5.6 Geology, Soils, and Seismicity

This section describes the applicable laws and policies related to geology, soils and seismicity; discusses the existing environmental setting relative to geology, soils, and seismicity; and recommends mitigation measures to avoid/lessen potential Project impacts.

5.6.1 Regulatory Framework

Federal

Federal Occupational Safety and Health Administration Regulations

Code of Federal Regulations (CFR) Title 29, Part 1926.650 details the Occupational Safety and Health Administration's (OSHA's) requirements for excavation and trenching operations. OSHA issued its first standards related to excavation and trenching operations in 1971, and has since updated the standards to further reduce risk of injury and accidents. Project-related excavation and trenching activities would be required to demonstrate compliance with CFR Title 29 Part 1926.650 excavation and trenching standards.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code 2621-2624, Division 2 Chapter 7.5) was passed in 1972 following the destructive February 9, 1971, moment magnitude (Mw)[1] 6.6 San Fernando earthquake to mitigate the hazard of surface faulting to structures intended for human occupancy. The Act's main purpose is to prohibit siting buildings used for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. The Act requires the State Geologist to establish regulatory zones, known as "Earthquake Fault Zones," delineating appropriately wide earthquake fault zones to encompass all potentially active and recently active traces of faults. Local agencies must regulate most development projects within these zones. Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed human occupancy structures would not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (typically 50-foot setbacks are required).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Public Resources Code, Chapter 7.8, Section 2690-2699.6) directs the Department of Conservation, California Geological Survey (CGS) to identify and map areas prone to liquefaction, earthquake-induced landslides, and amplified ground

[1] Moment magnitude is used to measure the size of an earthquake in terms of energy release. Each unit step in moment magnitude is equivalent to roughly a factor of 32 in energy release. Thus, an earthquake of Mw of 7.0 releases about 32 times as much energy as one of 6.0 and 1,000 times that of 5.0.

shaking. The purpose of the Seismic Hazards Mapping Act is to minimize loss of life and property through the identification, evaluation, and mitigation of seismic hazards.

Staff geologists in the Seismic Hazard Zonation Program gather existing geological, geophysical, and geotechnical data from numerous sources to produce the Seismic Hazard Zone Maps. They integrate and interpret these data regionally to evaluate the severity of the seismic hazards and designate as Zones of Required Investigation (ZORIs) those areas prone to liquefaction and earthquake-induced landslides. Cities and counties are then required to use the Seismic Hazard Zone Maps in their land use planning and building permit processes.

The Seismic Hazards Mapping Act requires that site-specific geotechnical investigations be conducted within the ZORI to identify and evaluate seismic hazards (i.e., liquefaction and earthquake-induced landslides) and formulate mitigation measures prior to permitting most developments designed for human occupancy.

California Building Standards Code and California Building Code

California building standards are published in the California Code of Regulations, Title 24, also known as the California Building Standards Code (CBSC). The CBSC, which applies to all applications for building permits, consists of 11 parts that contain administrative regulations for the CBSC and for all state agencies that implement or enforce building standards. Local agencies must ensure development complies with the CBSC guidelines. Cities and counties have the ability to adopt additional building standards beyond the CBSC. CBSC Part 2, named the California Building Code (CBC), is based upon the 2016 International Building Code.

Given the state's susceptibility to seismic events, the CBC's seismic standards are among the strictest in the world. The CBC applies to all occupancies in the state, except where stricter standards have been adopted by local agencies. Chapter 16 deals with structural design requirements governing seismically resistant construction (Section 1604), including (but not limited to) factors and coefficients used to establish seismic site class and seismic occupancy category for the soil/rock at the building location and the proposed building design (Sections 1613.5 through 1613.7). Chapter 18 includes (but is not limited to) the requirements for foundation and soil investigations (Section 1803); excavation, grading, and fill (Section 1804); allowable load-bearing values of soils (Section 1806); and the design of footings, foundations, and slope clearances (Sections 1808 and 1809); retaining walls (Section 1807); and pier, pile, driven, and cast-in-place foundation support systems (Section 1810). Chapter 33 includes (but is not limited to) requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes (Section 3304). Appendix J applies to grading, excavation, and earthwork construction, and specifies that no grading shall be performed without first having obtained a permit from the building official. Section J104.3 requires the preparation of a geotechnical report that contains at least the following:

- The nature and distribution of existing soils
- Conclusions and recommendations for grading procedures
- Soil design criteria for any structures or embankments required to accomplish the proposed grading

- Where necessary, slope stability studies, and recommendations and conclusions regarding site geology

Implementing the regulatory requirements in the CBC and local ordinances, and ensuring that all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers. As discussed above, the CBC describes required standards for the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California. The standards include earthquake design requirements that determine the seismic design category and then describe the structural design requirements. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California, which, in the case of the proposed Project, is the city of El Segundo. The California Professional Engineers Act (Building and Professions Code Sections 6700–6799) and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provide the basis for regulating and enforcing engineering practice in California.

NPDES Construction General Permit

Construction associated with the proposed Project would disturb more than 1 acre of land surface affecting the quality of stormwater discharges into waters of the United States. The proposed Project would, therefore, be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the United States from construction sites that disturb 1 acre or more of land surface, or that are part of a common plan of development or sale that disturbs more than 1 acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation, construction of buildings, and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters' risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters' risk level reflects the risk to the receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to the following requirements:

- Effluent standards
- Good site management housekeeping
- Non-stormwater management
- Erosion and sediment controls

- Run-on and runoff controls
- Inspection, maintenance, and repair
- Monitoring and reporting requirements

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific best management practices (BMPs) designed to prevent sediment and pollutants from contacting stormwater and moving off-site into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management, and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of sediment and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the Project area. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program, a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations and vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In the Project area, the Construction General Permit is implemented and enforced by the Los Angeles Regional Water Quality Control Board (LARWQCB), which administers the stormwater permitting program. Dischargers are required to electronically submit a notice of intent and permit registration documents (PRDs) in order to obtain coverage under this Construction General Permit. Dischargers are responsible for notifying the LARWQCB of violations or incidents of noncompliance, as well as for submitting annual reports identifying deficiencies of the BMPs and how the deficiencies were corrected. The risk assessment and SWPPP must be prepared by a State Qualified SWPPP Developer and implementation of the SWPPP must be overseen by a State Qualified SWPPP Practitioner. A Legally Responsible Person, who is legally authorized to sign and certify PRDs, is responsible for obtaining coverage under the permit.

California Coastal Act of 1976

The California Coastal Commission (CCC), in partnership with coastal cities and counties, plans and regulates the use of land and water in coastal areas under the California Coastal Act of 1976 (see Division 20 of the Public Resources Code). Under the Coastal Act, the state legislature mapped an official coastal zone. In accordance with the California Coastal Act, a permit is required for development activities within the coastal zone. The Coastal Act broadly defines development activities to include (among others) the construction of buildings, division of land, and any activity that changes the intensity of land or water use, or public access to and along the coast. The following sections of the Coastal Act contain requirements relevant to the proposed Project.

Section 30235: Construction altering natural shoreline. Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.

Section 30253: Minimization of Adverse Impacts. New development shall do all of the following:

a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.

b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

Regional

There are no regional laws, ordinances, or regulations pertaining to geology, soils, and seismicity.

