moore (2011), groundwater was encountered at depths ranging from 8 to 14 feet bgs during the 2011 geotechnical investigation. This variable depth to groundwater is likely influenced by several factors, including tidal fluctuations, precipitation, irrigation, and groundwater pumping. Based on the groundwater levels encountered by Ninyo & Moore (2011) and the reported historical groundwater levels, groundwater may be encountered during excavation activities to these depths at the site (Ninyo & Moore, 2011). Groundwater, if encountered, would be managed to minimize any potential impacts on project-related excavations and construction activities.

5.4.1.4.9 Seiches and Tsunamis

Tsunamis are seismically induced ocean waves with very long periods. Tsunamis may be manifested in the form of wave bores or a gradual upwelling of sea level and can be caused by landslides or earthquakes. Water surge caused by tsunamis is measured by distance of run-up on the shore. Tsunamis are relatively uncommon hazards in California. Seven tsunamis have been recorded in the state. In southern California, a significant tsunami was associated with the 1960 Chile Earthquake. Damage occurred in the Long Beach–Los Angeles harbor, where 5-foot-high waves surged back and forth in channels, causing damage to small boats and yachts. A tsunami tidal surge occurred in the Long Beach Harbor because of the magnitude 8.8 Chile earthquake in February 2010. Minor effects were reported at King Harbor in Redondo Beach and in Long Beach Harbor because of the March 2011 Japan tsunami.

Seiches are defined as oscillations in confined or semi-confined bodies of water because of earthquake shaking. Of most concern are seiches that are caused by tsunamis captured and reflected within the enclosed area of an inner harbor, such as those that occurred in Los Angeles–Long Beach following the 1964 Alaskan earthquake. Seiche area damage would be most severe in the same areas as tsunami hazards.

The project site is located in a State of California Tsunami Inundation Area mapped for susceptibility to tsunami inundation (Ninyo & Moore, 2011). The County of Los Angeles Safety Element, City of Long Beach Seismic Safety Element, and California Emergency Management Agency Tsunami Inundation Map also designate the project site as located in an area that is susceptible to a tsunami run-up hazard.

5.4.1.4.10 Dam Failure Inundation

Based on review of the County of Los Angeles Safety Element and the City of Long Beach Seismic Safety Element, the project site is mapped in an area subject to flooding from a failure of the Whittier Narrows Dam or the Prado Dam (Ninyo & Moore, 2011). Inundation from dam failure could cause damage to the project site. However, dams in California are monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design and construction practices, and ongoing programs of review, modification, seismic retrofitting, or total reconstruction of existing dams (including recent reconstruction of the Prado Dam) are intended to see that dams are capable of withstanding the maximum credible earthquake for the site. The Whittier Narrows Dam is approximately 20 miles from the project site, and the Prado Dam is approximately 30 miles from the site. Additionally, drainage channel systems for the San Gabriel River and Los Cerritos Channel are provided in the site vicinity to alleviate flooding conditions. Because of the regulatory monitoring of dams, nearby drainage channels, and the site distances from these dams, the potential for inundation due to dam failure is considered low (Ninyo & Moore, 2011).

5.4.1.5 Geologic Resources of Recreational, Commercial, or Scientific Value

The CGS and the State Mining and Geology Board (SMGB) classify the regional significance of mineral resources in accordance with the California Surface Mining and Reclamation Act of 1975. The SMGB uses a classification system that divides land into four mineral resource zones (MRZ) that have been designated based on quality and significance of mineral resources. According to the State of California, the AEC site is located in an area classified as MRZ-3, which is defined as “areas containing mineral deposits, the significance of which cannot be evaluated from available data.” Based on the background review and subsurface exploration conducted by Ninyo & Moore (2011), the project site is underlain by alluvial sediments comprised of sand, silt, and clay, which are not considered to have significant recreational, commercial, or scientific value.

Significant mineral deposits are not present in the project area, as identified in the Los Angeles County General Plan (Mineral and Energy Resources) (Los Angeles County, 2011). Based on the Los Angeles County General Plan (Los Angeles County, 2011) there are no known active areas of mining for mineral resources near the project site.

The project site lies within the Seal Beach oil field, with major oil field developments outside the limits of the project site to the west, south, and southeast. There are no active oil, gas, or geothermal wells within the project site boundary. According to online maps of the California Division of Oil, Gas and Geothermal Resources (2012), many oil wells within the Seal Beach oil field, particularly those west of the project site, have been plugged and are no longer active. The proximity of the project site to active and inactive oil wells within the Seal Beach oil field is shown on Figure 5.4-3.

