Section 3.5
Geology

SECTION SUMMARY

This section presents the geologic conditions for the proposed project area and analyzes (1) seismic hazards, including surface rupture, ground shaking, liquefaction, subsidence, tsunamis, and seiches; (2) other geologic issues, including potentially unstable soils and slopes; and (3) soil erosion or the loss of topsoil. This evaluation considers published reports, previous environmental documents, and the general geologic setting as indicators of potential geologic hazards. Although most impact sections in this Draft EIS/EIR look at the potential impact the proposed Project or alternatives could have on the affected resource areas, in Section 3.5, Geology, impacts are determined by whether the geological process could cause additional environmental impacts as a result of the proposed Project or alternatives. This difference is because geological processes, such as earthquakes, would occur independently of the proposed Project or any alternative.

Section 3.5, Geology, provides the following:

- a description of the existing geological setting in both the Port and proposed project area;
- a description of geological processes such as faults, tsunamis, and subsidence;
- a discussion on the methodology used to determine whether the proposed Project or alternatives would result in an impact on geological resources or whether the impacts of geological hazards on components of the proposed Project or alternatives would result in an impact on structures or expose people to risk of injury;
- an impact analysis of both the proposed Project and alternatives; and
- a description of any mitigation measures proposed to reduce any identified impacts, as applicable.

Key Points of Section 3.5:

All impacts related to geology were determined to result in a less-than-significant level or no impact, as identified below:

- with implementation of applicable building codes, regulations and modern engineering and safety standards, and LAHD policies and regulations, construction and operation of the proposed Project or an alternative would not expose people and structures to potential substantial adverse effects, including the risk of loss, injury, or death, related to:
  - surface rupture, ground shaking, and liquefaction;
  - tsunamis or seiches;
  - land subsidence/soil settlement;

- expansive soils;
- unstable soil conditions from excavation, grading, or fill; and
- erosion or significant loss of topsoil;

- the topography at the proposed project site and surroundings is flat and not subject to landslides or mudflows;
- there are no prominent geologic or topographic features located at the proposed project site that could be destroyed as a result implementation of the proposed Project or an alternative; and
- the proposed project site is composed entirely of fill and does not contain mineral resources.

3.5.1 Introduction

This section describes the existing geologic conditions within the Port and near the proposed project site, as well as potential geologic impacts associated with construction and operation of the proposed Project or alternatives. This section includes discussions on the existing conditions and impacts associated with a variety of geologic conditions, including faults and seismicity, liquefaction, subsidence, erosion, unstable soils, expansive soils, mineral resources, tsunamis, seiches, and sea level rise. Geologic conditions and trends generally encompass large areas beyond a particular project site, but the impacts focus on the specific conditions underlying the project area. For purposes of this EIS/EIR, the project area is limited to the approximately 185-acre site at Berths 212–224 on Terminal Island as shown in Figure 2-3 in Chapter 2, Project Description.

3.5.2 Environmental Setting

3.5.2.1 Regional Setting

Given the proximity of the site to Berths 302-306 (APL Container Terminal) and City Dock No. 1, and the fact that regional geologic characteristics do not change within the small geographic area, the regional setting description is largely based on information from the *Berths 302–306 APL Container Terminal Project Draft Environmental Impact Statement/Environmental Impact Report* (LAHD 2011) and *City Dock No.1 Marine Research Center Project Draft Environmental Impact Report* (LAHD 2012).

Geology

The proposed project site is located near sea level and underlain by imported fill of varying depths. The majority of these fill materials were placed as spoils from various nearby dredging operations. Quaternary and Neogene[1] deposits make up most of the regional vicinity. The alluvial sands and silts were deposited from recent and Pleistocene[2] river action as outwash from the Los Angeles Basin. A northwest-southeast trending fault system marks the southwestern structural block, one of four such blocks underlying the Los Angeles Basin (LAHD 2011).

