4.6 Geological Resources

This section addresses issues involving geological resources resulting from the proposed Rail Spur Project. The environmental setting provides information on geological resources in the vicinity of the Project Site. The impacts evaluation focuses on the potential effects of the Rail Spur Project and identifies potential mitigation measures for any significant impacts. The section also provides a discussion of cumulative geological resources impacts.

4.6.1 Environmental Setting

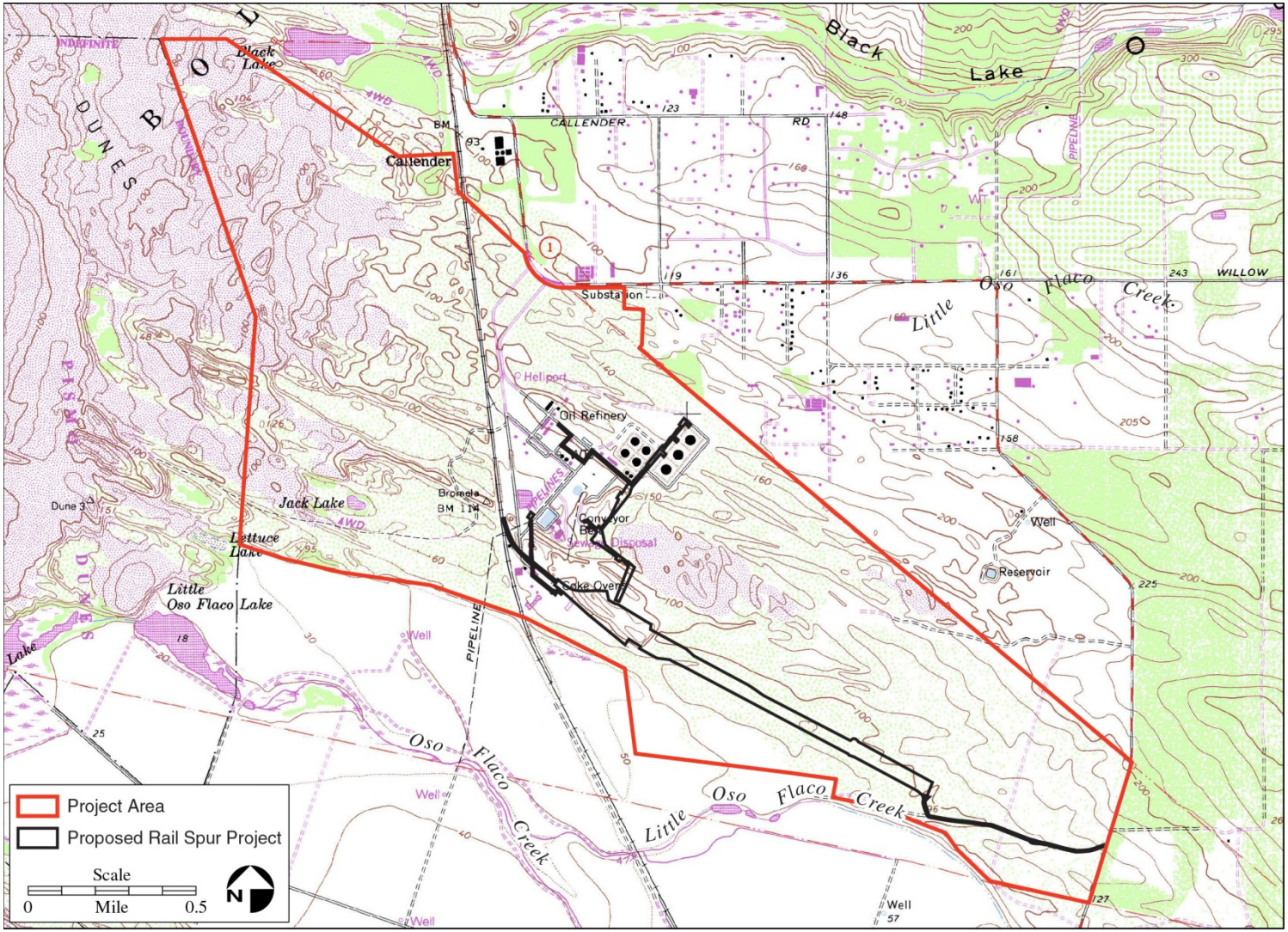
4.6.1.1 Regional Geologic Setting

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).

4.6.1.2 Topography and Stratigraphy

The Project Site is located on undulating dune topography, with elevations ranging from approximately 50 to 180 feet above mean sea level (Figure 4.6-1). The topography of the proposed rail spur portion of the Project Site ranges in elevation from approximately 80 to 110 feet above sea level. Slope gradients are predominantly gentle, with localized steep slopes up to 30 feet high where the topography has been modified by grading. The proposed pipeline route traverses two such steep slopes, with intervening areas of gentle topography. The proposed railcar unloading area consists of a relatively flat graded area used by the existing coke facility. Large stockpiles of coke are present in the eastern portion of the coke facility. The proposed Rail Spur Project roughly trends along a broad east-west trending ridge; however, the topography undulates along the alignment. Two broad, southwest-trending drainages emanate from the south side of the proposed rail spur. Several internally draining basins are also present in the Project Site, along the pipeline route and the rail spur alignment.

Figure 4.6-1 General Topography of Rail Spur Project Area



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 (Figure 4.6-2). 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; Earth Systems Pacific 2008a, 2008b).

4.6.1.3 Seismicity and Faulting

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 10 magnitude 5 to 5.5 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 (M 7.0), located offshore of Point Arguello, and the 1857 Fort Tejon earthquake (M 7.9), located on the San Andreas Fault, generated significant strong ground motion at the site (Dames & Moore 1990). More recently, the 2003 San Simeon earthquake (M 6.6) generated strong ground motion in the project area (USGS 2008).