There are no known geologic resources of recreational, commercial, or scientific value present at the project site, thus, project construction would have no effect on oil and gas production or on other geologic resources of commercial value or on the availability of such resources.

5.4.2 Environmental Analysis

The potential effects from construction and operation of the AEC, and the demolition of the existing Units 1–7 at the Alamitos Generating Station on geologic resources and risks to life and property from geological hazards are presented in the following sections. With the implementation of the mitigation measures presented in Section 5.4.4, the AEC will not result in significant direct, indirect, or cumulative impacts from or on geologic resources.

5.4.2.1 Significance Criteria

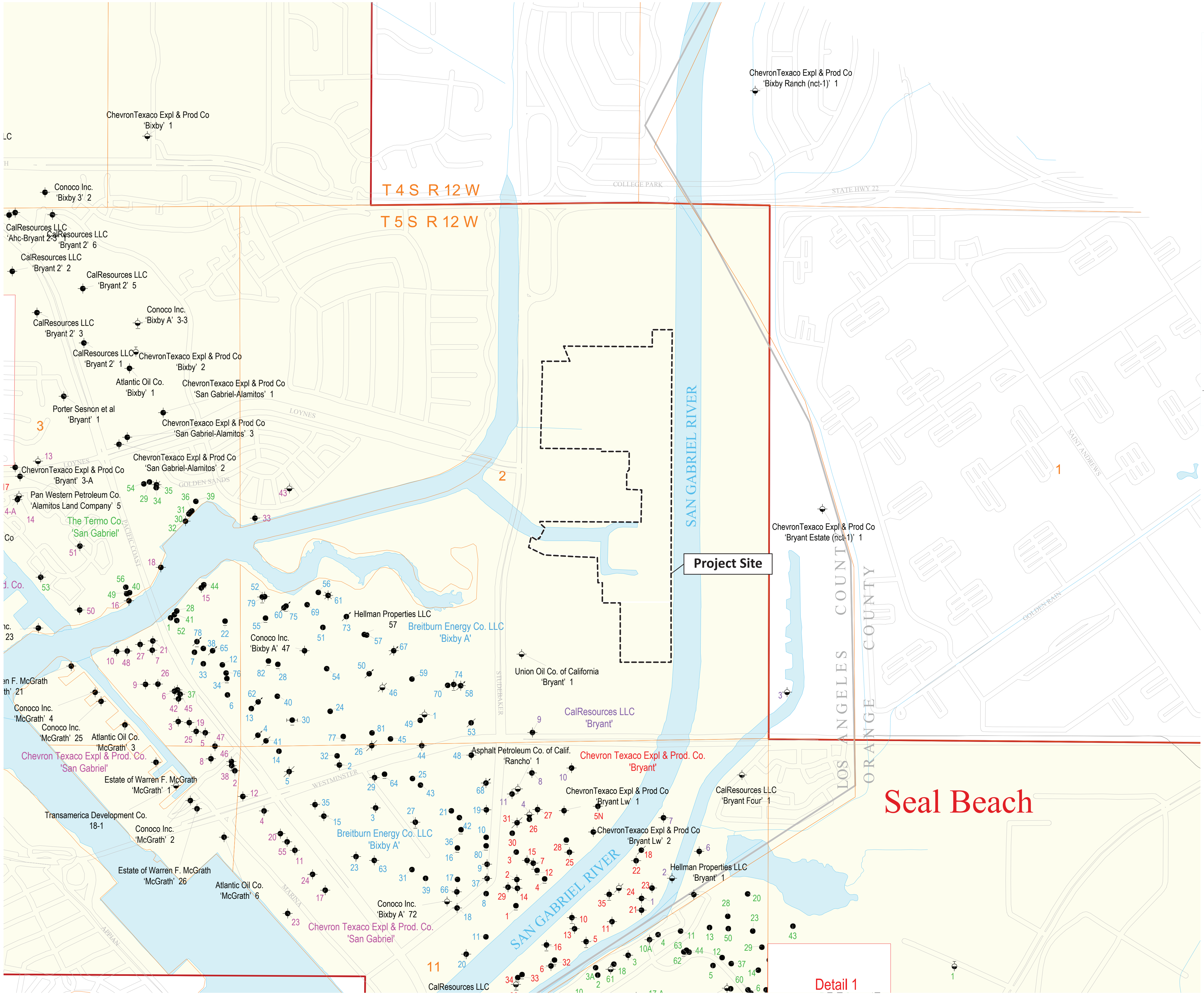
Appendix G of the California Environmental Quality Act (CEQA) is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is determine whether a project requires an environmental impact report, a Mitigated Negative Declaration or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects, but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