Seismicity and Major Faults

When an earthquake occurs, waves of energy are transmitted through the earth, resulting in a variety of seismic effects, including surface rupture, ground shaking, and ground failure such as liquefaction. Surface rupture is most common within the vicinity of a main fault trace and along other faults associated with the main fault. Ground shaking is the phenomenon most readily associated with earthquakes and may be experienced as a violent shuddering or rocking motion or as a gentle nudge. Soil liquefaction is a phenomenon in which saturated soils experience a sudden and nearly complete loss of strength during seismic events. If not confined, the soil acquires sufficient mobility to allow for horizontal and vertical movements. Liquefaction can result in shallow

[1] The **Neogene** is a geologic period and system starting 23.03 ± 0.05 million years ago and lasting until 2.588 million years ago with the beginning of the Quaternary period. The **Quaternary period** is the youngest of three periods of the Cenozoic era in the geologic time scale. It follows after the Neogene period, spanning 2.588 +/- 0.005 million years ago to the present. Quaternary includes two geologic epochs: the Pleistocene and the Holocene epochs. Quaternary and Neogene deposits refer to the geologic materials that were being deposited during the respective time periods.

[2] The **Pleistocene** is the epoch from 2.588 million to 12 000 years BP covering the world's recent period of repeated glaciations.

foundation failures, boiling, severe settlement, and failure of fill supported on liquefiable soils. The magnitude of liquefaction-induced settlement depends on the thickness and relative density of the liquefiable soils and the intensity of ground shaking. Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands.

An earthquake is classified by the magnitude of wave movement (related to the amount of energy released), which traditionally has been quantified using the Richter scale. This is a logarithmic scale wherein each whole-number increase in magnitude represents a tenfold increase in the wave magnitude generated by an earthquake. Structural damage typically occurs at magnitude 5.0 or greater. One limitation of the Richter magnitude scale is that it has an upper limit at which large earthquakes have about the same magnitude. As a result, the moment magnitude scale, which does not have an upper limit magnitude, was introduced in 1979; it is often used for earthquakes greater than magnitude 3.5. Earthquakes of magnitude 6.0 to magnitude 6.9 are classified as moderate, those between magnitude 7.0 and magnitude 7.9 are classified as major, and those of magnitude 8.0 or greater are classified as great.

The YTI site is located in a seismically active region. The southern half of California is recognized as one of the most seismically active areas in the United States. The region has been subjected to at least 50 earthquakes of M6 or greater since 1796. Ground motion in the region is generally a result of sudden movements of large blocks of the earth along active faults. The fault with the highest probability of generating at least one magnitude 6.7 quake or larger in the next 30 years is the southern San Andreas fault, at 59%. The probability of a magnitude 6.7 or greater earthquake in the greater Los Angeles area in the next 30 years is 67% (Southern California Earthquake Center 2013).

Seismic analyses generally include discussions of maximum credible and maximum probable earthquakes. A maximum credible earthquake (MCE) is usually defined as the maximum earthquake that appears capable of occurring under the known tectonic framework. The probability of occurrence is not considered in this characterization. A maximum probable earthquake (MPE) is defined as the maximum historical earthquake and also as the largest earthquake a fault is predicted capable of generating within a specified time period (i.e., 100 years). Additionally, LAHD uses a combination of probabilistic and deterministic seismic hazard assessments for seismic design. Probabilistic hazard assessments are required to define two-level design events, including the Operational Level Earthquake (OLE), which is the peak horizontal firm ground acceleration with a 50% probability of exceedance in 50 years and the Contingency Level Earthquake (CLE), which is the peak ground acceleration with a 10% probability of exceedance in 50 years.

Faults

Segments of the active Palos Verdes fault cross portions of the Los Angeles Harbor, with a portion of the fault adjacent (southwest) to the proposed project site. The fault is considered an active “B” type fault with slip rates of approximately 1 to 5 millimeters per year and a maximum credible earthquake magnitude of 7.3 (City of Rancho Palos Verdes 2010). The width of the zone of potential surface ruptures is variable and estimated to range approximately 1,640 feet to as narrow as about 246 feet. The zone is known to be widest in near the Vincent Thomas Bridge. No known earthquakes have occurred along the Palos Verdes fault in the past 200 years (LAHD 2011).