The California Geological Survey (CGS) classifies faults as either active or potentially active, according to the Alquist-Priolo Special Studies Zone Act of 1972. A fault that has exhibited surface displacement within the Holocene Epoch (the last 11,000 years) is defined as active by the CGS. A fault that has exhibited surface displacement during the Pleistocene Epoch (which began about 1.6 million years ago and ended about 11,000 years ago) is defined as potentially active. Pre-Pleistocene faults are considered inactive. The CGS has established Alquist-Priolo Special Study Zones (AP Zones) around faults identified by the State Geologist as being active. The Alquist-Priolo Special Studies Zone Act limits development along the surface trace of active faults to reduce the potential for structural damage and/or injury due to fault rupture (CDMG 1999 and 1994). The closest AP 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 (CDMG 1990; CGS 2007).

Major active or potentially active faults in the region include the Hosgri, Orcutt-Casmalia, Wilmar Avenue, and Oceano faults (Figures 4.6-2 and 4.6-3). 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.

Figure 4.6-2 Geology of Rail Spur Project Area

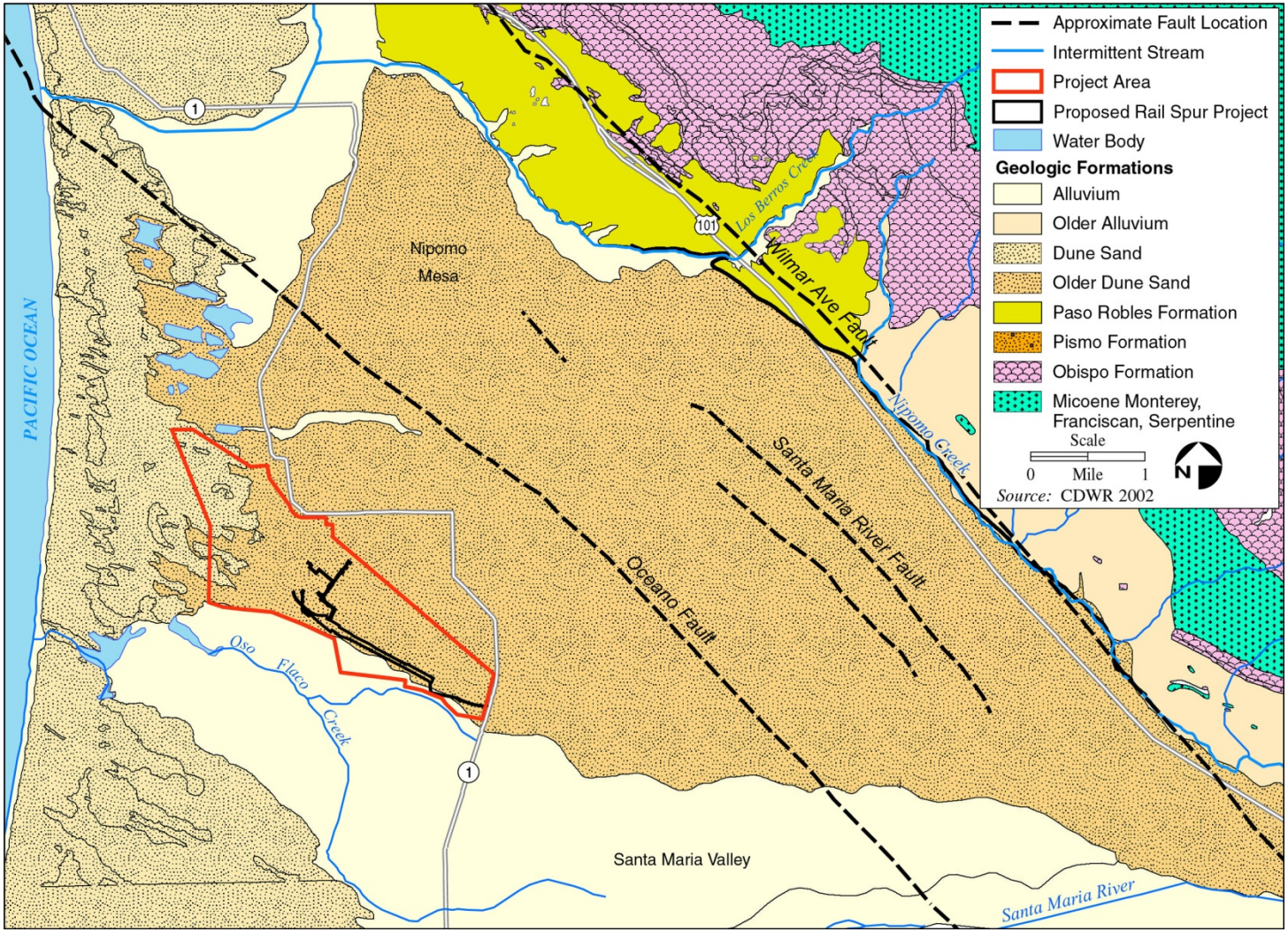
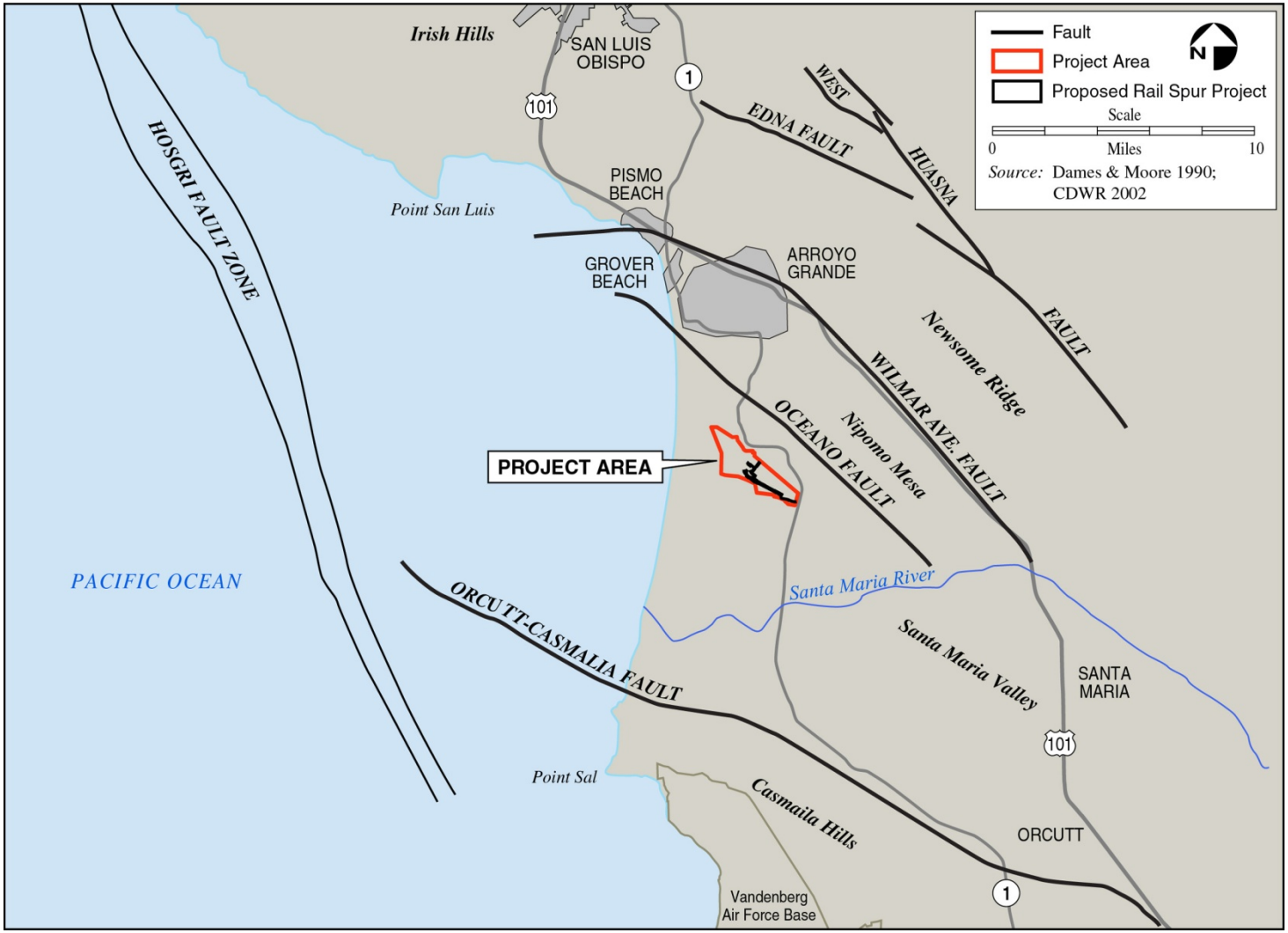


