4.7 Geology and Soils

This section addresses issues involving geology and soils resulting from the Project. This section also describes the environmental setting, regulatory setting, identifies the applicable significance thresholds for impacts, assesses potential impacts of the Project, and recommends measures to mitigate any significant impacts, if applicable. The section also provides a discussion of cumulative impacts. Alternatives are discussed in Chapter 5.0, Alternatives.

As described in Chapter 2.0, Project Description, the Project would include the demolition of aboveground infrastructure and remediation of the site, followed by soil stabilization or revegetation of disturbed areas, with some minor long-term operations associated with remediation.

4.7.1 Environmental Setting

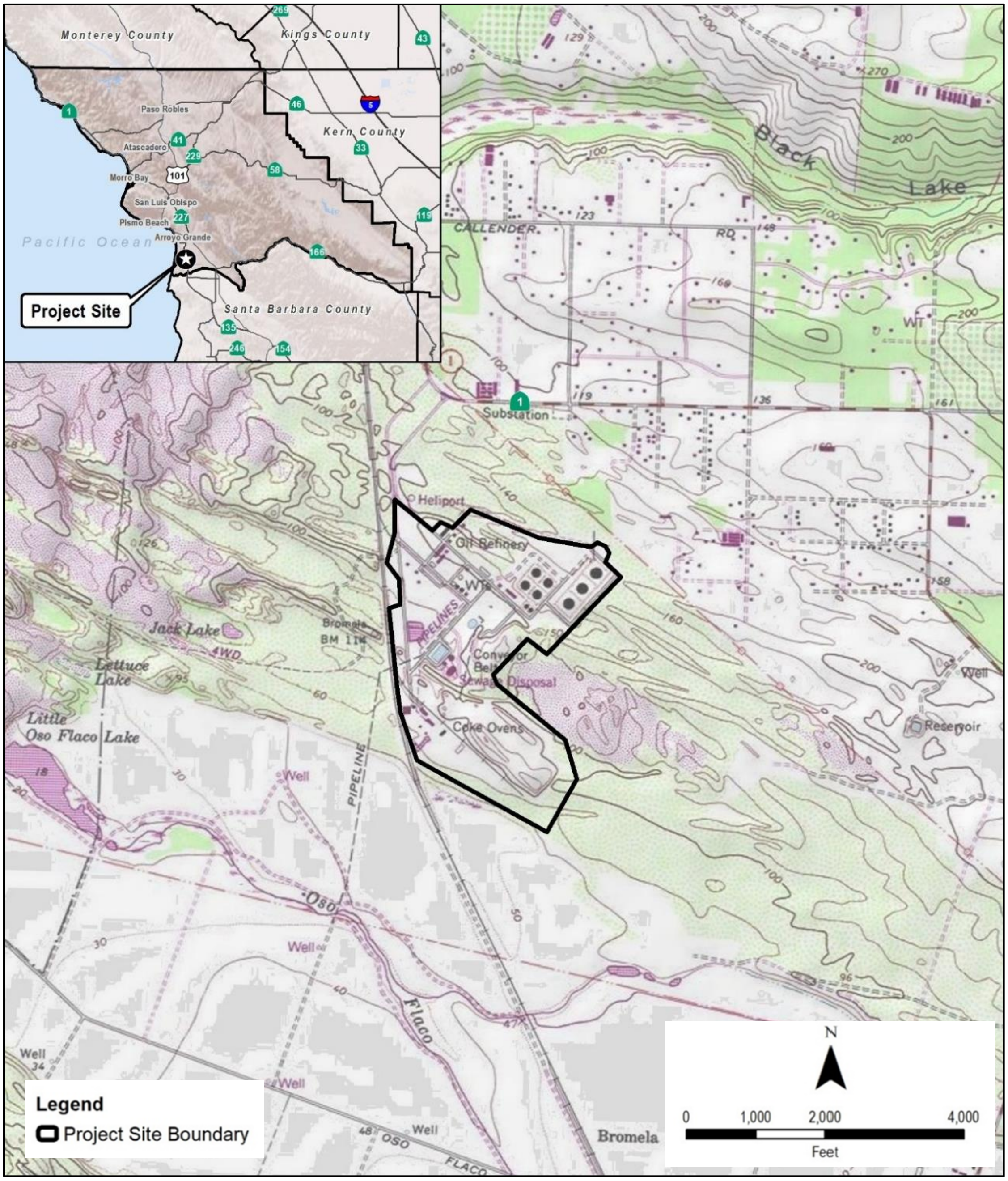
4.7.1.1 Regional Geologic Setting

The Project site is located in the Santa Maria Valley, at the southwestern edge of the Nipomo Mesa. The Nipomo Mesa and Santa Maria Valley comprise a structural and topographic basin bounded by the Casmalia and Solomon Hills on the south, Pacific Ocean on the west, Edna Hills and Newsom Ridge on the north-northeast, and San Rafael Mountains on the east-southeast. The regional geologic structure surrounding and including the Santa Maria Valley area is extremely complex, as it lies within the structural influence of both the California Coast Ranges and the Transverse Ranges of southern California. The older rocks, which are exposed in the bordering ranges, are concealed at considerable depth beneath Tertiary and Quaternary rocks. The Tertiary rocks form a series of west-trending folds. Of these folds, the northern-most forms the basin beneath the Santa Maria and Sisquoc valleys (Worts 1951).

4.7.1.2 Topography and Stratigraphy

The Project site is located on undulating dune topography, with elevations ranging from approximately 100 to 180 feet above mean sea level (see Figure 4.7-1). The slope gradients are predominantly gentle, with localized engineered slopes up to 30 feet high where the topography has been modified by grading. The engineered slope gradients are generally 2:1 (horizontal to vertical) or flatter. Spill containment berms are constructed around aboveground storage tanks. In addition, a large evaporation/percolation basin (Evaporation Pond 2) with engineered side slopes is located in the southwest part of the site (see Figure 2-3).