The San Pedro Basin fault runs parallel to the Palos Verdes fault (to the west). The San Pedro Basin fault is located in deep seafloor and may be associated with small-magnitude (3.0 to 5.0) earthquakes. Although it is a possibility that earthquakes of magnitude 7.0 to 7.2 could occur, a smaller magnitude earthquake (6.5 to 7.0) would be more likely given that the fault is highly segmented (LAHD 2011).

Additionally, numerous other active faults and fault zones are located in the general region, such as the Newport-Inglewood Whittier-Elsinore, Santa Monica, Raymond, San Fernando, Sierra Madre, San Gabriel, Cucamonga, San Jacinto, and San Andreas faults. Table 3.5-1 presents an overview of these major regional faults along with the anticipated earthquake magnitudes. Active faults are typical in Southern California. Therefore, it is reasonable to expect a strong ground-motion seismic event during the lifetime of the proposed Project, or alternative, in the region.

Numerous active faults located off-site are capable of generating earthquakes in the proposed project area (Tables 3.5-1 and 3.5-2). Because of its proximity and its seismic activity history, the Newport-Inglewood fault, which has generated earthquakes of magnitudes ranging from 4.7 to 6.3 on the Richter scale, has the highest probability of affecting the proposed project site.

In 1974, the California Division of Mines and Geology (CDMG) was designated by the Alquist-Priolo Act as the agency responsible for delineating those faults deemed active and likely to rupture the ground surface. The Alquist-Priolo Act does not currently zone faults in the area of the Port; however, there is evidence that the Palos Verdes fault may be active and could result in ground rupture (LAHD 2011).

Table 3.5-1: Hazardous Faults and Maximum Earthquake Magnitudes—Los Angeles Basin Area

Fault Name	Distance in miles from Proposed Project Site	Fault Type	Maximum Magnitude	Slip Rate* (mm/year)
Palos Verdes Fault	< 1	SS	7.7	3
Newport-Inglewood Fault Zone	7	SS	7.5	1–1.5
San Pedro Basin Fault	15	SS	7.2	0.5–1
Whittier-Elsinore Fault Zone (Whittier, Chino, and Elsinore Faults)	22	R/O	7.7	3–5
Santa Monica Fault	28	R/O	6.6	1
Hollywood Fault	23	R/O	6.7	1
Raymond Hill Fault	27	R/O	6.8	1.5
Cucamonga Fault	45	R	6.7	5
Sierra Madre/San Fernando Fault	40	R	6.7	2
San Jacinto Fault	57	SS	7.8	6–18
San Andreas Fault	54	SS	8.2	16–34

Source: LAHD 2011.
SS – Strike Slip
R – Reverse
O – Oblique
*Slip rate refers to how fast the two sides of a fault are slipping relative to one another.

Table 3.5-2: Historical Earthquakes at Los Angeles Basin Faults (with Magnitude Greater than 5.5)

Fault Name	Date	Richter Magnitude
Palos Verdes Fault	*	*
San Pedro Basin Fault	*	*
Santa Monica-Raymond Fault Zone	1855	6.0
San Andreas Fault	1857, 1952	8.2, 7.7
Newport-Inglewood Fault	1933	6.3
San Jacinto Fault	1968	6.4
San Fernando/Sierra Madre-Cucamonga Fault Zone	1971 1991	6.4 6.0
Whittier-Elsinore Fault Zone	1987	5.9
Camp Rock/Emerson Fault	1992	7.4
Blind-thrust fault beneath Northridge	1994	6.6

Source: LAHD 2011.
Notes: *No known earthquakes have occurred within the last 200 years.

Liquefaction

When loosely packed soils are subjected to seismic shaking in proximity to water (such as groundwater), a process called *liquefaction* can occur. This phenomenon typically occurs in loose, saturated sediments of primarily sandy composition with ground acceleration due to gravity (g) of more than 0.2 g. When this occurs, the sediments involved have a total or substantial loss of shear strength and behave more like a liquid or semi-viscous substance. This can cause ground settlement, foundation failures, and a buoyant rise of buried structures. When soil liquefies, loss of bearing strength may occur beneath a structure, possibly causing buildings to settle or tilt.