With Respect to "Geology and Soils," CEQA Appendix G asks whether the project would:

a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
    ii. Strong seismic ground shaking?
    iii. Seismic-related ground failure, including liquefaction?
    iv. Landslides?
b. Result in substantial soil erosion or the loss of topsoil?
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or offsite landslide, lateral spreading, subsidence, liquefaction or collapse?
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

With respect to "Mineral Resources," Appendix G asks, would the project:

a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local plan, specific plan, or other land use plan?



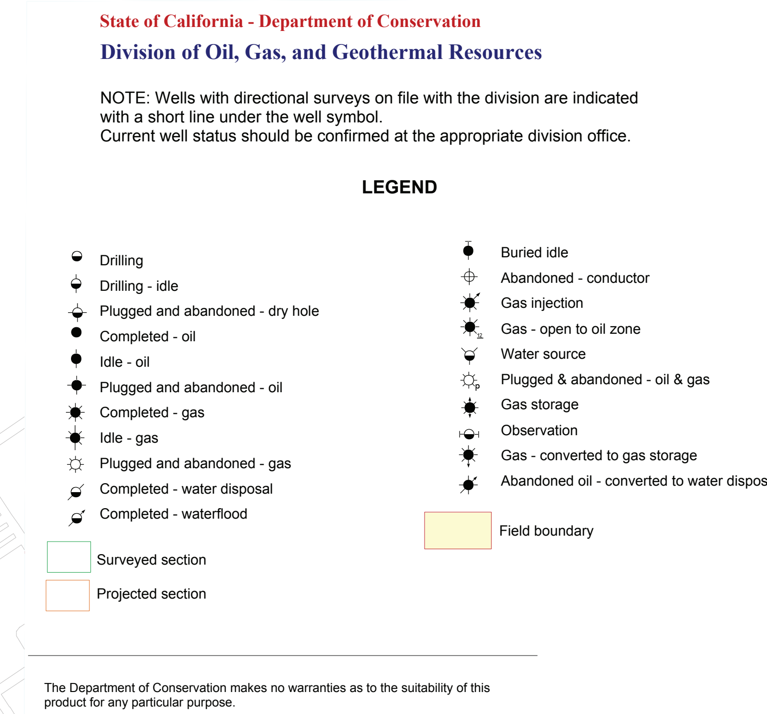


FIGURE 5.4-3
Oil and Gas Resources
Alamitos Energy Center
Long Beach, California

5.4.2.2 Geological Hazards

There is significant potential for seismic ground shaking to affect the project site in the event of a large-magnitude earthquake occurring on fault segments nearby. The project site, however, is not within a State of California EFZ or within the trace of any known active fault. The project would, therefore, not be likely to cause direct human exposure to ground rupture. Seismic hazards will be minimized by conformance with the recommended seismic design criteria of the 2010 CBC. Liquefaction potential, potential for consolidation settlement, potential for expansive soils, and elevated groundwater levels present at the project site will be considered during project design. If, during project design, it is determined that the above-mentioned geologic hazards are present at the project site, then the following mitigation alternatives could be implemented to reduce the potential risk to a less-than-significant level.

Mitigation alternatives for potential dynamic settlement related to liquefaction include supporting structures on deep pile foundations that extend through the liquefiable zones into competent material. Alternatively, densification of the liquefiable soils using in situ ground improvement techniques (such as vibro-replacement stone columns, rammed aggregate piers, or compaction grouting) would mitigate the liquefaction hazard, and the new structures could then be supported on shallow foundation systems (Ninyo & Moore, 2011).

To mitigate potential settlement at the site, the major power generating structures will be supported on deep pile foundations or on mat foundations when combined with in situ ground improvement. For preliminary planning purposes, 14-inch-diameter piles extending to approximately 50 feet deep with an axial capacity of 90 thousand pounds (or kilopounds [kips]) can be considered (Ninyo & Moore, 2011). Relatively light minor structures, new pavements and hardscape areas may be supported on suitable compacted fill, placed in accordance with detailed geotechnical recommendations. (Ninyo & Moore, 2011).