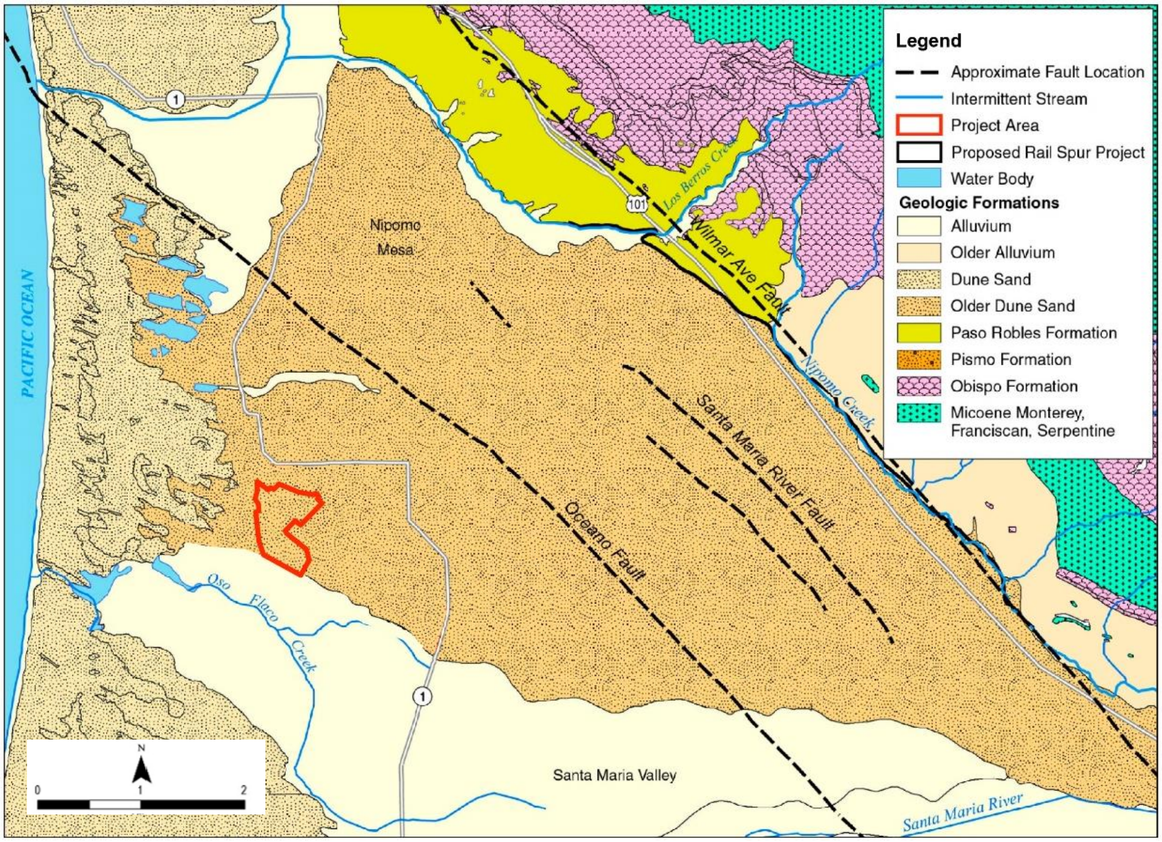
Figure 4.7-1 Regional Project Topography



Source: USGS 7.5-Minute Quads

Underlying sediments, to a depth of approximately 60 feet, are relatively uniform across the Project site, consisting primarily of poorly-graded dune sands with limited thin interbeds of silt and clay (see Figure 4.7-2). The sands are generally loose to medium dense at the surface, becoming denser and slightly coarser grained with depth. These late Quaternary wind-blown deposits are underlain by late Quaternary alluvium, Plio-Pleistocene sediments of the Paso Robles Formation, and/or Pliocene and Miocene age sedimentary rocks (Dames & Moore 1990; County 2015).

Figure 4.7-2 Geology of Project Area



Source: CDWR 2002; County 2015

The active wastewater outfall line originates at the water effluent treatment (WET) plant (Area 7 on Figure 2-3) and runs west through the Pismo/Oceano dunes for two miles to the shoreline and then terminates at a seafloor diffuser located 0.5 mile offshore in State Lands lease Public Resources Code (PRC) 1449.1, at a surveyed depth of approximately 38 feet below mean sea level. Inshore portions of the outfall line corridor lie beneath a zone of shallow sand bars and breaking waves. The nearshore environment features a broad sand beach, which is exposed to the prevailing northwesterly wind and swells (Tenera/Stantec 2023). Active sand dunes between the intertidal zone and the Santa Maria Refinery (SMR) consist of a series of parallel ridges generally aligned perpendicular to the prevailing west-northwesterly winds. The topography of the older dune sands, which comprise the sediments along the eastern portion of the outfall line, generally consists of broad west-northwest trending drainages and intervening broad ridges.

4.7.1.3 Seismicity and Faulting

The County of San Luis Obispo (County) is located in a geologically complex and seismically active region that is subject to earthquakes and potentially strong ground shaking. Earthquakes up to magnitude 4.0 commonly occur throughout the region and available historical and instrumental data indicate at least 11 magnitude 5.0 to 6.5 earthquakes have occurred in the onshore and offshore areas of the site region since 1902. In addition to these local earthquakes, the 1927 Lompoc earthquake (magnitude 7.0), located offshore of Point Arguello, and the 1857 Fort Tejon earthquake (magnitude 7.9), located on the San Andreas Fault, generated significant strong ground motion at the site (Dames & Moore 1990).

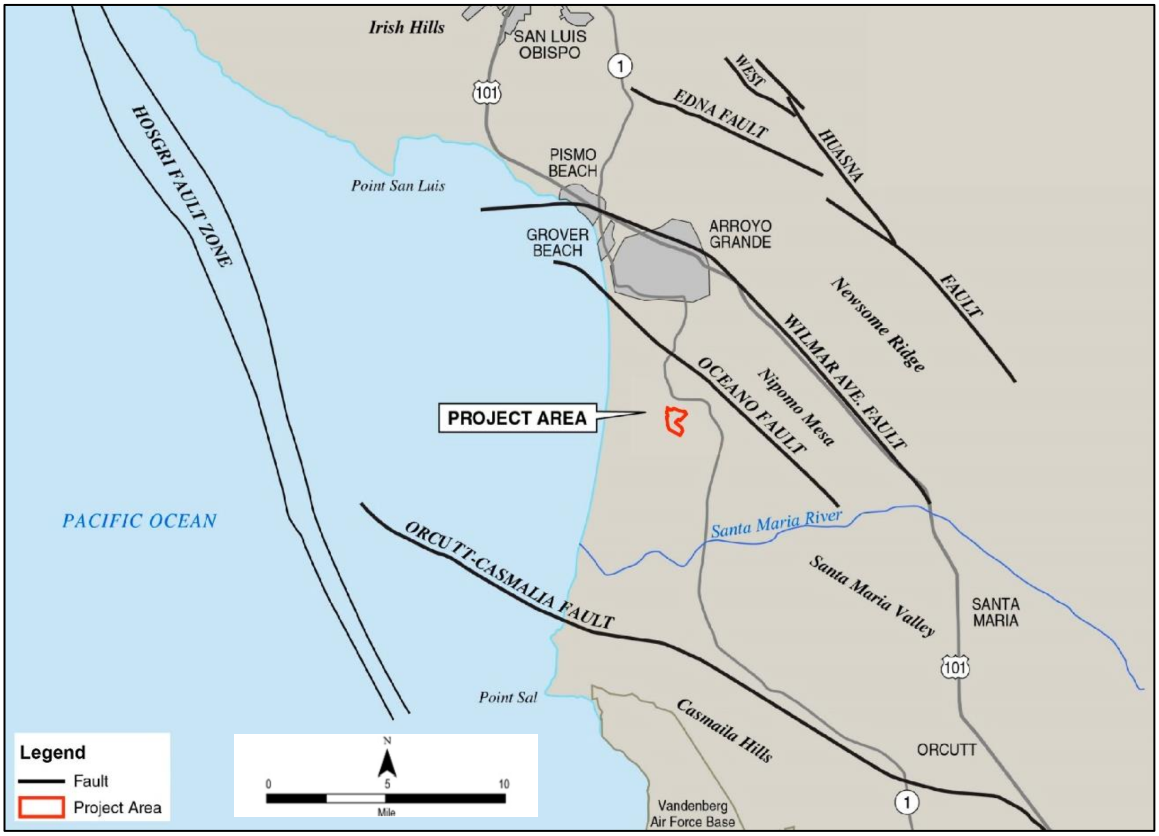
Surface fault rupture is the displacement of ground surface that occurs along a fault line during an earthquake event. Based on criteria established by the California Geological Survey (CGS), previously known as the California Division of Mines and Geology, faults are classified as either Holocene-active, pre-Holocene, or age-undetermined. Faults are considered active when they have shown evidence of movement within the past 11,700 years (i.e., Holocene epoch). Pre-Holocene faults, also known as potentially active faults, are those that have shown evidence of movement more than 11,700 years ago and generally before 1.6 million years (Quaternary age). Faults whose age of most recent movement is not known or is unconstrained by dating methods or by limitations in stratigraphic resolution are considered age-undetermined and inactive (CGS 2018).