Figure 4.6-3 Generalized Fault Map of Project Area



Predicted PGA values for the site based on USGS data are provided in Table 4-6.1 (USGS 2012; Arcadis 2013). 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; Arcadis 2013).

Table 4.6.1 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

Notes:
PGA values calculated for latitude 35.032117°N, longitude 120.584918°W.
Values calculated using USGS 2008 Interactive Deaggregations (Beta) Tool (USGS 2012).
Average shear wave velocity in the upper 30 meters (Vs_{30}) value of 287 meters per second used to calculate PGA values based on Kalkan et al. (2010).

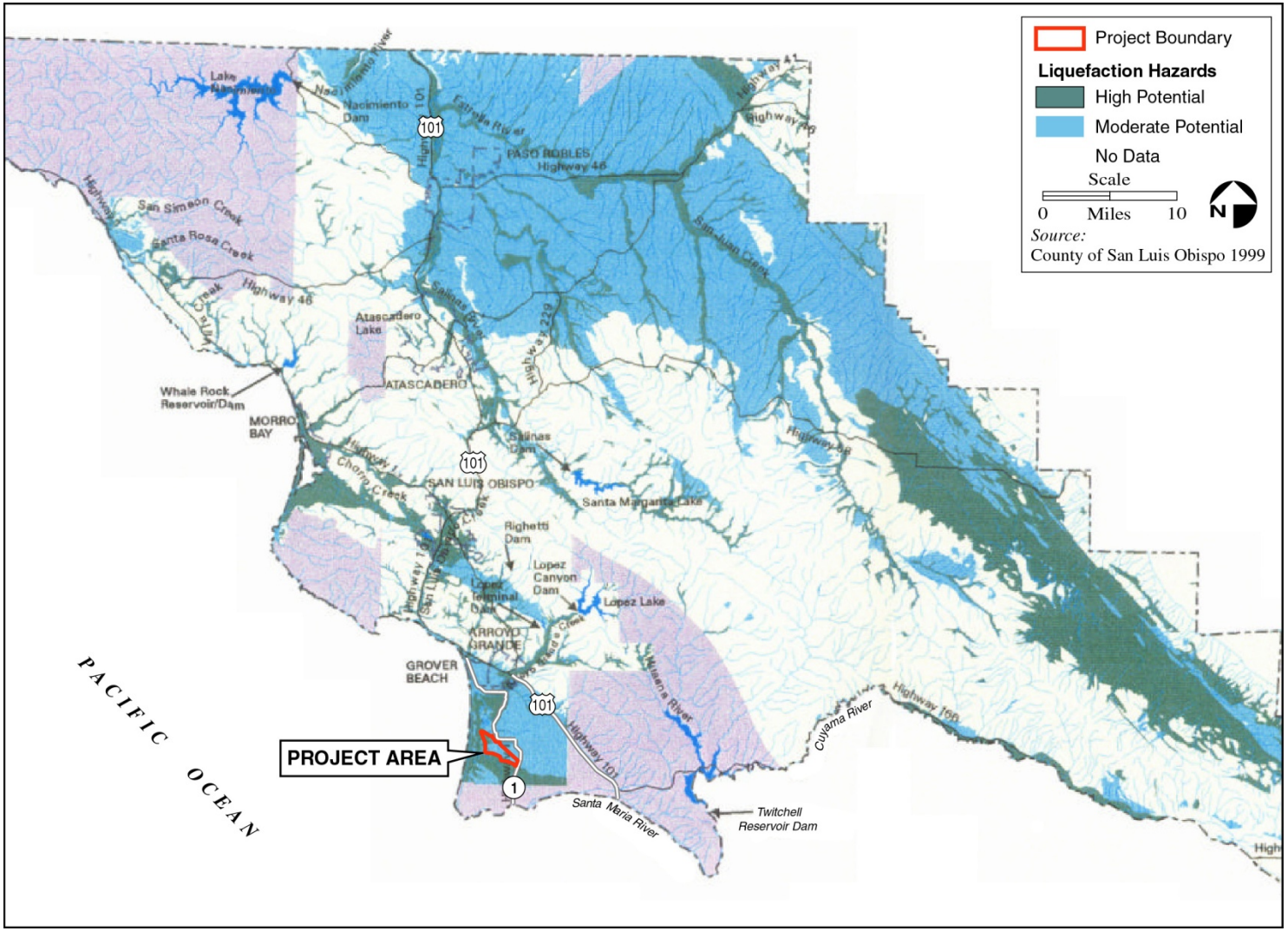
The highest predicted PGA value for a seismic event in the Project area with a return period of 144 years or less would be 0.15g. The predicted PGA would create strong ground shaking corresponding to a Modified Mercalli Intensity of VI, which could potentially cause light infrastructure damage (Wald et al. 1999; Arcadis 2013).