Natural drainages at Port berths have been backfilled with fill material from undocumented sources. Dredged materials from the harbor area were spread across lower Wilmington from 1905 until 1910 or 1911. Additionally, natural alluvial deposits in the area are generally unconsolidated, soft, and saturated. Previous environmental investigations show groundwater depth in the proposed project area typically ranging between 10 and 16 feet below ground surface (bgs). The soft, saturated, and unconsolidated soils, along with the shallow groundwater, make liquefaction possible. According to the City of Los Angeles General Plan, Safety Element, the proposed project area is susceptible to liquefaction due to the presence of recent alluvial deposits and groundwater less than 30 feet bgs (City of Los Angeles 1996).

Tsunamis

Tsunamis are large ocean waves caused by significant seismic events. Tsunamis, like tides, produce waves of water that move inland, but in the case of tsunami, the inland movement of water is much greater and lasts for a longer period than normal tides. Typically, oceanic tsunamis are the result of sudden vertical movement along a fault rupture in the ocean floor, submarine landslides, subsidence, or volcanic eruption where the sudden displacement of water sets off transoceanic waves with wavelengths of up to

125 miles and with periods generally from 5 to 60 minutes. The trough of the tsunami wave arrives first, leading to the classic retreat of water from the shore as the ocean level drops. This is followed by the arrival of the crest of the wave, which can run up on the shore in the form of bores or surges in shallow water, or a simple raising and lowering of the water level in relatively deeper water such as in harbor areas. According to the City of Los Angeles General Plan, Safety Element, hazardous tsunamis along the Los Angeles coast are rare, but major storms at sea also can generate heavy waves. These waves have caused considerable damage to properties and beaches along the ocean perimeter in the past.

Tsunamis are a relatively common natural hazard, although most such events are small in amplitude and not particularly damaging. However, a run-up of broken tsunamis in the form of bores and surges or relatively dynamic flood waves my cause coastal flooding after a large submarine earthquake or landslide. With a bore/surge-type run-up, the onshore flow can cause tremendous dynamic loads on structures (i.e., impact forces and drag forces) in addition to hydrostatic loading. The subsequent draw-down of the water after the run-up exerts often crippling opposite drags on structures and washes loose/broken properties and debris to sea. The floating debris, when brought back with the next onshore flow, has been found to be a significant cause of extensive damage after successive run-up and draw-down events. The potential loss of human life in this process can be great if such events occur in populated areas.

Abrupt sea level changes associated with tsunamis in the past have reportedly damaged moored vessels in the outer portions of the Los Angeles Harbor. Boats can break loose from their moorings, causing them to sink or sustain damage. Furthermore, leaking gasoline from damaged boats can create an environmental hazard.

Until recently, projections regarding tsunami run-ups along the western coastline of the United States were based on far-field events, such as submarine earthquakes or landslides occurring at great distances from the coast. With such distant sources, tsunami-generated wave heights of between 6.5 feet and 8 feet above mean lower low water (MLLW) at 100-year intervals and between 10 feet and 11 feet at 500-year intervals were projected. This includes the effects of astronomical tides. The MLLW is the benchmark from which infrastructure (e.g., wharf and berth heights) is measured in the Port; mean sea level (MSL) is +2.8 feet above MLLW (LAHD 2011).

Recent studies have projected larger tsunami run-ups based on near-field events, such as earthquakes or submarine landslides in proximity to the California coastline. Offshore faults present a larger local tsunami hazard than previously thought, posing a direct threat to near-shore facilities. Previously conducted simulations involving such faults have suggested the generation of waves in excess of 12 feet within the Port area. It is worth noting that the simulations were based on rare events, representing worst-case scenarios. However, landslide-derived tsunamis are now perceived as a viable local tsunami hazard. Such tsunamis can be more dangerous because of the lack of warning for such an event. According to the City of Los Angeles General Plan, Safety Element, Landslide Inventory and Hillside Areas map, the proposed project area is not located in an area with a high probability of landslides (City of Los Angeles 1996). According to previous studies in California, the likelihood of an occurrence as a result a large submarine landslide appears quite rare compared with tectonic faulting events. Although there are numerous mapped submarine landslides off the Southern California shore, few appear to be on the scale necessary to generate a catastrophic tsunami. As a result, the most likely direct cause of

most of the local tsunamis in Southern California is tectonic movement during large offshore earthquakes.