The Alquist-Priolo Earthquake Fault Zoning Act (formerly known as the Alquist-Priolo Special Studies Zones Act) established state policy to identify active faults and determine a boundary zone on either side of a known fault trace, called an Alquist-Priolo Earthquake Fault Zone. The delineated width of an Alquist-Priolo Earthquake Fault is based on the location, precision, complexity, or regional significance of the fault and can be between 200 and 500 feet in width on either side of the fault trace. If a site lies within a designated Alquist-Priolo Earthquake Fault Zone, a geologic fault rupture investigation must be performed to demonstrate that a proposed building site is not threatened by surface displacement from the fault before development permits may be issued (CGS 2018). The closest Alquist-Priolo Earthquake Fault Zone to the Project site is the Los Osos Fault Zone, located near the City of San Luis Obispo, approximately 17 miles to the north-northwest (CGS 2023).

Major active or potentially active faults in the region include the Hosgri, Orcutt-Casmalia, Wilmar Avenue, and Oceano faults (see Figures 4.7-2 and 4.7-3). These faults have the potential to generate the greatest strong ground motion at the site. Other faults in the region, including the Los Osos and Lion’s Head faults, could also generate earthquakes that could affect the site (Dames & Moore 1990).

In 2008, the U.S. Geological Survey (USGS) produced updated seismic hazard maps for the conterminous United States, including peak ground accelerations (PGAs) and spectral accelerations for a range of return periods and exceedance probabilities (Peterson et al. 2008). Multiple seismogenic source zones and ground motion prediction equations were used to develop the maps and hazard values. Predicted PGA values for the site based on USGS data are provided in Table 4.7.1 (County 2015). PGA depends largely on the ability of the surficial geologic unit to transmit seismic energy. These values were calculated using shear wave velocities representative of deep alluvial or eolian deposits observed in the area (CDWR 2002).

Figure 4.7-3 Generalized Fault Map of Project Area



Source: Dames and Moore 1990; CDWR 2002; County 2015

Table 4.7.1 Project Peak Ground Acceleration Values

Return Period (Years)	PGA (%g)	Mean Magnitude	Mean Distance (km)
30	10.72	6.52	65.7
72	10.73	6.65	51.4
144	15.22	6.69	41.7
475	26.04	6.67	28.2
1485	40.49	6.62	19.1
2475	48.27	6.61	16.3
4950	59.57	6.60	13.6
9900	71.84	6.59	11.7

Source: County 2015

The highest predicted PGA value for a seismic event in the Project area with a return period of 144 years or less would be 0.15g. The predicted PGA would create strong ground shaking corresponding to a Modified Mercalli Intensity of VI, which could potentially cause light infrastructure damage (Wald et al. 1999; County 2015).

Similarly, a site-specific seismic analysis was completed for previous SMR upgrades (Dames & Moore 1990). Available geologic data suggest that the highest PGAs occurring at the Project site, in association with a maximum credible earthquake (MCE), would occur on the Orcutt-Casmalia or Hosgri faults, which have an MCE of magnitude 6.9 and 7.2, respectively. The PGAs for the MCE, maximum probable earthquake (MPE), and Upper-Level Event (ULE) earthquakes on both these faults would be similar (approximately 0.14g to 0.15g for ULE earthquakes, 0.26g for the MCE, and 0.09g for the MPE) and are probably the most relevant for design considerations at the site. The ULE has a 10 percent probability of occurrence in 50 years, which is equivalent to a recurrence interval of approximately 475 years (Dames & Moore 1990).

Seismic design criteria have been updated since completion of the 1990 Dames & Moore seismic analysis. The 2022 California Building Code (CBC) currently requires that structures be designed to resist a minimum seismic force resulting from ground motion having a 2 percent probability of being exceeded in a 50-year period (CBC 2023; ASCE 2023), which is a more conservative, stricter approach than a 10 percent probability of occurrence in 50 years.