Similarly, a site-specific seismic analysis was completed for previous refinery 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). The Uniform Building Code currently requires that structures be designed to resist a minimum seismic force resulting from ground motion having a 10 percent probability of being exceeded in a 50 year period (County of San Luis Obispo 1999).

4.6.1.4 Liquefaction

State of California Liquefaction Hazard Zones have not been established for San Luis Obispo County; however, the San Luis Obispo 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 4.6-4) (County of San Luis Obispo 1999).

Figure 4.6-4 Liquefaction Hazards



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 refinery 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 20 to 25 feet, at the lowest topographic areas of the proposed rail spur portion of the Project Site. Borings drilled from higher elevations within the refinery, up to 60 feet higher than portions of the proposed rail spur portion of the Project Site, did not encounter groundwater to a depth of 61 feet (Dames & Moore 1990). Borings subsequently drilled in 2008 at the refinery did not encounter groundwater to a maximum depth of 31 feet, although these borings were also drilled at elevations up to 60 feet higher than the lower portions of the proposed rail spur portion of the Project Site (Earth Systems Pacific 2008a, 2008b).

The Project Site is underlain by relatively uniform sand. However, in general, the sands are sufficiently dense to prevent liquefaction at levels of seismically induced ground motion corresponding to the ULE earthquake (Dames & Moore 1990).

4.6.1.5 Mineral Resources

The California Geological Survey (CGS), previously known as the California Division of Mines and Geology, has classified land in San Luis Obispo 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 contain 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 (California Geological Survey 2011).

The County of San Luis Obispo 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 of San Luis Obispo 2010; California Geological Survey 2012).

4.6.2 Regulatory Setting

4.6.2.1 California Building Code

The California Building Standards Commission provides a minimum standard for building design with the California Building Code, which is based on the International Code Council but has been modified for California conditions. Chapter 23 of the California Building Code contains specific requirements for seismic safety. Chapter 29 of the California Building Code regulates excavation, foundations, and retaining walls. Chapter 33 of the California Building Code contains specific requirements pertaining to site demolition, excavation, and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapter 70 of the California Building Code regulates grading activities, including drainage and erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching, as specified in California Occupational Health and Safety Administration (Title 8 of the California Code of Regulations) and in Section A33 of the California Building Code.

4.6.2.2 The Alquist-Priolo Earthquake Fault Zone Act of 1994

The criteria most commonly used to estimate fault activity in California are described in the Alquist-Priolo Earthquake Fault Zone Act, which addresses only surface fault-rupture hazards. These legislative guidelines determine fault activity status and are based on the age of the youngest geologic unit offset by the fault. As previously discussed, an active fault is described by the California Geological Survey as a fault that has "had surface displacement within Holocene time." A potentially active fault is defined as "any fault that showed evidence of surface displacement during Quaternary time (within the last 1.6 million years)." This legislation prohibits the construction of buildings used for human occupancy on active and potentially active surface faults. However, only those potentially active faults that have a relatively high potential for ground rupture are identified as Alquist-Priolo Earthquake Fault Zones. Therefore, not all active or potentially active faults are zoned under the Alquist-Priolo Earthquake Fault Zone Act, as designated by the State of California.

4.6.2.3 Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was created to map and address non-surface fault rupture hazards, including liquefaction and earthquake-induced landslides, pursuant to the Seismic Hazards Mapping Act (Public Resources Code, Chapter 7.8, Section 2690 et seq.). The purpose of the Seismic Hazards Mapping Act is to reduce the threat of seismic hazards to public safety and to minimize the loss of life and property, by identifying and mitigating these seismic hazards.

Once Official Seismic Hazard Zones Maps are released, cities and counties affected by the Official Seismic Hazard Zone Maps must require a site-specific geotechnical investigation be conducted within the Zones of Required Investigation, to identify and evaluate seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy.