Local

City of El Segundo General Plan

The *City of El Segundo General Plan* Public Safety Element addresses hazards associated with geology and seismicity, flooding, fire, petroleum storage, and hazardous materials. The purpose of the Public Safety Element is to reduce death, injuries, property damage, and economic and social dislocation resulting from natural and man-made hazards such as urban fire, flooding, mudslides, earthquakes, and hazardous incidents. Following are the relevant Public Safety Element goals and policies:

> **Goal PS1:** Protect the public health and safety and minimize the social and economic impacts associated with geologic hazards.
>
> > **Policy PS1-1.1:** Continue to review proposals for new development and for the expansion of existing development in areas of potential geological hazards.

Policy PS1-1.2: Enforce, monitor, and improve development standards which place the responsibility on the developer, with advice from qualified engineers and geologists, to develop and implement adequate mitigation measures as conditions for project approval.

Program PS1-1.2A: The City shall review projects to ensure that adequate geotechnical investigation has been completed in areas susceptible to landsliding and debris flows and in areas where collapsible or expansive soils occur, and to approve only those which mitigate these hazards to the satisfaction of the City Engineer.

Program PS1-1.2B: The City shall review projects to ensure that adequate geotechnical investigation has been completed in areas underlain by the Oceano group of soils, and to approve only those which mitigate any hazards to the satisfaction of the City Engineer.

Goal PS-2: Minimize injury and loss of life, property damage, and social, cultural and economic impacts caused by earthquake hazards.

Program PS2-1.1A: The City shall continue to enforce the International Building Code.

Policy PS2-1.2: The City shall assist in the prevention of structural damage in areas with a high potential for liquefaction, landslides, and mudslides by requiring geotechnical studies for new development to mitigate potential impacts.

Program PS2-1.2A: The City shall require geotechnical evaluation of the potential for seismically induced landslide, mudslide, and liquefaction in areas where such hazards have been identified.

Refer to Section 5.8, *Hazards and Hazardous Materials*, for goals and policies pertaining to hazardous materials and Section 5.8, *Hydrology and Water Quality*, for goals and policies pertaining to hydrology and water quality.

City of El Segundo Multi-Hazard Mitigation Plan

The *City of El Segundo Multi-Hazard Mitigation Plan* (Mitigation Plan) includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for natural, man-made, and technological hazards. The Mitigation Plan provides a list of activities that may assist the City in reducing risk and preventing loss from future hazard events. The action items address multi-hazard issues, as well as activities for earthquake, flood, windstorm, tsunami, and technological and human-caused hazards. Technological and human-caused hazards (i.e., hazardous materials incidents, transportation accidents, civil unrest, national security emergency, domestic terrorism, and public health emergency) are among the hazards addressed in the Mitigation Plan that are relevant to the Project.

City of El Segundo Municipal Code

ESMC CHAPTER 5-4, STORM WATER AND URBAN RUNOFF POLLUTION CONTROL

City of El Segundo Municipal Code (ESMC) Section 5-4-9 specifies that each person applying to the City for a Grading or Building Permit for projects for which compliance with regulations

governing state construction activity stormwater permits (GCASPs) is required, must submit satisfactory proof to the City that:

1. A notice of intent to comply with the GCASP was filed.
2. An SWPPP has been prepared, before the City can issue any Grading or Building Permit on the construction project.

ESMC CHAPTER 13-1, BUILDING CODE

According to ESMC Section 13-1-1, *Adoption of California Building Code* (2013 Edition), the CBSC (Title 24, Part 5) was adopted by the City, subject to amendments, additions, and deletions. The City is currently in the process of adopting the current CBSC.

5.6.2 Environmental Setting

Geologic Conditions

This section describes the existing geological setting.

Topography and Bathymetry

The proposed Project site is within the Los Angeles Basin (LA Basin), a large alluvial basin characterized by generally low relief and natural slopes, generally less than 5 percent. The LA Basin is a northwest trending lowland plain, approximately 50 miles long and 20 miles wide. It is bordered on the north by the San Gabriel Mountains, on the west by the Pacific Ocean, on the south by the Santa Ana Mountains, and the east by the convergence of the San Gabriel and Santa Ana Mountains.

The ocean water desalination facility would be constructed at one of two locations at the El Segundo Generating Station (ESGS) at 301 Vista Del Mar along the coastline of Santa Monica Bay at the base of the El Segundo sand hills and the southern end of El Segundo Beach (see Figures 3-1 and 3-3). The access road to the ESGS descends from an elevation of approximately 86 feet above mean sea level (msl) to approximately 14 feet above msl in the northwest portion of the facility. The ESGS North Site is a flat area with an elevation of about +23 feet above msl. The South Site is a flat area with an elevation of +41 feet above msl.

The offshore components of the Project would be located in Santa Monica Bay, which is characterized by a gently sloping (approximately 0.5 degrees) continental shelf that extends to the break in the shelf at a depth of approximately 330 feet (see Figure 3-4). The gently sloping shelf within Santa Monica Bay is cut by two submarine canyons: Santa Monica Canyon, approximately 3 miles north of the ESGS, and Redondo Canyon, approximately 1 mile to the south.

Various distribution pipeline alignment options are shown in Figure 3-5. Elevations range from 40 to 85 feet above msl in the west along Vista Del Mar Boulevard to 55 to 85 feet above msl in the east along Van Ness Avenue, where the distribution pipelines would connect with existing distribution pipelines.

Regional Geology

The proposed ocean water desalination facility site is at the coastal margin in the southwestern region of the LA Basin. The LA Basin is at the northern end of the Peninsular Ranges physiographic province, which comprises mountains that generally trend northwest and valleys formed by active right-lateral strike-slip faults with a similar trend. The LA Basin is bounded on the north by the Transverse Ranges physiographic province, which comprises east-west trending mountains and valleys that were formed by a series of east-west fold belts and active left-lateral reverse and thrust faults. The Project site is within the southwestern structural block of the LA Basin, which is called West Basin and is separated from the Central Basin by northwest-trending Newport-Inglewood Uplift. The Newport-Inglewood Uplift is a series of folds and discontinuous faults that are characteristic of wrench-style deformation associated with a right-lateral strike slip fault zone.

The West Coast Basin contains a thick (greater than 1,000 feet) sequence of marine and non-marine sediments that were deposited between Upper Pliocene and Upper Pleistocene time (about 3 million years to 11,000 years ago). The unconsolidated to semi-consolidated Plio-Pleistocene sediments are underlain by Tertiary (3 to 65 million years ago) sedimentary and volcanic rocks. Metamorphic basement rocks of possible Jurassic to late Cretaceous age (65 to 195 million years old) underlie the LA Basin and Santa Monica Shelf at depths estimated between 1,000 and 8,000 feet (CSLC 2010). The surficial geology is shown in **Figure 5.6-1**, and consists largely of eolian (wind-derived) sandy alluvium along the coast and older alluvium inland. A more detailed discussion of the local geology is provided in the next section.

Based on seafloor photography and multibeam sonar imagery, most of the seafloor in Santa Monica Bay is reported to consist of unconsolidated sediment with silt and clay as the predominant size fraction. Sandy substrates are restricted to the innermost mainland shelf and a narrow outer shelf band north of Santa Monica Canyon. Cobble and gravel substrates are restricted to the innermost shelf south of El Segundo and limited parts of the shelf edge. Rocky substrates with interspersed patches of sand and gravel are only reported on the high-relief marginal plateau and along parts of the shelf break offshore of Malibu (Edwards et al 2003).