4.7.1.4 Liquefaction

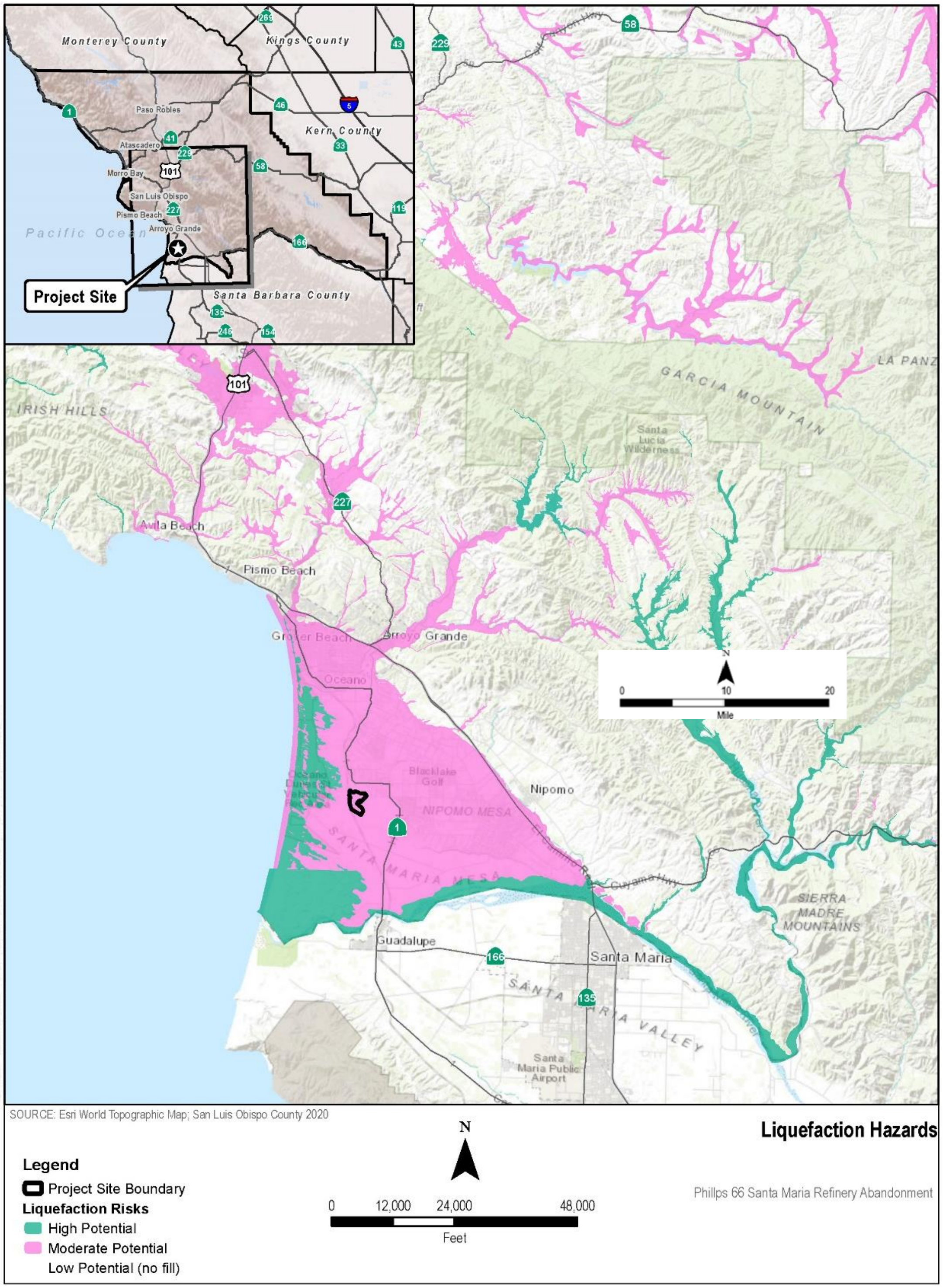
State of California Liquefaction Hazard Zones have not been established for the County; however, the County General Plan Safety Element indicates that locally shallow groundwater and sandy soils have created a moderate potential for liquefaction in the Project area (Figure 4.7-4) (County 1999). Liquefaction is the phenomenon in which loose, saturated, granular soils lose strength due to excess pore water pressure buildup during an earthquake. Liquefaction is usually manifested by the formation of boils and mud-spouts at the ground surface, by seepage of water through ground cracks, or in some cases by the development of quick-sand-like conditions.

Where the latter occurs, structures or equipment may sink substantially into the ground or tilt excessively, light weight structures may float upwards, and foundations may displace vertically or laterally, causing structural failures. The phenomenon of liquefaction generally adds to the damages which would otherwise be caused by strong ground motions alone. Lateral spreading typically occurs in association with liquefaction. Lateral spreading occurs when liquefaction of a subsurface layer causes the mass to flow down slope, moving blocks of ground at the surface.

The proximity of the site to the Oso Flaco Creek floodplain to the south indicates that high groundwater levels may be seasonally high or under other high water table conditions. In 1990, borings drilled at the SMR indicated that shallow groundwater was locally present at an elevation of 56 to 58 feet above mean sea level, corresponding to a depth of approximately 40 feet in the lower elevations of the Project site. Borings drilled from higher elevations within the SMR, up to 40 feet higher than the lower portions of the Project site, did not encounter groundwater to a depth of 61 feet (Dames & Moore 1990). Borings subsequently drilled in 2008 at the SMR did not encounter groundwater to a maximum depth of 31 feet, although these borings were also drilled at elevations up to 40 feet higher than the lower portions of the Project site (County 2015).

The Project site is underlain by relatively uniform sand. In general, the sands are sufficiently dense to resist liquefaction at levels of seismically induced ground motion corresponding to the ULE earthquake (Dames & Moore 1990). However, as indicated in Figure 4.7-4, the area between the Project site and the Pacific Ocean is considered an area of high liquefaction potential and therefore, the wastewater outfall pipeline and outfall terminus are in an area with high potential for liquefaction. The Project site is not in an area of documented land subsidence due to groundwater pumping, peat loss, or oil extraction (USGS 2023).

Figure 4.7-4 Liquefaction Hazards



Source: County 2020

4.7.1.5 Mineral Resources

The CGS has classified land in the County according to the presence or absence of significant Portland cement concrete-grade aggregate deposits. The Project site is within an area classified as MRZ-3, which contains known or inferred mineral occurrences of undetermined mineral resource significance. Only Portland cement concrete (PCC)-grade criteria were considered in classifying MRZ-3 areas. MRZ-2 areas, which are areas with a high likelihood for the occurrence of significant mineral resources, have been mapped by the CGS in combination with areas having current land uses deemed compatible with potential mining. The closest such area to the Project site is located approximately 0.6 mile southeast of the Project site (CGS 2011).

The County has similarly classified land in the County according to the presence or absence of appreciable mineral resources. The Project site is not located in an Energy or Extractive Resource Area (EX) or Extractive Resource Area (EX-1). The closest aggregate production areas, which are designated EX-1 areas, are located approximately three miles southwest and six miles southeast of the Project site, respectively, along the Santa Maria River (County 2010; CGS 2012).

4.7.2 Regulatory Setting

4.7.2.1 Federal Regulations

Occupational Safety and Health Administration Regulations

Excavation and trenching are among the most hazardous construction operations. Occupational Safety and Health Administration (OSHA) Excavation and Trenching Standard, Title 29 of the Code of Federal Regulations, Part 1926, Subpart P, covers requirements for excavation and trenching operations. OSHA requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area.

4.7.2.2 State Regulations

California Building Standards Code

The state regulations protecting structures from geo-seismic hazards are contained in the CBC (24 California Code of Regulations [CCR] Part 2), which is updated on a triennial basis. These regulations apply to public and private buildings in the state. Until January 1, 2008, the CBC was based on the then-current Uniform Building Code and contained additions, amendments, and repeals specific to building conditions and structural requirements of the State of California. The 2022 CBC, effective January 1, 2021, is based on the 2021 International Building Code and enhances the sections dealing with existing structures. Seismic-resistant construction design is required to meet more stringent technical standards than those set by previous versions of the CBC.