During the design phase of the project, additional evaluation of groundwater and fluctuations in groundwater levels will be performed. The near-term impacts associated with groundwater are anticipated to involve construction excavations and possible below-grade structures. Excavations that extend below groundwater would involve construction dewatering to maintain excavations in a relatively dry condition. Below-grade structures that extend below groundwater, including pipelines, vaults, and retention basins, would be designed to resist hydrostatic uplift pressures from groundwater and would involve waterproofing, as appropriate. Long-term groundwater impacts may involve rising groundwater levels associated with predicted sea level rises.

Mitigation of tsunami run-up hazards includes structural and civil engineering evaluation, strengthening of seafront structures, and providing emergency warning systems. Tsunami warning systems include the seismic Sea-Wave Warning System for the Pacific Ocean operated by a cooperative program of nations around the Pacific Rim and the Alaska Tsunami Warning Center operated by the National Weather Service. Structural reinforcement at the site also could be considered for tsunami protection, as determined during detailed design.

The probability of mass wasting, subsidence, and flooding by dam failure at the project site is low to negligible.

In summary, compliance with the 2010 CBC requirements will reduce the exposure of people to the risks associated with large seismic events, liquefaction potential, expansive soils, and compressive soils to less-than-significant levels. Additionally, major structures will be designed to withstand the strong ground motion of a DBE, as defined by the 2010 CBC. Through compliance with CBC standards, impacts associated with geological hazards will be less than significant.

5.4.2.3 Mineral Resources

Construction and operation of the AEC will not result in a loss of availability of a known mineral resource that would be of value to the region and the residents of the state. Additionally, the AEC will not result in a loss of availability of a locally important mineral resource recovery site delineated on a local plan, specific plan, or other land use plan. There are no such resources that have been identified on or near the site, so there will be no adverse impacts on mineral resources.

5.4.3 Cumulative Effects

A cumulative impact refers to a proposed project's incremental effect together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code Section 21083; California Code of Regulations, Title 14, Sections 15064(h), 15065(c), 15130, and 15355).

Potential cumulative impacts on geologic hazards and resources from construction and operation of the AEC are not expected. Because structures will be designed to meet seismic requirements of the 2010 CBC, the project will not cause an exposure of people or property to geological hazards. Therefore, the AEC will have a less-than-significant effect on geologic hazards and resources in the immediate vicinity of the project site. Projects that could result in a cumulative impact also would be required to comply with applicable federal, state, and local LORS. The AEC is unlikely, therefore, to result in cumulative impacts on geologic hazards and resources in combination with other closely related past, present, and reasonably foreseeable future projects.

5.4.4 Mitigation Measures

To address potential impacts related to geological hazards, the following mitigation measures are proposed for the AEC:

- Structures will be designed to meet seismic requirements of the 2010 CBC. Moreover, the design of plant structures and equipment will be in accordance with 2010 CBC earthquake design requirements to withstand the ground motion of a DBE.
- A geotechnical engineer will be assigned to the project to carry out the duties required by the CBC to assess geologic conditions during construction and approve actual measures used to protect the facility from the geological hazards discussed in Section 5.4.2.2.

With the implementation of these mitigation measures, the AEC will not result in significant direct, indirect, or cumulative impacts from or on geologic resources.

5.4.5 Laws, Ordinances, Regulations, and Standards

The LORS that may apply to AEC related to geologic resources and hazards are summarized in Table 5.4-2. The local LORS discussed in this section are ordinances, plans, or policies of the City of Long Beach. There are no federal LORS that apply to geological hazards and resources.

5.4.5.1 State LORS

5.4.5.1.1 California Building Code

The CBC provides specific and acceptable design criteria for excavations and structures for static and dynamic loading conditions. The CBC is based on the Federal Uniform Building Code. The project will comply with the CBC by ensuring that AEC design and construction meet the criteria for the seismic design and load-bearing capacity (see Section 5.4.2).

5.4.5.1.2 Alquist-Priolo Earthquake Fault Zoning Act

The main purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Although the project is subject to the Alquist-Priolo Earthquake Fault Zoning Act, the project features are not within areas identified as subject to surface rupture from active faults (see Section 5.4.2).

5.4.5.1.3 Seismic Hazards Mapping Act

The purpose of the Seismic Hazards Mapping Act is to ensure public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The project will conform to this act by conducting analysis for potential seismic hazards at the project site (see Section 5.4.2).