In 2004, the California State Lands Commission (CSLC) developed tsunami run-up projections for the Ports of Los Angeles and Long Beach. The CSLC estimated tsunami run-ups to be approximately 8.0 feet and 15.0 feet above MSL at 100- and 500-year intervals, respectively, as a part of its Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS). These projections do not incorporate consideration of localized landfill configurations, bathymetric features (water depth and topography of the harbor bottom), and the interaction of the diffraction (bending of waves around obstacles), reflection (change in direction due to interference), and refraction (change in direction due to speed) of tsunami wave propagation within the Port Complex in the predictions of tsunami wave heights.

In a 2007 study Moffatt and Nichol developed a tsunami model for the Los Angeles/Long Beach Port Complex that incorporates consideration of the localized imported fill configurations, bathymetric features, and the interaction of the diffraction, reflection, and refraction of tsunami wave propagation in the prediction of tsunami wave heights. The Los Angeles/Long Beach Port Complex model uses a methodology similar to the above studies to generate a tsunami wave from different potential sources, including local earthquakes, remote earthquakes, and local submarine landslides. Specifically, the potential seismic tsunamigenic sources include two scenarios based on a magnitude 7.6 Santa Catalina fault earthquake (Segments 1–7 and Segments 5–7), one scenario based on a magnitude 7.1 Lasuen Knoll fault earthquake, one scenario based on a magnitude 7.0 San Mateo thrust fault earthquake, one scenario based on a magnitude 9.2 Cascadia Subduction Zone earthquake located in the Pacific Northwest, and two landslide events based on the Palos Verdes escarpment located south of the Port. This model indicates that a reasonable maximum source for future tsunami events at the proposed project site would either be an earthquake on the Santa Catalina fault or a submarine landslide along the nearby Palos Verdes Peninsula.

The Port Complex model predicts a maximum tsunami wave height, or reasonable worst-case scenario, of approximately 5.2 to 6.6 feet above MSL for the earthquake scenario and approximately 7.2 to 23.0 feet above MSL for the landslide scenario at certain locations within the Port. The highest anticipated water levels from the earthquake scenarios are predicted to occur in the East Channel area of the Port. The highest anticipated water levels from the landslide scenarios would occur in the Outer Harbor area and the western side of Pier 400. The report determined that for the worst-case landslide scenario, water levels could exceed the adjacent deck levels in some localized areas (Pier 400) and some limited overtopping of the wharves could occur; however, no overtopping would be expected at the Port under any of the other scenarios analyzed. Additionally, none of the scenarios modeled, including the two with the most significant sea level rise (the Palos Verdes landslide scenario and Catalina fault [Segments 1–7] scenario), indicated a sea level rise impact in the YTI Terminal area. Further, the modeled worst-case tsunami scenario was based partially on a moment magnitude 7.6 earthquake on the offshore Catalina fault. The recurrence interval for a magnitude 7.5 earthquake along an offshore fault in Southern California is about 10,000 years. Similarly, the recurrence interval of a magnitude 7.0 earthquake is about 5,000 years, and the recurrence interval of a magnitude 6.0 earthquake is about 500 years. However, there is no certainty that any of these earthquake events would result in a tsunami (only about 10% of earthquakes worldwide result in a tsunami). In addition, available evidence

indicates that tsunamigenic landslides are extremely infrequent and occur less often than large earthquakes. This suggests that the recurrence intervals for such landslide events would be longer than the 10,000-year recurrence interval estimated for a magnitude 7.5 earthquake (LAHD 2011).