A copy of each approved geotechnical investigation, including the mitigation measures, is required to be submitted to the California Geological Survey within 30 days of approval of the investigation. Additional guidance regarding the responsibilities of local agencies, guidelines for evaluating and mitigating seismic hazards, as well as the text of the Seismic Hazards Mapping Act, are contained within Special Publication 117A - Guidelines for Evaluating and Mitigating Seismic Hazards in California (California Geological Survey 2008). In addition, local agencies are to incorporate the Seismic Hazard Zone Maps into their Safety Element and the Natural Hazard Disclosure Statement. The Seismic Hazards Mapping Act also requires sellers of real property to disclose to buyers if the property is within a Zone of Required Investigation.

4.6.2.4 California Division of Oil, Gas, and Geothermal Resources

The California Division of Oil, Gas, and Geothermal Resources regulates environmentally sensitive pipelines, which are defined under California Code of Regulations Section 1760 as:

- A pipeline located within 300 feet of any public recreational area, or a building intended for human occupancy, that is not necessary to the operation of the production operation, such as residences, schools, hospitals, and businesses;
- A pipeline located within 200 feet of any officially recognized wildlife preserve or environmentally sensitive habitat that is designated on a United States Geological Survey topographic map, designated waterways, or other surface waters, such as lakes, reservoirs, rivers, canals, creeks, or other water bodies that contain water throughout the year;
- A pipeline located within the coastal zone, as defined in Section 30103(b) of the Public Resources Code; and

Any pipeline for which the Supervisor determines there may be a significant potential threat to life, health, property, or natural resources, in the event of a leak, or that has a history of chronic leaks.

California Code of Regulations, Title 14, Section 1774 requires a pipeline management plan for environmentally sensitive pipelines.

4.6.2.5 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 Surface Mining and Reclamation Act of 1975, 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.

4.6.2.6 San Luis Obispo County 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.

4.6.3 Significance Criteria

The California Environmental Quality Act (CEQA) Guidelines indicate that a substantial adverse impact would occur if a project would expose people or structures to major geologic hazards. This recognizes any and all unstable geologic conditions as a result of construction, as well as hazards associated with earthquakes, ground shaking, ground movement, fault rupture, groundwater, and other geologic hazards, features, or events. In terms of construction, significant adverse impacts are determined based on whether construction of the project would generate unstable geologic conditions lasting beyond the short-term construction phase.

In addition, impacts would be considered significant as a result of deterioration of components of facility infrastructure due to corrosion, weathering, fatigue, or erosion that could reduce structural stability.

The following significance criteria for geological resources were derived from the San Luis Obispo County Environmental Checklist which was developed in accordance with Appendix G of the CEQA Guidelines. Impacts of the proposed Project would be considered significant and would require mitigation if the Project:

- Results in exposure to or production of unstable earth conditions, such as landslides, earthquakes, liquefaction, ground failure, land subsidence, or other similar hazards;
- Is located in a California Geological Survey Alquist-Priolo Earthquake Fault Zone, or other known fault zones, per the California Division of Mines and Geology Special Publication 42;
- 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;
- Includes structures located on expansive soils;

- Is inconsistent with the goals and policies of the County's Safety Element relating to geologic and seismic hazards; or
- Precludes the future extraction of valuable mineral resources.

4.6.4 Project Impacts and Mitigation Measures

This section discussed the impacts and any mitigation measures associated with the Rail Spur Project related to geological resources.

Impact #	Impact Description	Phase	Impact Classification
GR.1	Seismically induced ground shaking could damage proposed structures and infrastructure, potentially resulting in loss of property, risk to human health and safety, and oil spills.	Construction and Operations	Class II

No active or potentially active faults underlie the Project Site. The closest Alquist-Priolo 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. Therefore, the potential for surface fault rupture at the Project Site is low. However, San Luis Obispo 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 4.6-2 and 4.6-3). Available geologic data suggest that the highest peak ground accelerations at the Project Site would occur on the Orcutt-Casmalia or Hosgri faults, which have a maximum credible earthquake of magnitude 6.9 and 7.2, respectively. The proposed rail spur, unloading facility, and associated oil pipeline would be susceptible to damage as a result of an earthquake on these regional faults.

Shallow groundwater and sandy soils also create a moderate potential for liquefaction at the Project Site. Water levels measured in borings drilled at the Project Site, in combination with 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. Lateral spreading and seismically induced settlement typically occur in association with liquefaction. Because of the nature of the industrial activities proposed, the effects of seismically induced ground failure could be severe and include hazardous oil spills, risk of fire, and soil, surface water, and groundwater contamination.

As discovered during the 1971 San Fernando earthquake and the 1994 Northridge earthquake, existing building codes are often inadequate to completely protect engineered structures from hazards associated with large ground accelerations. Therefore, potential seismic impacts and associated damage to structures from a major earthquake on the nearby Orcutt-Casmalia or Hosgri faults, or any other regional fault, would be considered potentially significant.

Mitigation Measures

The following measures would ensure that the Rail Spur Project is consistent with provisions of the California Building Code and goals and policies of the County's Safety Element relating to geologic and seismic hazards:

GR-1a *At the time of application for grading and construction permits, the proposed rail spur, unloading facility, and oil pipeline infrastructure shall be designed and constructed to withstand anticipated horizontal and vertical ground acceleration in the Project area, based on the California Building Code. The calculated design base ground motion for project components shall consider the soil type, potential for liquefaction, and the most current and applicable seismic attenuation methods that are available.*

GR-1b *At the time of application for construction permits, all surface facilities and equipment shall have suitable foundations and anchoring design, surface restraints, and moment-limiting supports to withstand seismically induced groundshaking.*

GR-1c *A Registered Civil Engineer and Certified Engineering Geologist shall complete an updated geotechnical investigation specific to the proposed rail spur and oil pipeline site, as previous on-site geotechnical investigations were completed in other areas of the refinery. All geotechnical recommendations provided in the report shall be followed during grading and construction at the Project Site. The updated geotechnical evaluation shall include, but not be limited to, an estimation of both vertical and horizontal anticipated peak ground accelerations, as well as an updated liquefaction analysis.*