Site-Specific Geologic Characterization

The nearshore area of El Segundo is underlain by a thick, interbedded sequence of Quaternary clays, silts, sands, and gravels (CSLC 2010). Existing data compiled and reviewed include numerous borings and monitoring wells at the ESGS and adjacent Chevron Refinery Facilities (Trihydro 2017), several shallow seafloor borings 800 to 2,500 feet offshore (Appendix G in El Segundo Power 2000) and shallow seafloor samples 1,000 to 6,000 feet offshore (Fugro West 2004, 2007 in CSLC 2010). **Figure 5.6-2** shows locations of existing borings and samples near the ESGS facility. Based on review of these data, the subsurface near the coastal margin near the ESGS facility has a generally consistent stratigraphy to depths of approximately 100 feet below sea level (CSLC 2010), which is summarized below:

- Old Dune Sand Aquifer: Recent and Upper Pleistocene dune sands, consisting of well-sorted, fine- to medium-grained sand, along with discontinuous lenses of silt, coarse-grained sand,

gravel, and cobbles. The thickness of this aquifer is approximately 55 feet near the ESGS facility.

- Manhattan Beach Aquitard: Multi-layered assemblage of clay, silt, and very fine-grained sand of variable thickness and presence (CSLC 2010). Although previous investigations have reported that the presence of the Manhattan Beach Aquitard is uncertain beneath the northern portion of the ESGS facility, offshore borings and jet probes from 1954 and 1962 and the offshore geophysical survey conducted as part of this study show a thin fine-grained layer that appears to correlate with the Manhattan Beach Aquitard extending at least 1,500 feet north of the ESGS facility and approximately 2,000 feet offshore.
- Gage Aquifer: Coarse poorly-graded sand with localized layers of silt and clay with a relatively constant thickness of approximately 20 feet. The Old Sand Dune and Gage Aquifers are reported to merge where the Manhattan Beach Aquitard is not present.
- El Segundo Aquitard: Laterally extensive, dense silty clay; thickness varies between 10 and 25 feet near the ESGS facility.
- Silverado Aquifer: Fine- to coarse-grained sand and gravel with interbeds of pebbles, also localized lenses of silt and clays up to 10 feet thick. The thickness of the Silverado Aquifer is not documented by borings near the ESGS facility, but based on the offshore geophysical survey, the Silverado Aquifer or similar material is estimated to extend to depths of approximately 600 feet.

Instability in the beach sediment is indicated by approximately 250 feet of offset in the position of the coastal margin north and south of the jetty or rock groin adjacent to the ESGS facility (much wider beach north of the jetty; see Figure 3-3). Offset of the beach width and surf zone position on opposite sides of the groin is evidence of substantial southward long-shore erosion and transport of sand and beach instability. Artificial beach nourishment has been conducted many times to maintain and locally increase the beach width.

The monitoring program conducted by Chevron includes quarterly monitoring of two wells that are on the west and east sides of the proposed South Site (Trihydro 2017). During 2016, the depths to groundwater ranged from 27.40 to 35.25 feet below the ground surface at the location of the wells and groundwater elevations ranged from 2.90 to 4.87 feet above msl. Fluctuations in groundwater levels may occur due to tides, seasonal rainfall, and local irrigation.

Faulting and Seismic Hazards

Hazards associated with earthquakes include primary seismic hazards, such as fault rupture and strong seismic ground shaking, and secondary seismic hazards, such as liquefaction, lateral spreading, seismically-induced settlement, and landsliding.

The CGS defines an active fault as one that has had surface displacement within Holocene time (within the last 11,000 years; the U.S. Geological Survey [USGS] uses within the last 15,000 years). A Quaternary fault is defined as a fault that has shown evidence of surface displacement during the Quaternary period (the last 1.6 million years), but has not been proven by direct evidence to have moved within the last 11,000 years.

The proposed Project is not located within a state of California Earthquake Fault Zone (also known as an Alquist-Priolo Special Studies Zone). However, the Project area is located in a seismically active region of California. The Los Angeles Basin contains both active and potentially active faults. Throughout the Project area, there is the potential for damage resulting from movement along any one of a number of the active faults. The Working Group on California Earthquake Probabilities (WGCEP), comprised of the USGS, the CGS, and the Southern California Earthquake Center, evaluates the probability of one or more earthquakes of Mw[2] 6.7 or higher occurring in the state of California over the next 30 years. It is estimated that the Los Angeles region area as a whole has a 60 percent chance of experiencing an earthquake of Mw 6.7 or higher over the next 30 years; among the various active faults in the region, the southern San Andreas Fault is the most likely to cause such an event (WGCEP 2015).

Table 5.6-1 lists principal known active faults with potential to affect the proposed desalination facility site, and the maximum moment magnitude (M_{max}) as reported for the CGS.

Note that none of the faults cross the proposed ocean water desalination facility, intake and discharge pipelines, or the desalinated water conveyance components. The nearest active fault to the western end of the intake and discharge pipelines is the Palos Verde Fault under the ocean at 1.8 miles to the west. The nearest active fault to the easternmost portion of the proposed distribution pipelines connections at Van Ness Avenue would be the Newport-Inglewood Fault system at 0.5 miles northeast of the proposed Regional Pipeline/WB Feeder Connector alignments situated along Van Ness Avenue and regional pump station optional sites 4 and 5 near the intersection of Van Ness Avenue and West 12th Street.

TABLE 5.6-1
PRINCIPAL ACTIVE FAULTS

Fault	Approximate Distance to ESGS (miles)	Maximum Moment Magnitude (M_{max})
Palos Verdes	3.2	7.3
Newport-Inglewood (LA Basin)	6.2	7.1
Santa Monica	9.3	6.6
Malibu Coast	10.4	6.7
Hollywood	12.1	6.4
Puente Hills Blind Thrust	12.6	7.1
Northridge	16.8	7.0
Verdugo	20.4	6.9
Sierra Madre	24.8	6.9
San Andreas	47.7	8.0

SOURCE: Ninyo & Moore 2013.

[2] While the Richter magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude (Mw) as the preferred method to express the size of an earthquake. The Mw scale is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. The Mw can reliably measure larger earthquakes, and from greater distances.

Strong Seismic Ground Shaking

The nearest active fault to the proposed ocean water desalination facility, screened ocean intake, and concentrate discharge sites are the Newport-Inglewood Fault Zone, located approximately 6 miles to the east of the proposed desalination facility and about 2,000 feet northeast of the northeastern end of the proposed new conveyance pipeline alignment (see Figure 5.6-1). In addition, the Palos Verdes Fault Zone is approximately 1.8 miles west of the western end of the intake and discharge pipes. The Newport-Inglewood Fault Zone is capable of generating earthquakes in excess of 6.9 Mw, while the Palos Verdes Fault Zone is capable of generating earthquakes between 6.0 and 7.0 Mw or greater (SCEDC 2016).

Peak Ground Acceleration and Seismic Soil Class

The 2016 California Building Code, based on ASCE 7-16, recommends that the design of structures be based on the risk-targeted maximum considered earthquake (MCE_R) and design response spectrum. The design response spectrum is equal to two-thirds of the MCE_R spectrum. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures on-site.