Chapters 16 and 16A of the 2022 CBC include structural design requirements governing seismically resistant construction, 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. Chapters 18 and 18A include the requirements for foundation and soil investigations (Sections 1803 and 1803A); excavation, grading, and fill (Sections 1804 and 1804A); damp-proofing and water-proofing (Sections 1805 and 1805A); allowable load-bearing values of soils (Sections 1806 and 1806A); the design of foundation walls, retaining walls, embedded posts and poles (Sections 1807 and 1807A), and foundations (Sections 1808 and 1808A); and design of shallow foundations (Sections 1809 and 1809A) and deep foundations (Sections 1810 and 1810A). Chapter 33 of the 2022 CBC includes requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes (Section 3304).

Construction activities are subject to occupational safety standards for excavation and trenching, as specified in the California Safety and Health Administration regulations (Title 8 of the CCR, see below) and in Chapter 33 of the CBC. These regulations specify the measures to be used for excavation and trench work where workers could be exposed to unstable soil conditions. The Project would be required to employ these safety measures during excavation and trenching.

California Health and Safety Code

Sections 17922 and 17951–17958.7 of the California Health and Safety Code require cities and counties to adopt and enforce the current edition (2022) of the CBC, including a grading section. Sections of Volume II of the CBC specifically apply to select geologic hazards.

California Occupational Safety and Health Administration Regulations

In California, California OSHA (Cal/OSHA) has responsibility for implementing federal rules relevant to worker safety, including slope protection during construction excavations. Cal/OSHA's requirements are more restrictive and protective than federal OSHA standards. Title 8 of the CCR, Chapter 4, Division of Industrial Safety, covers requirements for excavation and trenching operations, as well as safety standards whenever employment exists in connection with the construction, alteration, painting, repairing, construction maintenance, renovation, removal, or wrecking of any fixed structure or its part.

Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act of 1975 (SMARA) was enacted to promote conservation of the state's mineral resources and to ensure adequate reclamation of lands once those lands have been mined. Among other provisions, SMARA requires the State Geologist to classify land in California for mineral resource potential. The State Geologist submits the mineral land classification report to the State Mining and Geology Board, which transmits the information to appropriate local governments that maintain jurisdictional authority in mining, reclamation, and related land use activities.

Local governments are required to incorporate the State Mining and Geology Board report and maps into their general plans and consider the information when making land use decisions. In accordance with the SMARA, Section 2762, before permitting a use in an MRZ-3 area that would threaten the potential to extract minerals in that area, the lead agency must first require the significance of the minerals to be evaluated. The lead agency's report must be forwarded to the State Geologist.

4.7.2.3 Local Regulations

County of San Luis Obispo General Plan

The County's General Plan Safety Element provides measures for evaluation of geologic hazards and geotechnical requirements related to new construction to reduce the potential for loss of life and reduce the amount of property damage. In addition, the County's Conservation and Open Space Element balances protection of mineral and other resources in order to enable exploitation of important mineral resources, while protecting the environment.

4.7.3 Thresholds of Significance

The following significance criteria for geology and soils were derived from the County's Environmental Checklist, which was developed in accordance with Appendix G of the State California Environmental Quality Act (CEQA) Guidelines. Impacts of the Project would be considered significant and would require mitigation if the Project:

a. Results in exposure to or production of unstable earth conditions, such as landslides, earthquakes, liquefaction, ground failure, land subsidence, or other similar hazards;

b. Is located in a CGS Alquist-Priolo Earthquake Fault Zone, or other known fault zones, per the California Division of Mines and Geology Special Publication 42;

c. Results in soil erosion, topographic changes, loss of topsoil, or unstable soil conditions from Project-related improvements, such as vegetation removal, grading, excavation, or fill;

d. Includes structures located on expansive soils;

e. Is inconsistent with the goals and policies of the County's Safety Element relating to geologic and seismic hazards; or

f. Precludes the future extraction of valuable mineral resources.

4.7.4 Impact Assessment Methodology

Potential direct and indirect Project impacts related to geology and soils were evaluated against the thresholds of significance listed in Section 4.7.3 and are discussed below. The impact analysis evaluates potential Project impacts during both demolition and remediation activities (construction phase) and restoration (revegetation and monitoring phase).

In December 2015, in California Building Industry Association v. Bay Area Air Quality Management District (2015) 62 Cal.4th 369, 392, the California Supreme Court found that "agencies generally subject to CEQA are not required to analyze the impact of existing environmental conditions on a project's future users or residents. But when a proposed project risks exacerbating those environmental hazards or conditions that already exist, an agency must analyze the potential impact of such hazards on future residents or users. In those specific instances, it is the project's impact on the environment – and not the environment's impact on the project – that compels an evaluation of how future residents or users could be affected by exacerbated conditions." Thus, with respect to geologic and seismic hazards, the County is not required to consider impacts to infrastructure remaining on site, including the wastewater outfall, unless the remnant infrastructure itself would worsen or otherwise exacerbate the geologic conditions on site. Nonetheless, in order to provide a complete picture of the Project, geologic and seismic hazard impacts are discussed below.

4.7.5 Project-Specific Impacts and Mitigation Measures

Impact #	Impact Description	Residual Impact
GEO.1	Threshold a): Would the Project potentially result in exposure to or production of unstable earth conditions, such as landslides, earthquakes, liquefaction, ground failure, land subsidence, or other similar hazards?	Class III

Seismicity

As discussed in Section 4.7.1, the County is located in a geologically complex and seismically active region that is subject to earthquakes and potentially strong ground shaking. Major active or potentially active faults in the region include the Hosgri, Orcutt-Casmalia, Wilmar Avenue, and Oceano faults (Figures 4.7-2 and 4.7-3). These faults have the potential to generate the greatest strong ground motion at the site. Available geologic data suggest that the highest PGAs occurring at the Project site, in association with a MCE, would occur on the Orcutt-Casmalia or Hosgri faults, which have an MCE of magnitude 6.9 and 7.2, respectively. In general, SMR sediments are sufficiently dense to prevent liquefaction at levels of seismically induced ground motion corresponding to the ULE earthquake. However, the wastewater outfall pipeline traverses an area of potentially high liquefaction potential. The Project area is not located in an area of documented land subsidence.

The Project would not include any new construction. The Project would include demolishing existing aboveground and some belowground facilities where remediation is required, except for any essential infrastructure or utilities required to be kept in place by regulatory authorities, and features for potential use by subsequent site occupants, including the existing wastewater treatment system ocean outfall pipeline. In the absence of processing of crude oil at the site, abandonment of the facility would reduce the potential for releases of crude oil and related substances into the environment because of seismically induced ground movement and associated equipment failure (some minor equipment would remain).