GR-1d *The geotechnical report shall be completed prior to completion of the final Project design and shall be submitted to the County of San Luis Obispo Building Division for review and approval. The Project design must conform to the recommendations within the updated geotechnical evaluation. The geotechnical recommendations would likely include, but not be limited, to the following:*

a. Proposed structures shall be designed and constructed to withstand anticipated horizontal and vertical ground acceleration in the Project area, based on the California Building Code.

b. Proposed structures shall be designed and constructed to withstand the effects of liquefaction, as applicable, based on the California Building Code.

c. The Project Site shall be cleared of unsuitable materials and graded to provide a firm base for compacted fill, as applicable. Ground surfaces to receive compacted fill shall be prepared by removing organics, rubble, debris, existing disturbed fill, artificial fill, unconsolidated materials, and soft or disturbed soils. Removal of unconsolidated materials would likely include several feet of overexcavation.

d. All fill material shall be placed in uniform lifts not exceeding 8 inches in its loose state and compacted to a minimum of 90 percent relative compaction, as determined by the latest ASTM Test Designation D-1557.

e. Due to the low cohesion of the onsite soils (i.e., dune sands), the potential need for mechanical stabilization of fill slopes shall be evaluated and implemented, as applicable, to attain the acceptable factors of safety for stability. Mechanical stabilization may include Mechanically Stabilized Earth (MSE), which includes use of engineered geogrids placed at 2-foot vertical spacing within fill slopes. Cut slopes may similarly require construction of overlying stability fills, using MSE.

f. Surface runoff shall be directed away from slopes and foundations and collected in lined ditches or drainage swales, via non-erodible engineered drainage devices. Fill slopes and stability fills, as applicable, shall be provided with subsurface drainage for stability.

GR-1e At the time of application for grading and construction permits, all proposed slope, building pad, and rail track bed construction shall be properly engineered, with fill placed in accordance with requirements of the current County of San Luis Obispo Building and Construction Ordinance (Title 19 of the San Luis Obispo County Code), and California Building Code.

GR-1f During construction, the proposed aboveground oil pipeline shall be anchored to prevent pipeline movement, as determined by a California Registered Civil Engineer, in accordance with California Building Code, San Luis Obispo County requirements, and the American Public Works Association Greenbook.

GR-1g At the time of application for construction permits, the facilities and equipment, including spill containment vaults and Project-related pipelines, shall be designed for predicted, site-specific seismic loading in accordance with applicable codes, including the California Building Code.

GR-1h The Applicant shall cease rail car unloading and pipeline oil conveyance following any perceptible (i.e., felt by humans) seismic event and inspect all project-related facilities, equipment, and pipelines for damage prior to restarting operations.

GR-1i Consistent with California Building Code Section 3401.2, all project-related facilities, equipment, and pipelines shall be maintained in conformance with the California Building Code edition under which it was installed. Annual inspections shall be completed by a California Registered Civil Engineer to verify that project components have not been damaged or compromised by seismic induced ground shaking, corrosion, soil erosion, soil settlement, or other geologic hazards.

Residual Impacts

Implementing mitigation measures GR-1a through GR-1i would reduce the severity of seismic-related impacts to *less than significant with mitigation (Class II).*

Impact #	Impact Description	Phase	Impact Classification
GR.2	Project grading would result in changes in topography, potentially unstable slopes, and potential increased erosion.	Construction and Operations	Class II

Slope gradients within the proposed area of ground disturbance are predominantly gentle, with localized steep slopes along the proposed pipeline alignment. The proposed railcar unloading area consists of a relatively flat graded area used by the existing coke facility; however, the proposed rail spur alignment roughly trends along a broad east-west trending ridge with undulating topography. Approximately 135,771 cubic yards of cut and 114,075 cubic yards of fill would be required to establish the proposed rail spur final grade. As a result, the topography would be altered, primarily along the proposed rail spur alignment. Cut and fill slopes along the majority of the rail spur would not exceed 15 feet; however, the eastern end of the spur would include a cut slope up to 25 feet high.

Underlying sediments are relatively uniform across the proposed area of disturbance, consisting primarily of poorly-graded dune sands, which are generally loose to medium dense at the surface. Excavations and oversteepened slopes in such loose sands could result in sloughing and shallow slope failures. However, cut slopes and compacted fill slopes would not exceed 2.5:1 (horizontal to vertical) in gradient, thus minimizing the potential for slope failure. In addition, track construction would include placement of sub-ballast, thus contributing to stabilization of the track bed by reducing erosion and rilling at the top of slope.

If specified by Union Pacific, demolition/removal of approximately 1,300 feet of existing track may occur, resulting in exposure of underlying soils to wind and water erosion. However, this work would occur within the existing track corridor and would not require impacts outside the existing disturbed area. Areas to be graded would initially be cleared of vegetation, thus exposing the sandy soils to increased wind and water erosion during construction. Areas not paved during construction would be susceptible to increased wind and water erosion following construction. However, the last stage of construction would include soil stabilization and vegetation restoration, thus minimizing erosion. In addition, most of the precipitation infiltrates with minimal runoff to cause soil erosion. Although onsite soils have been classified as highly erodible, evidence of erosion, such as rilling or gullying, was not noted during a site reconnaissance of the Project Site, including areas that had been previously disturbed and/or graded. However, Project related erosion would be considered potentially significant.

Mitigation Measures

Implementation of Mitigation Measures GR-1c, GR-1d, and GR-1e would ensure that the Rail Spur Project is consistent with goals and policies of the County's Safety Element relating to geologic hazards. In addition, the following mitigation measures would reduce erosion related impacts.