Liquefaction

Liquefaction occurs when loose, water-saturated sediments lose strength and fail during strong ground shaking. Liquefaction is defined as the transformation of granular material from a solid state into a liquefied state because of increased pore-water pressure. The process for identifying liquefaction zones includes reviewing Quaternary geologic mapping, historical groundwater information, and subsurface geotechnical data. The liquefaction hazard ZORI boundaries are based on the presence of shallow (less than 50 feet depth) groundwater in uncompacted sands and silts deposited during the last 15,000 years and sufficiently strong levels of earthquake shaking expected during the next 50 years (CGS 2008).

Proposed Ocean Water Desalination Facility, Screened Ocean Intake, and Concentrate Discharge Sites. According to the CGS Seismic Hazard Zones Map for the Venice Quadrangle, the narrow strip of beach west of the proposed desalination facility site is identified as an area possessing historic occurrence of liquefaction, as shown in **Figure 5.6-3** (CGS 1999a). This is largely due to the presence of saturated sandy soils along the shoreline. In addition, past construction activities for the El Segundo Power Facility Modification have previously identified the presence of shallow groundwater levels ranging from 7 to 11 feet below ground surface on the North Site, and the Final Engineering Geology Report prepared for the redevelopment of ESGS Units 5 through 8 indicate that subsurface conditions at the ESGS are likely conducive to liquefaction (Ninyo & Moore 2013).

Proposed Desalinated Water Conveyance Corridors and Regional Pump Station Optional Sites. According to the CGS, the proposed desalinated water conveyance pipeline corridors and regional pump station sites situated within the Venice Quadrangle (west of Isis Avenue) would not be located within a ZORI for liquefaction (see Figure 5.6-3) (CGS 1999a). In addition, no segment of the desalinated water conveyance components or regional pump station optional sites

located within the Inglewood Quadrangle (east of Isis Avenue) would be sited within a ZORI for liquefaction (CGS 1999b).

Lateral Spreading

Lateral spreading involves the dislocation of near-surface soils generally along a near-surface liquefiable layer. In many cases, this phenomenon of shallow landsliding occurs on relatively flat or gently sloping ground adjacent to a "free face," such as a slope or retaining wall.

Proposed Desalination Facility, Screened Ocean Intake, and Concentrate Discharge Sites. The existing 70-foot slope on the eastern boundary of the ESGS site represents a "free face," which could pose a risk of lateral spreading (CGS 1999a). The ESGS property is at an elevation ranging from 14 to 86 feet above msl. According to the Final Engineering Geology Report prepared for redevelopment of ESGS Units 5 through 8, groundwater levels for areas near the slope were at or near sea level, indicating that the soils along the free face of slope are not saturated and that the likelihood of lateral spreading due to liquefaction is remote (Ninyo & Moore 2013). Given the existing nature of the Project area, the likelihood for lateral spreading to affect the proposed desalination facility, screened ocean intake, and concentrate discharge sites during a major earthquake in the area is low.

Proposed Desalinated Water Conveyance Corridors and Regional Pump Station Optional Sites. The potential for lateral spreading at the proposed desalinated water conveyance corridors and regional pump station optional sites is unknown at this time. However, given the lack of a free face, the relatively flat topography, and low liquefaction potential east of the shoreline, the potential for lateral spreading is considered low.

Seismically Induced Landslides

Landslides tend to occur in weak soil and rock on sloping terrain. The ZORI for earthquake-induced landslides generally indicate areas characterized by steep slopes composed of weak materials that may fail when shaken by an earthquake. The process for zonation of earthquake-induced landslides incorporates expected levels of future earthquake ground accelerations, evidence of existing landslides, slope gradient, and strength of soil and bedrock materials.

Proposed Desalination Facility, Screened Ocean Intake, and Concentrate Discharge Sites. Because of the Project area's relatively flat nature, and as confirmed through the Seismic Hazard Zones Map, the proposed desalination facility site is not located within a ZORI for earthquake-induced landslide hazard (see **Figure 5.6-4**) (CGS 1999a). However, as described previously, the eastern boundary of the ESGS property includes a cut slope approximately 70 feet in height. The existing slope is composed of highly vegetated semi-consolidated dune sand and is supported by a 3-foot concrete retaining wall at its toe, as well as two approximately 5-foot retaining walls at its southern end. The presence of this existing slope indicates the proposed desalination facility site may be subject to landslide hazards.

Proposed Desalinated Water Conveyance Corridors and Regional Pump Station Optional Sites. The proposed desalinated water conveyance corridors and regional pump station optional sites would traverse portions of the Venice and Inglewood Quadrangles. According to the Seismic

Hazards Zone Map for the Venice Quadrangle, the desalinated water conveyance corridor crosses a small area prone to landslide hazard approximately 0.3 mile east of the shoreline and west of El Segundo Boulevard's western terminus (see Figure 5.6-4) (CGS 1999a). The Inglewood Quadrangle identifies areas prone to landslides hazards, including several areas located within Windsor Hills in Los Angeles County (CGS 1999b). However, no portions of the proposed desalinated water conveyance corridors or any regional pump station optional site would be affected by a state-designated Landslide Zone, as shown on the Seismic Hazards Zone Map – Inglewood Quadrangle (see Figure 5.6-4).

Expansive Soils

Expansive soils are clayey soils that have the potential to expand when water is added and shrink when water is lost. Expansive soils can damage overlying structures and infrastructure. According to the 1992 City of El Segundo General Plan EIR, Montezuma and Ramona soils, which tend to have a high shrink/swell potential, tend to occur primarily in the eastern portion of the City, east of Sepulveda Boulevard (City of El Segundo 2004). Based on geotechnical investigations for the ESGS site, the site is underlain by Holocene-age alluvial and dune deposits consisting of silty sand and sand (Ninyo & Moore 2013). The subsurface materials encountered in borings consisted of eolian (wind-blown) deposits (underlying the asphalt concrete pavement section) consisting of medium dense to very dense, poorly graded sand to silty sand to depths of approximately 25 to 30 feet. The eolian deposits are underlain by older alluvium to depths of up to about 76 feet (Ninyo & Moore 2007). Therefore, the Project site does not appear to contain soils susceptible to expansion.

5.6.3 Significance Thresholds and Criteria

The California Environmental Quality Act (CEQA) Guidelines, Appendix G, Environmental Checklist Form, includes questions pertaining to geology and soils. The issues presented in the Environmental Checklist have been used as thresholds of significance in this section. Accordingly, the Project would have a significant adverse environmental impact if it would:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - The 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) (refer to Impact GEO 5.6-1)
  - Strong seismic ground shaking (refer to Impact GEO 5.6-1)
  - Seismic-related ground failure, including liquefaction and lateral spreading; or
  - Landslides (refer to Impact GEO 5.6-1)
- Result in substantial soil erosion or the loss of topsoil (refer to Impact GEO 5.6-2).
- 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 off-site landslides, lateral spreading, subsidence, liquefaction or collapse (refer to Impact GEO 5.6-3).

- Be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code,[3] creating substantial direct or indirect risks to life or property (refer to Impact GEO 5.6-4).
- 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 (refer to Impact GEO 5.6-5).