The wastewater outfall pipeline is not underlain by an active fault and would not be subject to rupture as a result of fault movement. The outfall would likely be subject to strong seismically induced ground movement and associated liquefaction, which may include differential settlement and rupture. However, as described in Section 4.7.4, significant impacts would only occur in the event the Project caused or exacerbated the potential for earthquakes and associated ground failure to occur. Leaving the outfall pipeline in-place following SMR demolition and remediation completion would not cause or exacerbate the potential for earthquakes and associated ground failure to occur. For the purposes of this analysis, it is assumed that the outfall pipeline would be empty following SMR abandonment. Therefore, any potential rupture of the outfall pipeline would not result in the release of any substances that might result in adverse environmental impacts. Any future users of the outfall would be subject to additional CEQA review with respect to potential spills from the outfall. As a result, seismic related impacts at the wastewater outfall pipeline would be less than significant.

Slope Stability

On-site slope gradients at the SMR are predominantly gentle, with localized engineered slopes up to 30 feet high where the topography has been modified by grading. The engineered slope gradients are generally 2:1 (horizontal to vertical) or flatter. As a result, the potential for on-site landslides is low. Proposed soil remediation would entail assessment and characterization of site soil and excavation in areas of identified impacted soils, where needed, and stockpiling, loading, and hauling of impacted material for off-site disposal. Groundwater remediation is not anticipated to be required, as discussed further below, but is ongoing. Phillips 66 indicates that the SMR is currently coordinating its investigation and remediation programs with the Central Coast Regional Water Quality Control Board. Although the full details of site remediation are still not yet known, County planning staff indicated the need to evaluate the demolition activities concurrent with the site remediation activities in the same CEQA analysis. For the purposes of Project impacts related to geology and soils, the conceptual remediation approach for the site only includes excavation and off-site disposal, followed by backfill, hardscape replacement where needed and minimal grading of the site to match the surrounding topography (primarily in Area 6, Coke Storage; see Chapter 2.0, Project Description, Figure 2-3).

Excavations for facility and infrastructure demolition/removal and soil remediation would result in temporary steep slopes pending completion of remediation with final site grading to match existing slopes. These temporary excavations would likely include relatively narrow trenches with vertical walls, such as for utility or pipeline removal, or large open excavations with temporary steep slopes created during removal of contaminated soil. Temporary slopes are typically created at a gradient of ¾:1 to prevent caving and failure. In the absence of proper shoring and/or temporary slope construction, trench sidewalls and temporary slopes could collapse, resulting in injury or death to on-site personnel.

However, temporary excavations would be completed in accordance with Cal/OSHA, which has responsibility for implementing federal rules relevant to worker safety, including slope protection during construction excavations. As described in Section 4.7.2, Cal/OSHA's requirements are more restrictive and protective than federal OSHA standards. Title 8 of the CCR, Chapter 4, Division of Industrial Safety, covers requirements for excavation and trenching operations, as well as safety standards whenever employment exists in connection with removal or wrecking of any fixed structure or its part. Compliance with Cal/OSHA regulations would prevent caving of temporary trench walls and failure of temporary steep slopes during facility/infrastructure removals and soil remediation activities. As a result, slope stability related impacts would be **less than significant (Class III).**

Impact #	Impact Description	Residual Impact
GEO.2	Threshold b): Would the Project be located in a CGS Alquist-Priolo Earthquake Fault Zone, or other known fault zones, per the California Division of Mines and Geology Special Publication 42.?	Class III

As discussed in Section 4.7.1, no known fault zones traverse the SMR or wastewater outfall pipeline. The closest Alquist-Priolo Earthquake Fault Zone to the Project site is the Los Osos Fault Zone, located near the City of San Luis Obispo, approximately 17 miles to the north-northwest. Major active or potentially active faults identified in the region include the Hosgri, Orcutt-Casmalia, Wilmar Avenue, and Oceano faults (Figures 4.7-2 and 4.7-3). As a result, no impacts would occur with respect to known fault zones, and Project impacts would be **less than significant (Class III).**

Impact #	Impact Description	Residual Impact
GEO.3	Threshold c): Results in soil erosion, topographic changes, loss of topsoil, or unstable soil conditions from Project-related improvements, such as vegetation removal, grading, excavation, or fill?	Class III

The Project would include demolishing existing aboveground and some of the belowground facilities where remediation is required, except for any essential infrastructure or utilities required to be kept in place by regulatory authorities, and features for potential use by subsequent site occupants, including the existing wastewater treatment system ocean outfall pipeline. Excavations for removal of foundations, pipelines, utilities, and other facilities, where needed for remediation, would result in soil disturbance and temporary soil stockpiling, pending off-site disposal or reuse on site. Similarly, soil remediation would involve soil excavations and temporary soil stockpiling, pending sampling and analysis to determine appropriate off-site disposal options.

Equipment staging areas would be established in paved areas of the site, and existing roads and accessways would be used for hauling. In the vegetated areas at the site perimeters, soil testing equipment could result in soil disturbance during testing, and disturbance would occur during remediation activity where test results are positive. Existing vegetation within the SMR fence line would be disturbed locally during demolition and remediation. Topsoil would be segregated and stored in stockpiles pending reuse during revegetation. In the absence of proper soil management, each of these soil disturbing activities could result in wind and water erosion, and associated off-site sedimentation of downstream water bodies, including Oso Flaco Creek, located approximately 0.6 mile southwest of the Project site, and Little Oso Flaco Lake (Figure 4.10-1), located 0.25 mile from the Pacific Ocean. Oso Flaco Creek and its tributary Little Oso Flaco Creek are mostly channelized and generally flow year-round, supported by irrigation tailwater runoff (see Section 4.10, Hydrology and Water Quality).

However, because ground disturbance would be greater than 1.0-acre, Project soil disturbing activities would be completed in accordance with the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and

Land Disturbance Activities (Construction General Permit) (see Section 4.10 for additional information). NPDES compliance measures require a standard Construction Stormwater Pollution Prevention Plan (SWPPP) and associated Best Management Practices (BMPs), to be implemented for sediment and erosion control during site demolition, soil remediation, and site grading. Applicable BMPs may include surface roughening, mulching, and installation of silt fences and biodegradable fiber rolls or wattles to reduce erosion and sedimentation rates during vegetation establishment. Typical BMPs would ensure soil remediation and grading is primarily conducted during dry-weather conditions, water is used for moisture control of exposed soils to prevent wind erosion when temporarily disturbed, coverings for temporary stockpiles, temporary catch basins, and sandbagging. If soil remediation and subsequent site grading are made during the rainy season (typically from October through April), BMPs would be implemented to protect slopes against erosion. Measures to help minimize erosion could include the installation of berms, plastic sheeting, or other devices to protect exposed soils from the effects of precipitation. Surface water would be prevented from flowing over or ponding at the top of excavations.