GR-2 *During construction and operations, the Applicant shall implement a Storm Water Pollution Prevention Plan using Best Management Practices and monitor and maintain stormwater pollution control facilities identified in the Storm Water*

Pollution Prevention Plan, in a manner consistent with the provisions of the Federal Water Pollution Control Act (National Pollutant Discharge Elimination System Program). Stormwater management protection measures and wet weather measures shall be designed by a California registered, Qualified Storm Water Pollution Prevention Plan Developer. In addition, a California registered, Qualified Storm Water Pollution Prevention Plan Practitioner shall oversee and monitor construction and operational Best Management Practices and stormwater management, in accordance with the State General Construction Permit and the Central Coast Regional Water Quality Control Board. Conventional measures typically recommended by the State Water Resource Board and the California Department of Transportation include the following:

a. *Implement permanent erosion and sediment control measures:*

   - *Minimize grading, clearing, and grubbing to preserve existing vegetation;*
   - *Use mulches and hydroseed, free of invasive plants, to protect exposed soils;*
   - *Use geotextiles and mats to stabilize soils;*
   - *Use drainage swales and dissipation devices; and*
   - *Use erosion control measures outlined in the California Stormwater Quality Association Best Management Practice Handbook.*

b. *Implement temporary Best Management Practice mitigation measures:*

   - *Use silt fences, sandbags, and straw wattles;*
   - *Use temporary sediment basins and check dams; and*
   - *Use temporary Best Management Practices outlined in the California Stormwater Quality Association Best Management Practice Handbook.*

c. *Implement tracking control Best Management Practices to reduce tracking sediment offsite.*

   - *Use stabilized construction entrance and exit with steel shakers;*
   - *Use tire wash areas; and*
   - *Use tracking control Best Management Practices outlined in the California Stormwater Quality Association Best Management Practice Handbook.*

Personnel at the site shall be trained in equipment use and containment and cleanup of an oil spill. Dry cleanup methods, such as absorbents, shall be used on paved and impermeable surfaces. Spills in dirt areas shall be immediately contained with an earthen dike and the contaminated soil shall be dug up and discarded in accordance with local and state regulations.

Residual Impacts

Implementing mitigation measures GR-1c, GR-1d, GR-1e, and GR-2 would reduce the severity of slope stability- and erosion-related impacts to *less than significant with mitigation (Class II).*

Impact #	Impact Description	Phase	Impact Classification
GR.3	Expansive soils, if present, could damage proposed foundations.	Construction	Class II

Soil expansion generally occurs in clay rich soils as a result of wetting of the soil. The soils subsequently contract when dry, resulting in widespread cracking of the soil. This alternating sequence of soil expansion and contraction can result in damage to overlying foundations. However, because the Project Site soils consist of dune sand, the likelihood of expansive soils is low. However, in the absence of site-specific soils testing, impacts are potentially significant.

Mitigation Measures

GR-3 Implement Mitigation Measure GR-1c to confirm the absence of expansive soil.

Residual Impacts

Implementing mitigation measure GR-1c would reduce the severity of potential expansive soil-related impacts to *less than significant with mitigation (Class II).*

Impact #	Impact Description	Phase	Impact Classification
GR.4	The Project could potentially preclude the future extraction of valuable mineral resources.	Construction and Operations	Class III

The Project Site is within an area classified as MRZ-3 by the California Geological Survey, which contain 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 California Geological Survey 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.

Similarly, the Project Site is not located in an EX or EX-1 area, as designated by the County of San Luis Obispo. 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.

Mitigation Measures
None required.

Residual Impacts
Residual impacts would be *less than significant (Class III)*.

4.6.5 Cumulative Analysis

In general, the impacts due to the Rail Spur Project can be mitigated to less than significant levels.

Cumulative impacts related to seismically-related ground shaking and associated ground failure, as well as slope failures and other impacts, would be similar to what is described for Project-specific impacts. The impacts would be addressed on a project-by-project basis through compliance with existing building codes and any site-specific mitigation measures for individual projects. Remaining impacts associated with the cumulative projects in the vicinity of the project will not have any impacts that result in cumulative impacts, since the impacts are site specific and not significant with mitigation.

Compliance with applicable code requirements and the recommendations of site-specific geotechnical evaluations on a case-by-case basis would reduce cumulative impacts relating to geotechnical hazards to a less than significant level.

All mitigation measures are based on conventional techniques and standards within the industry. All geotechnical hazards can be mitigated to acceptable levels by licensed professionals who will provide guidelines and specifications to mitigate and remediate the specific hazard.

Therefore, cumulative impacts relating to geotechnical hazards would be less than significant.

4.6.6 Mitigation Monitoring Plan

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
GR-1a	At the time of application for grading and construction permits, the proposed rail spur, unloading facility, and oil pipeline infrastructure shall be designed and constructed to withstand anticipated horizontal and vertical ground acceleration in the Project area, based on the California Building Code. The calculated design base ground motion for project components shall consider the soil type, potential for liquefaction, and the most current and applicable seismic attenuation methods that are available.	Review and approval of design drawings and seismic loading calculations	Approve design drawings and seismic loading calculations prior to issuance of building permits	County Planning and Building
GR-1b	At the time of application for construction permits, all surface facilities and equipment shall have suitable foundations and anchoring design, surface restraints, and moment-limiting supports to withstand seismically induced groundshaking.	Review and approval of design drawings	Approve design drawings prior to issuance of building permits	County Planning and Building
GR-1c	A Registered Civil Engineer and Certified Engineering	Review and	Approve	County