In 2015, the California Supreme Court held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of a project. *California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal. 4th 369. However, if a project exacerbates a condition in the existing environment, the lead agency is required to analyze the impact of that exacerbated condition on the environment, which may include future occupants of the project. As stated in *Ballona Wetlands Land Trust v. City of Los Angeles* (2011) 201 Cal.App.4th 455, 473: "[T]he purpose of an EIR is to identify the significant effects of a project on the environment, not the significant effects of the environment on the project." While the potential for increased exposure of people or structures to risks associated with seismic occurrences and location of people or structures on unstable geologic units as a result of the location of the proposed Project are discussed in this section for informational purposes, the effects of the preexisting hazards on users of the proposed Project and structures are not environmental impacts under CEQA.

Potentially Significant Impacts

The environmental factors determined to be potentially affected by the Project, identified in the Notice of Preparation (see Appendix 1A), are analyzed below. Feasible mitigation measures are recommended, where warranted, to avoid or minimize the Project's significant adverse impacts.

5.6.4 Impacts and Mitigation Measures

Seismic Hazards

Impact GEO 5.6-1: Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: the 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); strong seismic ground shaking; seismic-related ground failure, including liquefaction, lateral spreading, and landslides?

The following analysis evaluates potential impacts associated with constructing and operating each of the three primary elements of the Project, including offshore, coastal, and inland Project components for both the Local and Regional Projects. **Table 5.6-2** summarizes the impact significance conclusions.

[3] Appendix G still refers to a Table 18-1-B in the CBC. However, the current version of the CBC refers to Section 1803.5.3, which describes the criteria for analyzing expansive soils.

TABLE 5.6-2
SUMMARY OF IMPACT GEO 5.6-1 SEISMIC HAZARDS

	Ocean Water Desalination Facility	Offshore Intake and Discharge Facilities	Inland Conveyance Facilities
Impact GEO 5.6-1: Impacts on seismic hazards.			
Local Project			
Construction	LTS	LTS	LTS
Operation	LTS	LTS	LTS
Regional Project			
Construction	LTS	LTS	LTS
Operation	LTS	LTS	LTS

NOTES:
LTS = Less than Significant, no mitigation proposed

Local Project

Construction-Related Impacts

All Project Components

Construction activities would be temporary, and thus are not anticipated to exacerbate the exposure of people or structures to substantial adverse effects involving seismic hazards. A less than significant impact would occur.

Mitigation Measures:

None Required.

Local Project Significance Determination

Less than Significant Impact.

Operational Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

The Local Project would be located at the westernmost boundary of the city of El Segundo at one of two locations: the ESGS North Site or South Site. According to the Alquist-Priolo Earthquake Fault Zone Map for the Venice Quadrangle, the entire city of El Segundo, including the proposed Local Project, is not located within a state-designated Alquist-Priolo Earthquake Fault Zone. As such, the operations of the Local Project would not exacerbate the exposure of people or structures to risk involving rupture of a known earthquake fault and there would be no impact. In addition, the proposed Project does not include the extraction of large amounts of fluids (e.g., oil or groundwater) or the injection of fluids (e.g., wastewater). There would be no impact relative to activating a fault.

As discussed in the Environmental Setting, the possibility of moderate to high ground acceleration or seismic shaking at the desalination facility site may be considered as approximately similar to the entire Southern California region as a whole. The proposed Local

Project is adjacent to a ZORI for liquefaction. Construction activities for the El Segundo Power Facility Modification have previously identified the presence of shallow groundwater levels ranging from 7 to 11 feet below ground surface, and the final engineering geology report prepared for the redevelopment of Units 5 through 8 indicate that subsurface soil conditions at the ESGS are likely conducive to liquefaction. Finally, the eastern boundary of the ESGS property includes a cut slope approximately 70 feet in height. The existing slope is composed of highly vegetated semi-consolidated dune sand and is supported by a 3-foot concrete retaining wall at its toe and two approximately 5-foot retaining walls at its southern end.

The presence of this existing slope indicates the Local Project may be subject to landslide hazards. Overall, development of the Local Project ocean water desalination facility could expose an essential public utility as well as persons and structures to potential substantial adverse effects involving strong seismic ground shaking, seismic-related ground failure (liquefaction, lateral spreading, and landslides).

As discussed in the Existing Regulatory Setting, the CBC and local ordinances would require that the structural elements of the proposed Project would be required to undergo appropriate design-level geotechnical evaluations prior to final design and construction. The geotechnical investigation would include any necessary recommendations for soils remediation and/or foundation systems necessary to reduce seismic-related hazards to less than significant. Compliance with the existing regulations would ensure that persons and structures associated with the Local Project ocean water desalination facility would not be exposed to potential substantial adverse effects involving strong seismic ground shaking and seismic-related ground failure (liquefaction, lateral spreading, and landslides). With compliance with existing regulations and conditions, the impact would be less than significant.

Screened Ocean Intake and Concentrate Discharge

As discussed in the Existing Environmental Setting, conditions at the Screened Ocean Intake and Concentrate Discharge portions of the Local Project are not located on a known earthquake fault and would not be subject to seismically induced landslides being on the ocean floor. Additionally, these facilities are not intended for human occupancy. Therefore, offshore portions of the Local Project screened ocean intake and concentrate discharge facilities operations would not directly or indirectly cause potential substantial adverse effects involving rupture of a known earthquake fault or seismically induced landslide.

The potential exists that the Local Project screened ocean intake and concentrate discharge facilities would be exposed to adverse effects involving strong seismic ground shaking. The possibility of moderate to high ground acceleration or shaking at the Project site may be considered as approximately similar to the entire Southern California region, as a whole. As described in Section 3, *Project Description*, changes to the existing offshore pipelines would include adding passive wedgewire screens to the intake pipe and adding new intake and discharge pipelines inside the existing intake and discharge tunnels. In the unlikely event that a seismic event is strong enough to damage the pipelines, the result would be a temporary shutdown of the system until the pipelines were repaired. Given the temporary nature of the potential effect, the impact relative to seismic shaking would be less than significant.

Desalinated Water Conveyance Components

As described above, the proposed desalinated water conveyance components would traverse areas within the Venice and Inglewood Quadrangles. No portion of the desalinated water conveyance components proposed under the Local Project would be sited within designated hazard zones under the Alquist-Priolo Earthquake Fault Zoning Act identified as Earthquake Fault Rupture Hazard Zones. In addition, no portion of the desalinated water conveyance components proposed under the Local Project would be sited within a designated Liquefaction Hazard Zone. However, a small portion of the proposed Local Project desalinated water conveyance components located in the Venice Quadrangle (approximately 0.3 miles east of the shoreline and west of El Segundo Boulevard's western terminus) would be sited within an area identified as a designated Landslide Hazard Zone, as shown in Figure 5.6-3. As previously discussed, the CBC and local ordinances would require a design-level geotechnical evaluation and the recommendation of design-level measures to address potential seismic-related ground failures. In addition, the pipelines would be constructed using the American Water Works Association (AWWA) industry standards. The preparation of a geotechnical investigation and implementation of its recommendations, and the use of AWWA industry standards, would result in an impact of less than significant.

Mitigation Measures:

None Required.

Local Project Significance Determination:

Less than Significant Impact.

Regional Project

Construction-Related Impacts

All Project Components

The Regional Project construction activities would be similar to the Local Project and the temporary and short-term activities are not anticipated to expose people or structures to substantial adverse effects involving seismic hazards. A less than significant impact would occur.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

Less than Significant Impact.