Seiches

A seiche is a surface wave created when a body of water is shaken. Seiches are seismically induced waves that surge back and forth in an enclosed basin and may be expected in the harbor as a result of earthquakes. A significant wave front could cause damage to sea walls and docks and breach sea walls surrounding the proposed project site. Modern shoreline protection techniques are designed to resist seiche damage.

The Los Angeles/Long Beach Port Complex model considered impacts from both tsunamis and seiches. In each case, impacts from a tsunami were equal to or more severe than those from a seiche (LAHD 2011).

Sea Level Rise

Model data suggest that sea levels along the California coast could rise substantially over the next century as a result of climactic change. Inundation of low-lying areas along the coast as a result of sea level rise is a concern. Other risks pertaining to sea level rise include the exposure of new areas to flooding risks, an increase in intensity and risk in areas already susceptible to flooding, and an increase in coastal erosion in erosion-prone areas.

The *State of California Sea Level Rise Guidance Document* prepared by the Sea Level Rise Task Force of the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT) recommends using the ranges of sea level rise presented in the June 2012 National Research Council report on *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* as a starting place for estimating sea level projections, as shown in Table 3.5-3 (CO-CAT 2013).

Table 3.5-3: Los Angeles Sea Level Rise Projections Relative to Year 2000

Year	Projection (feet)	Range (feet)c
2030	0.26	0.2 –0.32
2050	0.59	0.43–0.73
2100	1.92	1.27–2.51

Source: Committee on Sea Level Rise in California, Oregon, and Washington et al. 2012.

Subsidence

Ground subsidence due to groundwater withdrawal is the gradual settling or sinking of the ground surface, with little or no horizontal movement. Fill and native materials on-site become water saturated, and the net decrease in pore pressure and contained water allows the grains of soil to pack closer together. This closer grain packing results in less volume and a lowering of the ground surface.

Subsidence was first observed in the Los Angeles-Long Beach Harbor area in 1928 (LAHD 2011). Studies by the City of Long Beach and the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources, determined that most of the area's subsidence was the result of oil and gas extraction from the Wilmington Oil Field following the discovery of oil in 1936. Additionally, groundwater withdrawal and tectonic movement also appear to have contributed to subsidence in the area, most notably prior to the extraction of oil from the Wilmington Oil Field.

East of the proposed project site, oil production from the Wilmington Oil Field created a land surface subsidence bowl up to 29 feet deep in and around the Port of Long Beach and along the coastal strand of the City of Long Beach. An area of more than 20 square miles was affected adjacent to the shoreline. Other areas affected included the City of Seal Beach and the City of Los Angeles. Today, water injection is used to offset the total volume of extracted substances, including oil, gas, and water, to prevent further reservoir compaction and subsidence. (City of Long Beach 2013a, b.)

Landslides

Landslides are movements of relatively large landmasses, either as nearly intact bedrock blocks or as jumbled mixes of bedrock blocks, fragments, debris, and soil. Landslides are common throughout Southern California's mountain ranges, particularly near major fault zones where the rock has been weakened by fracturing, shearing, and crushing. Landslides may occur because of seismic shaking, local climatic conditions, or human-made modifications to the slide mass. Ocean wave action, the undercutting of slopes during construction, improper compaction, or over saturation can also trigger landslides. In areas on hillsides where the ground cover has been destroyed, landslides are more probable because water can more easily infiltrate the soils. Immediate dangers from landslides include the destruction of property and possible fatalities from rocks, mud, and water sliding downhill or downstream. Other dangers include broken electrical, water, gas, or sewage lines.

As mentioned in the tsunami discussion, the proposed project area is not located within an area with a high probability of landslides.

Erosion

Erosion is a condition that can significantly and adversely affect development on any site. Structures located above or below actively eroding natural slopes or manufactured slopes could be susceptible to the effects of erosion. In addition, development could exacerbate erosion conditions, if they exist, by exposing soils and adding additional water to the soil from irrigation and runoff from new impervious surfaces.

Erosion and the loss of topsoil could occur during implementation of the proposed Project. YTI Terminal backland improvements involve pavement removal and repaving and these activities could result in the temporary exposure and loss of soils. Currently, the potential for significant soil erosion or loss of topsoil without implementation of the proposed Project is very low because the majority of the YTI Terminal area is paved.