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
	Geologist shall complete an updated geotechnical investigation specific to the proposed rail spur and oil pipeline site, as previous on-site geotechnical investigations were completed in other areas of the refinery. All geotechnical recommendations provided in the report shall be followed during grading and construction at the Project Site. The updated geotechnical evaluation shall include, but not be limited to, an estimation of both vertical and horizontal anticipated peak ground accelerations, as well as an updated liquefaction analysis.	approval of geotechnical report.	geotechnical report prior to issuance of grading permit.	Planning and Building
GR-1d	The geotechnical report shall be completed prior to completion of the final Project design and shall be submitted to the County of San Luis Obispo Building Division for review and approval. The Project design must conform to the recommendations within the updated geotechnical evaluation. The geotechnical recommendations would likely include, but not be limited, to the following: a. Proposed structures shall be designed and constructed to withstand anticipated horizontal and vertical ground acceleration in the Project area, based on the California Building Code. b. Proposed structures shall be designed and constructed to withstand the effects of liquefaction, as applicable, based on the California Building Code. c. The Project Site shall be cleared of unsuitable materials and graded to provide a firm base for compacted fill, as applicable. Ground surfaces to receive compacted fill shall be prepared by removing organics, rubble, debris, existing disturbed fill, artificial fill, unconsolidated materials, and soft or disturbed soils. Removal of unconsolidated materials would likely include several feet of overexcavation. d. All fill material shall be placed in uniform lifts not exceeding 8 inches in its loose state and compacted to a minimum of 90 percent relative compaction, as determined by the latest ASTM Test Designation D-1557. e. Due to the low cohesion of the onsite soils (i.e., dune sands), the potential need for mechanical stabilization of fill slopes shall be evaluated and implemented, as applicable, to attain the acceptable factors of safety for stability. Mechanical stabilization may include Mechanically Stabilized Earth (MSE), which includes use of engineered geogrids placed at 2-foot vertical spacing within fill slopes. Cut slopes may similarly require construction of overlying stability fills, using MSE. f. Surface runoff shall be directed away from slopes and foundations and collected in lined ditches or drainage	Review and approval of geotechnical report.	Approve geotechnical report prior to issuance of grading permit.	County Planning and Building

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
	swales, via non-erodible engineered drainage devices. Fill slopes and stability fills, as applicable, shall be provided with subsurface drainage for stability.			
GR-1e	At the time of application for grading and construction permits, all proposed slope, building pad, and rail track bed construction shall be properly engineered, with fill placed in accordance with requirements of the current County of San Luis Obispo Building and Construction Ordinance (Title 19 of the San Luis Obispo County Code), and California Building Code.	Review and approval of grading plans	Approve grading plans prior to issuance of building permits	County Planning and Building
GR-1f	During construction, the proposed aboveground oil pipeline shall be anchored to prevent pipeline movement, as determined by a California Registered Civil Engineer, in accordance with California Building Code, San Luis Obispo County requirements, and the American Public Works Association Greenbook.	Review and approval of design drawings	Approve design drawings prior to issuance of building permits	County Planning and Building
GR-1g	At the time of application for construction permits, the facilities and equipment, including spill containment vaults and Project-related pipelines, shall be designed for predicted, site-specific seismic loading in accordance with applicable codes, including the California Building Code.	Review and approval of design drawings	Approve design drawings prior to issuance of building permits	County Planning and Building
GR-1h	The Applicant shall cease rail car unloading and pipeline oil conveyance following any perceptible (i.e., felt by humans) seismic event and inspect all project-related facilities, equipment, and pipelines for damage prior to restarting operations.	Cease any rail car unloading and pipeline oil conveyance and inspect all project-related facilities, equipment and pipelines following any perceptible seismic event.	Inspection for earthquake damage of unloading and oil conveyance infrastructure immediately following seismic events.	County Planning and Building
GR-1i	Consistent with California Building Code Section 3401.2, all project-related facilities, equipment, and pipelines shall be maintained in conformance with the California Building Code edition under which it was installed. Annual inspections shall be completed by a California Registered Civil Engineer to verify that project components have not been damaged or compromised by seismic induced ground shaking, corrosion, soil erosion, soil settlement, or other geologic hazards.	Inspection of project-related facilities, equipment, and pipelines	Annually	County Planning and Building
GR-2	During construction and operations, the Applicant shall implement a Storm Water Pollution Prevention Plan using Best Management Practices and monitor and maintain stormwater pollution control facilities identified in the	Review and approval of SWPPP.	Approve SWPPP prior to issuance of grading permit.	County of San Luis Obispo

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
	Storm Water Pollution Prevention Plan, in a manner consistent with the provisions of the Federal Water Pollution Control Act (National Pollutant Discharge Elimination System Program). Stormwater management protection measures and wet weather measures shall be designed by a California registered, Qualified Storm Water Pollution Prevention Plan Developer. In addition, a California registered, Qualified Storm Water Pollution Prevention Plan Practitioner shall oversee and monitor construction and operational Best Management Practices and stormwater management, in accordance with the State General Construction Permit and the Central Coast Regional Water Quality Control Board. Conventional measures typically recommended by the State Water Resource Board and the California Department of Transportation include the following: a. Implement permanent erosion and sediment control measures: – Minimize grading, clearing, and grubbing to preserve existing vegetation; – Use mulches and hydroseed, free of invasive plants, to protect exposed soils; – Use geotextiles and mats to stabilize soils; – Use drainage swales and dissipation devices; and – Use erosion control measures outlined in the California Stormwater Quality Association Best Management Practice Handbook. b. Implement temporary Best Management Practice mitigation measures: – Use silt fences, sandbags, and straw wattles; – Use temporary sediment basins and check dams; and – Use temporary Best Management Practices outlined in the California Stormwater Quality Association Best Management Practice Handbook. c. Implement tracking control Best Management Practices to reduce tracking sediment offsite. – Use stabilized construction entrance and exit with steel shakers; – Use tire wash areas; and – Use tracking control Best Management Practices outlined in the California Stormwater Quality Association Best Management Practice Handbook. Personnel at the site shall be trained in equipment use and containment and cleanup of an oil spill. Dry cleanup methods, such as absorbents, shall be used on paved and impermeable surfaces. Spills in dirt areas shall be immediately contained with an earthen dike and the contaminated soil shall be dug up and discarded in			

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
	accordance with local and state regulations.			

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