Operational Impacts

All Project Components

The Regional Project ocean water desalination facility would be subject to seismic hazards similar to the Local Project. Please refer to the Local Project operational analysis above. The preparation of a geotechnical investigation and implementation of its recommendations would be required by existing regulations. In addition, pipelines would be constructed using AWWA industry standards. With compliance with existing regulations, the impact would be less than significant.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

Less than Significant Impact.

Soil Erosion

Impact 5.6-2: Would the Project result in substantial soil erosion or the loss of topsoil?

The following analysis evaluates potential impacts associated with constructing and operating each of the three primary elements of the Project, including offshore, coastal, and inland Project components for both the Local and Regional Projects. **Table 5.6-3** summarizes the impact significance conclusions.

TABLE 5.6-3
SUMMARY OF IMPACT GEO 5.6-2 SOIL EROSION

	Ocean Water Desalination Facility	Offshore Intake and Discharge Facilities	Inland Conveyance Facilities
Impact GEO 5.6-2: Impacts on soil erosion or topsoil loss.			
Local Project			
Construction	LTS	LTS	LTS
Operation	NI	NI	NI
Regional Project			
Construction	LTS	LTS	LTS
Operation	NI	NI	NI

NOTES:
NI = No Impact, no mitigation proposed
LTS = Less than Significant, no mitigation proposed

Local Project

None of the Project components are located in areas with topsoil capable of supporting natural vegetation. Project components would be located on fill or beach sand or under the ocean. Therefore, no impacts related to loss of topsoil would occur and topsoil is not discussed further.

Construction-Related Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Construction of the Local Project ocean water desalination facility would have the potential to result in soil erosion during excavation, grading, and soil stockpiling. Because the overall footprint of construction activities would exceed 1 acre, the proposed Project would be required to comply with the *NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ) (Construction General Permit),

and ESMC Chapter 5-4-9, all of which are described above in the Regulatory Framework. These state and local requirements were developed to ensure that stormwater is managed and erosion is controlled on construction sites. The Construction General Permit requires preparation and implementation of an SWPPP, which requires applications of BMPs to control run-on and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, use of infiltration swales, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. With compliance with existing regulations, impacts associated with soil erosion during construction would be less than significant.

Screened Ocean Intake and Concentrate Discharge

Offshore construction activities would include dredging that may include depositing dredge materials to the side of the excavated trenches or removing the excavated materials on a barge for disposal at the LA-2 dredge disposal site. The excavation would not induce erosion since the underwater trenches would be refilled. A less than significant impact would occur.

Desalinated Water Conveyance Components

Construction of the Local Project desalinated water conveyance components would have the potential to result in soil erosion during excavation and soil stockpiling. Compliance with the Construction General Permit would ensure that soil erosion is prevented. With compliance with the regulations discussed above, impacts associated with soil erosion during construction would be less than significant.

Mitigation Measures:

None Required.

Local Project Significance Determination:

Less than Significant Impact.

Operational Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Once constructed, the Local Project would not cause substantial soil erosion. As part of the Project design, the facility would include drainage improvements to capture stormwater on site and prevent scour caused from uncontrolled runoff. No impact would occur.

Screened Ocean Intake and Concentrate Discharge

Once constructed, operation of the intake and discharge facilities would not result in substantial soil erosion since they are beneath the ocean. No impact would occur.

Desalinated Water Conveyance Components

Once constructed, the desalinated water conveyance components would operate below grade and would not induce soil erosion. There would be no impact.

Mitigation Measures:

None Required.

Local Project Significance Determination:

No Impact.

Regional Project

Construction-Related Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Construction of the Regional Project would result in soil erosion impacts similar to the Local Project. Compliance with existing regulatory requirements (i.e., Construction General Permit and ESMC Chapter 5-4-9), would ensure a less than significant soil erosion impact.

Screened Ocean Intake and Concentrate Discharge

Construction of the Regional Project would result in soil erosion impacts similar to the Local Project. Compliance with existing regulatory requirements would ensure less than significant soil erosion impacts.

Desalinated Water Conveyance Components

Construction of the Regional Project would result in soil erosion impacts similar to the Local Project. Compliance with existing regulatory requirements would ensure less than significant soil erosion impacts.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

Less than Significant Impact.

Operational Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Once constructed operation of the desalination facility intake would not result in soil erosion. No impact would occur.

Screened Ocean Intake and Concentrate Discharge

Once operational, the Regional Project intake and discharge structures would not induce soil erosion since they would be below the ocean. No impact would occur.

Desalinated Water Conveyance Components

Once operational, the Regional Project desalinated water conveyance components and regional pump station would not induce soil erosion since they would be below ground structures. No impact would occur.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

No Impact.

Unstable Geologic Units or Soil

Impact 5.6-3: Would the Project 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 off-site landslides, lateral spreading, subsidence, liquefaction, or collapse?

The following analysis evaluates potential impacts associated with constructing and operating each of the three primary elements of the Project, including offshore, coastal, and inland Project components for both the Local and Regional Projects. **Table 5.6-4** summarizes the impact significance conclusions.

TABLE 5.6-4
SUMMARY OF IMPACT GEO 5.6-3 UNSTABLE GEOLOGIC UNITS OR SOIL

	Ocean Water Desalination Facility	Offshore Intake and Discharge Facilities	Inland Conveyance Facilities
Impact GEO 5.6-3: Impacts on unstable geologic units or soil.			
Local Project			
Construction	LTS	LTS	LTS
Operation	NI	NI	NI
Regional Project			
Construction	LTS	LTS	LTS
Operation	NI	NI	NI

NOTES:
NI = No Impact, no mitigation proposed
LTS = Less than Significant, no mitigation proposed

Local Project

Construction-Related Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

The Local Project ocean water desalination facility could expose people and structures to potential substantial adverse effects related to unstable geologic units and soils. As discussed above in the Environmental Setting, the existing landscaped berm on the eastern extent of the ESGS property represents a source of unstable soil. The CGS identified areas directly adjacent to the ESGS property as a ZORI for liquefaction, and past construction activities for the El Segundo Power Facility Modification have documented the presence of shallow groundwater levels ranging from 7 to 11 feet below ground surface on the ESGS site, indicating that subsurface conditions at the ESGS are likely conducive of liquefaction.

As previously discussed, the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential unstable geologic units and soils. Compliance with existing regulations would require preparation

of a soils engineering report pursuant to the CBC for areas of the ESGS property where the ocean water desalination facility and its appurtenant facilities would be located. The soils engineering report would include recommendations for soils remediation and/or foundation systems necessary to reduce impacts related to liquefaction and landslide. With compliance with existing regulations, potential substantial adverse effects involving unstable geologic units and soils would be less than significant.

Screened Ocean Intake and Concentrate Discharge

Construction offshore could encounter unstable sediment. The pipelines would be constructed within the existing intake tunnel and would not be exposed to or affect sediment conditions outside of the tunnel. The intake screens and discharge diffusers that would be installed at the end of the existing intake tunnel would be placed on reworked riprap that would not result in unstable sediment conditions, resulting in a less than significant impact.

Desalinated Water Conveyance Components

The Venice and Inglewood Quadrangles contain several areas that are subject to liquefaction, including a narrow strip of shoreline and southern portions of the city of Gardena. However, no aspect of the proposed Local Project desalinated water conveyance components would be installed in these identified areas and no impact would occur. Operation of the Local Project desalinated water conveyance components would not expose people or structures to substantial adverse effects involving lateral spreading, subsidence, or collapse.