Post demolition and remediation, sediment control structures would be inspected and maintained until vegetation becomes adequately established. The Project site would be a combination of existing paved roads, other hardscapes, and areas revegetated after ground disturbance (primarily Area 6 – Coke Storage). Areas disturbed by demolition and remediation would be restored to previous hardscapes or would involve plantings and revegetation to achieve long-term dust control and minimize potential erosion and sedimentation. In addition to Area 6, the restoration area may include existing vegetated areas within the SMR fence line that could be disturbed during demolition and remediation. Portions of the existing SMR where hardscape would be removed in order to access subsurface infrastructure or impacted soil would be restored with hardscapes, including aggregate from crushed concrete, poured concrete slurry, or asphalt, and returned to the original contour.

Final site contouring would be configured such that site drainage continues to be retained on site, with no off-site runoff, thus minimizing erosion. The preliminary grading plan final site contour, very similar to existing contours, is configured to retain post-construction site drainage on site and to convey on-site flows in a non-erosive manner that prevents potential off-site stormwater impacts.

The Construction SWPPP would include an Operation, Monitoring, and Maintenance (OM&M) Plan to monitor and maintain BMP effectiveness. The OM&M Plan would consist of monitoring by a Qualified Storm Water Practitioner (QSP), or trained delegate, until the Notice of Termination for coverage under the Construction General Permit is accepted (i.e., when the Construction General Permit parameters for site stabilization are achieved). The OM&M Plan would describe the expected types and frequency of maintenance activities that would be implemented to ensure that stormwater features effectively convey stormwater runoff throughout the site. Maintenance activities may include, but are not limited to, removal of sediment from conveyance swales, repair of riprap, maintenance of fiber rolls, and maintenance of the perimeter security fence. Natural stormwater management features would be selected for final implementation to the extent practicable. Maintenance of the features should not be required after the site vegetation is fully established.

With implementation of the Construction SWPPP and OM&M Plan, short-term and long-term erosion-related impacts at the SMR would be less than significant.

As discussed in Section 4.7.1, the wastewater outfall pipeline originates at the WET plant and runs west through the Pismo/Oceano dunes for two miles to the shoreline and then terminates at a seafloor diffuser located 0.5 mile offshore in State Lands lease PRC 1449.1, at a surveyed depth of approximately 38 feet below mean sea level. The coastline is in a constant state of change, adjusting to the forces of waves, currents, tides, and sediment deposition. These forces create a flow of sand along the coastline known as littoral drift. Littoral drift generally flows southward along the California coast. The amount of sand present at a beach remains in equilibrium only when the amount of sand deposited is equal to the amount of sand washed away. Since the forces controlling the deposition and removal of sand rarely balance each other exactly, the coastline is almost always in a dynamic state of either recession or advancement (County 1999).

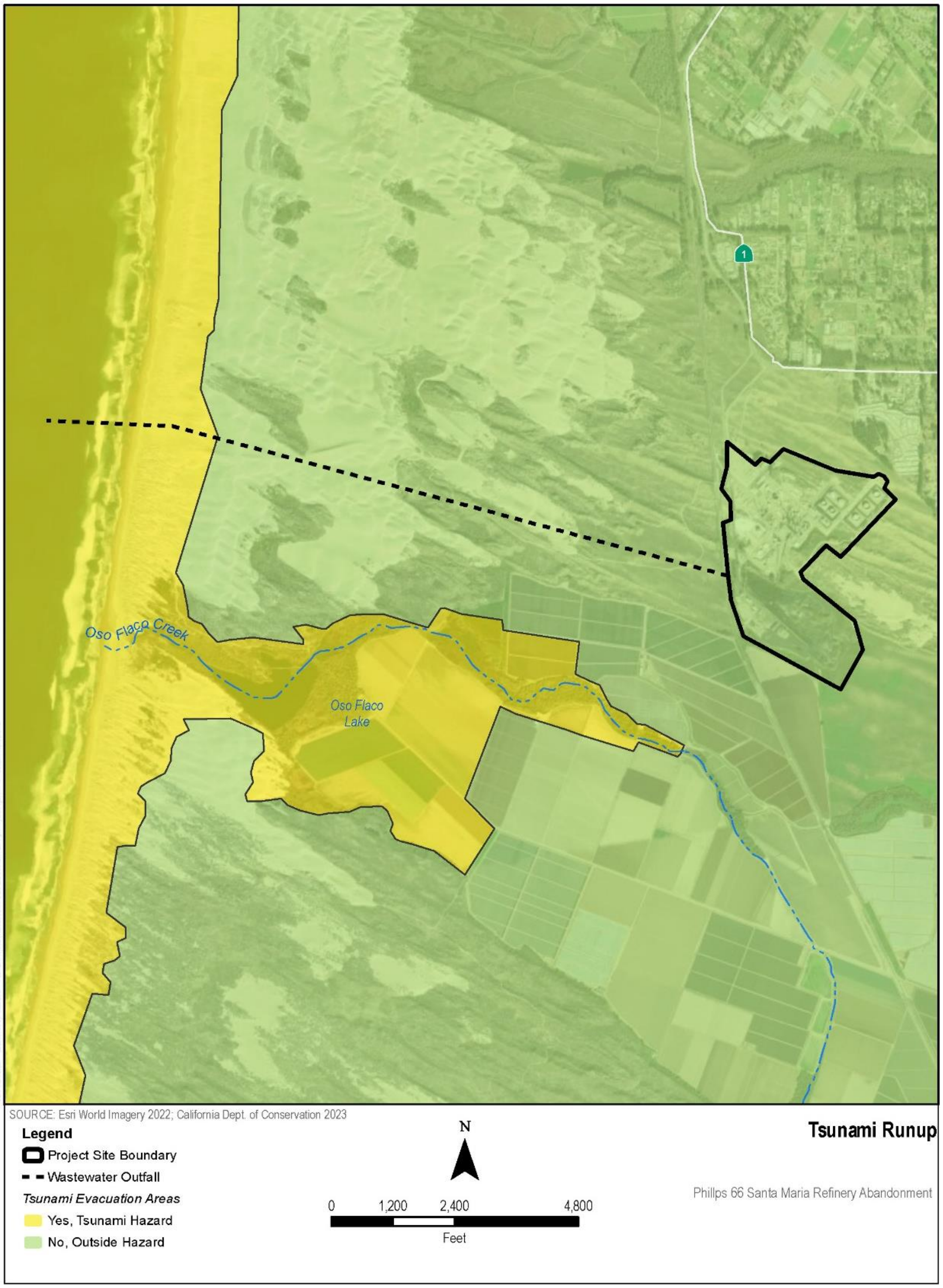
Sandy beaches are formed largely by the weathering of inland rocks and the transport of sediment to the sea by rivers and streams. The amount of sand on the beach also varies with the seasonal changes in wave action. For example, during winter months when wave activity is increased, waves striking the beach strip away accumulated sand. Conversely, in summer months which have low to moderate wave activity, sand tends to accumulate, resulting in a wider sandy beach. Long-term advancement or erosion of beaches is affected by long-term weather patterns as well as changes in sediment transport caused by human intervention. Manmade shore protection devices can also affect shoreline changes (County 1999).