5.4.5.2 Local LORS

Except as otherwise provided for in the Public Resources Code, building and construction within the city of Long Beach are subject to the regulations of the City of Long Beach Municipal Code (2013). Municipal Code Chapter 18.24, Building Codes, adopts and incorporates by reference the CBC. Additionally, the Seismic Safety Element and Public Safety Element of the City of Long Beach General Plan are intended to protect the public from the effects of natural geologic hazards. According to the General Plan, new construction must comply with the Uniform Building Code to withstand geologic hazards including groundshaking and liquefaction. The project will conform to this element of the General Plan (see Section 5.4.2).

TABLE 5.4-2
Laws, Ordinances, Regulations, and Standards for Geological Hazards and Resources

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
State			
2010 CBC	Acceptable design criteria for structures with respect to seismic design and load-bearing capacity	California Code, State of California, and City of Long Beach	Section 5.4.2.2
Alquist-Priolo Earthquake Fault Zoning Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 3, California Code of Regulations)	Identifies areas subject to surface rupture from active faults	California Building Standards Commission, State of California, and City of Long Beach	Section 5.4.2.2
The Seismic Hazards Mapping Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 10, California Code of Regulations)	Identifies non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides	California Building Standards Commission, State of California, and City of Long Beach	Section 5.4.2.2
Local			
City of Long Beach Public Safety Element (City of Long Beach, 1975), Section V, Geologic Hazards	Requires compliance with Chapter 70 of the Uniform Building Code	City of Long Beach	Section 5.4.2.2
City of Long Beach Municipal Code (City of Long Beach, 2013), Title 18, Buildings and Construction	Requires compliance with 2010 CBC	City of Long Beach	Section 5.4.2.2

5.4.6 Agencies and Agency Contacts

There are no agencies or contacts associated with geologic hazards and resources.

5.4.7 Permits and Permit Schedule

Because the project falls under the exclusive jurisdiction of the California Energy Commission and the Commission certification is issued in lieu of any permit, certificate, or similar document required by any state, local, or regional agency, no state or local permits are required. There are no federal LORS that apply to geological hazards and resources.

5.4.8 References

California Building Code. 2010 Edition, July.

California Division of Oil, Gas, and Geothermal Resources. 2012. Oil and Gas Field Maps. http://www.consrv.ca.gov/dog.- Accessed June 2013.

California Department of Conservation, Division of Mines and Geology (CDMG). 1997. Guidelines for Evaluating and Mitigating Seismic Hazards in California: Special Publication 117, 74 p.

California Geological Survey (CGS). 2012, Geologic Compilation of Quaternary Surficial Deposits in Southern California, Los Angeles 30’ x 60’ Quadrangle. Special Report 217 (Revised).

California Geological Survey (CGS). 2007. *Special Publication 42 (Interim Revision 2007). Fault-Rupture Hazard Zones in California. Alquist-Priolo Earthquake Fault Zoning Act*. California Department of Conservation.

City of Long Beach, Department of Planning and Building. 1988, Seismic Safety Element, City of Long Beach General Plan. October.

City of Long Beach, Department of Planning and Building. 1975, Public Safety Element, City of Long Beach General Plan. May.

City of Long Beach (Long Beach). 2013. City of Long Beach Municipal Code. February.

California Department of Natural Resources, Division of Oil and Gas. 1956. Summary of Operations, California Oil Fields. Forty Second Annual Report of the State Oil and Gas Supervisor, 42:2, 226 p.

Los Angeles County Department of Regional Planning. 2011. Los Angeles County Draft General Plan 2035. Available online at: http://planning.lacounty.gov/generalplan/draft

Ninyo & Moore. 2011. Preliminary Geotechnical Evaluation, Alamitos Generating Station 690 North Studebaker Road, Long Beach, California. October.

Saucedo, G. J., Greene, G. H., Kennedy, M. P., and Bezore, S. P. 2003. Geologic Map of the Long Beach 30x60 Quadrangle, California. California Department of Conservation, California Geological Survey Scale 1:100,000.

Southern California Earthquake Center. 2004. Index of Faults of California. Available online at: http://www.data.scec.org/fault_index/, dated June 17.

Troxel, B. W. 1954. Geologic guide for the Los Angeles Basin, Southern California, *in* Jahns, R. H. (editor), Geology of Southern California: California Division of Mines Bulletin 170, Geologic Guide no. 3; 46p.