The CGS designates several areas of the Venice and Inglewood Quadrangles as Landslide Hazard Zones, particularly in isolated areas less than a mile from the shoreline and in the northwest corner of the Inglewood Quadrangle near Windsor Hills. As depicted in Figure 5.6-3, a segment of the desalinated water conveyance components approximately 0.3 mile from the shoreline would be installed within a small area identified as a Landslide Hazard Zone. As previously discussed, the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential unstable geologic units and soils. The preparation of a geotechnical investigation and implementation of its recommendations would ensure that impacts would be less than significant

Mitigation Measures:

None Required.

Local Project Significance Determination:

Less than Significant Impact.

Operational Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Once constructed, the previously discussed unstable soil conditions under the Local Project ocean water desalination facility would have been addressed by implementing the recommendations of the required geotechnical investigation. No impact would occur.

Screened Ocean Intake and Concentrate Discharge

Once installed, the intake and discharge facilities would be located on reworked riprap that would not expose people to geologic hazards associated with unstable soils. No impact would occur.

Desalinated Water Conveyance Components

Once constructed, the implementation of the recommendations in the required geotechnical investigation would have addressed the landslide hazards in the isolated areas less than a mile from the shoreline and in the northwest corner of the Inglewood Quadrangle near Windsor Hills and there would be no impact. No other unstable soil conditions are known.

Mitigation Measures:

None Required.

Local Project Significance Determination:

No Impact.

Regional Project

Construction-Related Impacts

Ocean Water Desalination Facility – ESGS North and South Sites

Similar to the Local Project, construction of the Regional Project ocean water desalination facility would not result in the exposure of people and structures to potential substantial adverse effects related to unstable geologic units and soils. Compliance with the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential unstable geologic units and soils. The Regional Project would not expose people or structures to substantial adverse effects involving landslides, lateral spreading, subsidence, liquefaction, or collapse. A less than significant impact would occur.

Screened Ocean Intake and Concentrate Discharge

Similar to the Local Project, construction of the Regional Project intake and discharge facilities would not expose people or structures to substantial adverse effects involving landslides, lateral spreading, subsidence, liquefaction, or collapse. Compliance with the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential unstable geologic units and soils. A less than significant impact would occur.

Desalinated Water Conveyance Components

Similar to the Local Project, construction of the Regional Project conveyance facilities would not expose people or structures to substantial adverse effects involving landslides, lateral spreading, subsidence, liquefaction, or collapse. Compliance with the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential unstable geologic units and soils. A less than significant impact would occur.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

Less than Significant Impact.

Operational Impacts

All Project Components

Once constructed, there would be no exposure of people and structures to potential substantial adverse effects related to unstable geologic units and soils and there would be no impact.

Mitigation Measures:

None Required.

Regional Project Significance Determination:

No Impact.

Expansive Soils

Impact GEO 5.6-4: Would the Project could be located on expansive soil creating substantial risks to life or property?

The following analysis evaluates potential impacts associated with constructing and operating each of the three primary elements of the Project, including offshore, coastal, and inland Project components for both the Local and Regional Projects. **Table 5.6-5** summarizes the impact significance conclusions.

Local and Regional Projects

Construction-Related and Operational Impacts

All Project Components

The ESGS North and South Sites, offshore intake and discharge impact areas, and desalinated water conveyance component areas do not appear to contain soils susceptible to expansion. Compliance with the CBC and local ordinances would require appropriate design-level geotechnical evaluations and the recommendation of design-level measures to address potential expansive soils if any are encountered. A less than significant impact would occur.

Mitigation Measures:

None Required.

Local and Regional Project Significance Determination:

Less than Significant Impact.

TABLE 5.6-5
SUMMARY OF IMPACT GEO 5.6-4 EXPANSIVE SOILS

	Ocean Water Desalination Facility	Offshore Intake and Discharge Facilities	Inland Conveyance Facilities
Impact GEO 5.6-4: Impacts on expansive soils.			
Local Project			
Construction	LTS	LTS	LTS
Operation	LTS	LTS	LTS
Regional Project			
Construction	LTS	LTS	LTS
Operation	LTS	LTS	LTS

NOTES:
LTS = Less than Significant, no mitigation proposed

Septic Tanks

Impact GEO 5.6-5: Would the Project could 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?

The following analysis evaluates potential impacts associated with constructing and operating each of the three primary elements of the Project, including offshore, coastal, and inland Project components for both the Local and Regional Projects. **Table 5.6-6** summarizes the impact significance conclusions.

Local and Regional Projects

Construction-Related and Operational Impacts

All Project Components

Project construction and operations would not involve the use of septic tanks or alternative wastewater disposal systems, since the Project would connect to the existing local sewer system for the disposal of wastewater. No impact would occur.

Mitigation Measures:

None Required.

Local and Regional Project Significance Determination:

No Impact.

TABLE 5.6-6
SUMMARY OF IMPACT GEO 5.6-5 SEPTIC TANKS

	Ocean Water Desalination Facility	Offshore Intake and Discharge Facilities	Inland Conveyance Facilities
Impact GEO 5.6-1: Impacts on septic tanks or alternative wastewater disposal.			
Local Project			
Construction	NI	NI	NI
Operation	NI	NI	NI
Regional Project			
Construction	NI	NI	NI
Operation	NI	NI	NI

NOTES:
NI = No Impact, no mitigation proposed

5.6.5 Cumulative Impacts

In general, geologic impacts are localized and cumulative impacts generally only occur where projects are constructed in close proximity such that impacts have the potential to overlap. There are no cumulative projects in proximity to the Project such that there would be the potential for overlapping impacts. The Project would construct an essential public utility in an urbanized area subject to seismic activity. The facility would not exacerbate the existing risks to existing people or structures. Exposure of people and structures to potential adverse effects involving seismic hazards, unstable geologic units, and expansive soils would not be increased by implementation of the Project. Therefore, the Project would not have the potential to result in a considerable contribution to any impact related to geology, soils, and seismicity and impacts would be less than significant.

5.6.6 Significant Unavoidable Impacts

No significant unavoidable impacts to geology, soils, and seismicity have been identified.