As discussed in more detail in Section 4.18, Other Considerations, rising sea levels are expected to increase storm flooding, coastal erosion, tidal inundation, submergence of nearshore lands, groundwater rise, and seawater intrusion (CCC 2021; CNRA OPC 2018). The best available science currently offers probabilities of specific sea level projections at various tide gauges that are used to inform planning decisions along the California coast. These probabilities are based on observations, global climate models, and expert opinion, and consider a range of sea level rise (SLR) projections due to uncertainty in future greenhouse gas emissions and local changes in land elevations.

Tsunami runup and associated wave scour in the vicinity of the wastewater outfall pipeline (Figure 4.7-5) could similarly expose the outfall, resulting in pipeline damage.

Based on the impact methodology described in Section 4.7.4, although the wastewater outfall would be subject to potential exposure and damage over the long-term (conservatively through 2100, see Section 4.18, Other Considerations) due to tsunami runup, SLR (see Section 4.18), and associated wave scour, geology and soils impacts would only be considered significant in the event that the wastewater outfall pipeline results in soil erosion, topographic changes, loss of topsoil, or unstable soil conditions as a result of the Project. Unlike a seawall or rock revetment, which can cause a loss of beach sand and narrowing of the beach due to wave energy reflection, the presence of a single 12-inch- to 14-inch-diameter wastewater outfall would not result in adverse impacts to natural beach sand replenishment and sand migration processes.

Figure 4.7-5 Tsunami Runup Hazards



Source: CDOC 2023

If exposed, the outfall pipeline exposure would likely occur during periods of high surf, high tides, and associated intense wave scour during the winter months. Conversely, the outfall pipeline may be covered during the summer months when swells are generally smaller at Pismo Beach and sand accretion generally occurs along the shoreline.

As discussed for impact GEO.1, for the purposes of this analysis, it is assumed that the outfall pipeline would be empty and capped following SMR demolition and remediation completion. Therefore, any potential rupture of the outfall pipeline would not result in the release of any substances that might result in adverse environmental impacts. Phillips 66 or any successors-in-interest would be required, under the terms of the lease with the State Lands Commission, to continue to inspect and maintain the pipeline within the easement. Any future users of the outfall pipeline would be subject to additional CEQA review with respect to potential spills from the outfall pipeline. Regardless of the amount of outfall pipeline exposure due to wave scour, because the outfall pipeline would not cause or exacerbate the potential for soil erosion or unstable soil conditions, impacts would be **less than significant (Class III).**

Impact #	Impact Description	Residual Impact
GEO.4	Threshold d): Would the Project potentially include structures located on expansive soil?	Class III

The Project does not include any new construction. The Project involves demolition of the SMR and remediation of underlying contaminated soil. Soil expansion generally occurs in clay rich soils as a result of wetting of the soil. The soil subsequently contracts when dry, resulting in widespread cracking of the soil. This alternating sequence of soil expansion and contraction can result in damage to overlying foundations and related infrastructure. However, the SMR and associated wastewater outfall pipeline are located on poorly graded (similar grain size) dune sands with limited thin interbeds of silt and clay (Figure 4.7-2). As a result, the potential for clay-rich expansive soils beneath the remnant wastewater outfall pipeline is low. Regardless, although it is possible that the outfall pipeline could be damaged in the future because of expansive soils, as described in Section 4.7.4, impacts on the geologic environment would not occur as a result of leaving the outfall in-place and impacts would be **less than significant (Class III).**

Impact #	Impact Description	Residual Impact
GEO.5	Threshold e): Would the Project be inconsistent with the goals and policies of the County's Safety Element relating to geologic and seismic hazards?	Class III

The County's General Plan Safety Element provides measures for evaluation of geologic hazards and geotechnical requirements related to new construction to reduce the potential for loss of life and reduce the amount of property damage. The goals and policies related to geologic and seismic hazards include measures related to new construction and faulting, ground shaking, liquefaction, settlement, slope stability, landslides, and coastal bluff erosion. Because the Project would not involve new construction, these goals and policies would not apply to the Project. Project impacts would be **less than significant (Class III).**

Impact #	Impact Description	Residual Impact
GEO.6	Threshold f): Would the Project not preclude the future extraction of valuable mineral resources?	Class III

MRZ-2 areas, which are areas with a high likelihood for the occurrence of significant mineral resources, have been mapped by the CGS in combination with areas having current land uses deemed compatible with potential mining. The closest such area to the Project site is located approximately 0.6 mile southeast of the Project site. In addition, the Project site is not located in an Energy or Extractive Resource Area (EX) or Extractive Resource Area (EX-1). The closest aggregate production areas, which are designated EX-1 areas, are located approximately three miles southwest and six miles southeast of the Project site, respectively, along the Santa Maria River. As a result, the Project would not preclude the future extraction of valuable mineral resources and impacts are considered **less than significant (Class III).**

4.7.6 Mitigation Measure Impacts to Other Issue Areas

As no mitigation measures are proposed for geology and soils, there would not be any impact from the mitigation measures on other issue areas.

4.7.7 Cumulative Impacts

The Project would not include any new construction. Therefore, cumulative projects involving construction, California Department of Transportation (Caltrans) roadway projects, and various northern Santa Barbara County projects (see Table 3.1) would have no cumulative impact regarding geologic hazards, such as faulting, seismicity, and slope stability. In addition, geologic hazard impacts at development sites are typically site-specific and do not combine to create cumulatively considerable impacts.

Soil remediation for cumulative projects at the SMR has already been completed (NIWS site); therefore, potential erosion-related impacts at these SMR remediation projects would not overlap temporally with potential erosion impacts associated with the Project.

With respect to cumulative mineral resources impacts, as discussed under impact GEO.6, the Project would not preclude future extraction of valuable mineral resources. As a result, the Project would not contribute to any potential cumulative mineral resource related impacts associated with construction within the Oceano Dunes State Vehicular Recreation Area (ODSVRA) and various northern Santa Barbara County projects. Cumulative mineral resource related impacts would not be cumulatively considerable.

4.7.8 References

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