5.6.7 Sources Cited

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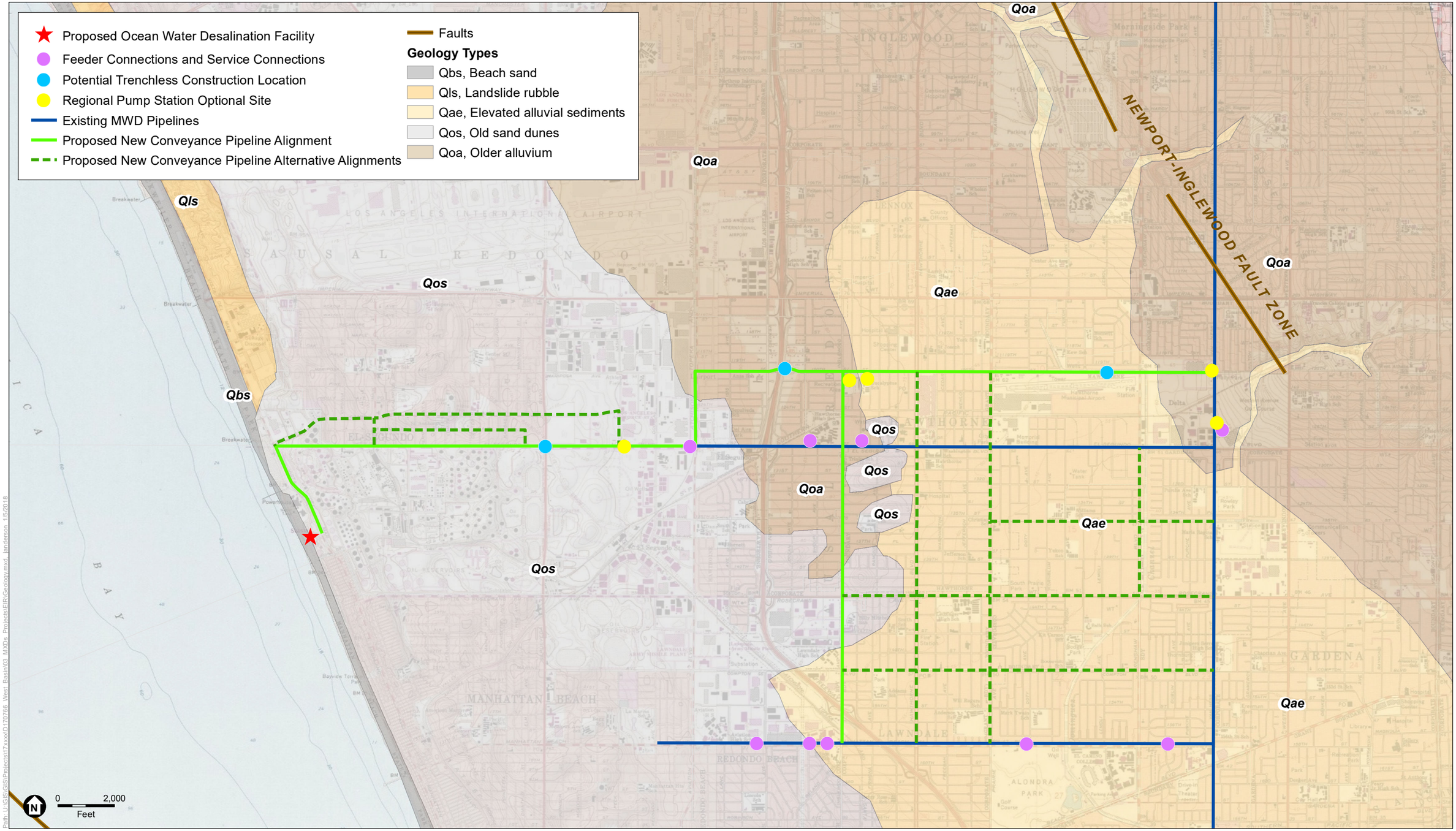
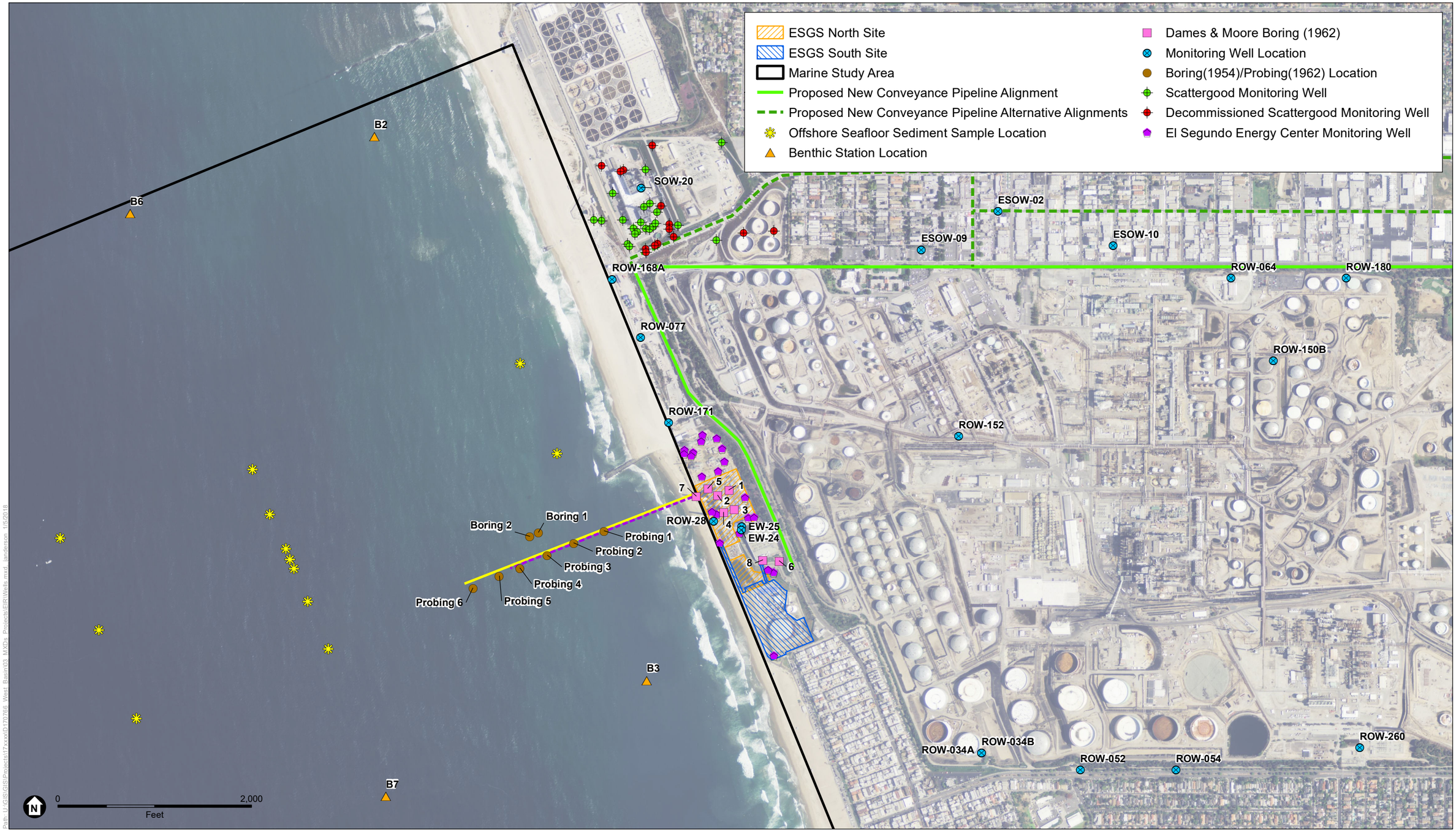


SOURCE: ESRI; CGS

West Basin Ocean Water Desalination Project

Figure 5.6-1
Geologic Map of Project Area

ESA



SOURCE: ESRI

West Basin Ocean Water Desalination Project

Figure 5.6-2
Historical Field Sampling and Existing Monitoring Well Locations

ESA

SOURCE: CalWater; Nature Conservancy

West Basin Ocean Water Desalination Project

Figure 5.6-3
Liquefaction Hazard Map

ESA

SOURCE: CalWater; Nature Conservancy

West Basin Ocean Water Desalination Project

Figure 5.6-4
Landslide Hazard Map

ESA