Unstable Soils

Compressible soils are fine-grained soils (silts and clays) that are susceptible to decreasing in volume (i.e., they compress) when weight is placed on them. The settlement of compressible silts and clays is referred to as *consolidation*, which occurs when groundwater is squeezed from soil pores by added surface loads, such as fills or building foundations. The amount and rate of settlement can vary greatly, depending on a number of factors, including natural moisture and density, the thickness of the compressible layer, the amount of fill placed over the compressible material, and the ability of pore water to escape from soil pores through drainage paths such as sand lenses and soil fissures.

Natural alluvial and estuarine deposits, as well as imported fill consisting of dredged deposits or of imported soils, comprise the soil in the proposed project area. Because the proposed project site is partially constructed in fill areas, it could be subject to lateral spreading, subsidence, liquefaction, or collapse and become unstable.

Expansive Soils

Fine-grained soils (silts and clays) may contain variable amounts of expansive minerals. These minerals can undergo significant volume changes as a result of changes in moisture content (i.e., they expand when they get wet and shrink as they dry out). This expansive behavior can damage foundations and other building components. Fine-grained sediments with high clay content, which are found throughout the Port, would be most susceptible to potential expansive soil impacts. Additionally, clay minerals are likely to be present in the imported fill located throughout the Port.

Mineral Resources

Enactment of the Surface Mining and Reclamation Act of 1975 (SMARA) was intended to promote conservation of the mineral resources of the state and ensure adequate reclamation of mined lands. Among other provisions, SMARA requires the state geologist to classify land in California for mineral resource potential. The four categories are Mineral Resource Zone (MRZ) 1 (areas of no mineral resource significance), MRZ-2 (areas of identified mineral resource significance), MRZ-3 (areas of undetermined mineral resource significance), and MRZ-4 (areas of unknown mineral resource significance).

The proposed project area has a classification of MRZ-1 (California Department of Conservation 1994) and therefore is considered an area of no mineral resource significance. In addition, the proposed project site is located southwest of and beyond the approximately 11-mile-long and 3-mile-wide Wilmington Oil Field. The Wilmington Oil Field covers approximately 13,500 acres (California Department of Conservation 2013). The southwesterly edge of the field crosses the Los Angeles Harbor north of the Vincent Thomas Bridge. The proposed project site is not within an active oil field, and no oil production or exploration occurs within the general vicinity.

For the reasons stated above, impacts on mineral resources are not discussed further in this section.

3.5.3 Applicable Regulations

Alquist-Priolo Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate hazards from surface faulting to structures for human occupancy. Under the Alquist-Priolo Act, the California state geologist identifies areas in the state that are at risk from surface fault rupture. The primary purpose of the Alquist-Priolo Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the state geologist to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Local agencies can be more restrictive than state law requires (California Department of Conservation 2005.)

Before a project can be permitted, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet). (California Department of Conservation 2005.)

Seismic Hazards Mapping Act of 1990

The California State Seismic Hazards Mapping Act of 1990 addresses earthquake hazards other than surface fault rupture, including liquefaction and seismically induced landslides. Through it, the state establishes city, county and state agency responsibilities for identifying and mapping seismic hazard zones and mitigating seismic hazards to protect public health and safety. It requires the California Department of Conservation, Division of Mines and Geology, to map seismic hazards and establishes specific criteria for project approval that apply within seismic hazard zones, including the requirement for a geological technical report.

California Building Code

The California Code of Regulations, Title 24 (California Building Code), applies to all applications for building permits. The California Building Code (also called the California Building Standards Code) has incorporated the Uniform Building Code (first enacted by the International Conference of Building Officials in 1927 and updated approximately every 3 years since that time). The current version of the California Building Code became effective in 2007.

Local agencies must ensure that development in their jurisdictions comply with guidelines contained in the California Building Code. Cities and counties can, however, adopt building standards beyond those provided in the code

City of Los Angeles General Plan

The City of Los Angeles governs the geologic resources and geotechnical hazards in the proposed project vicinity. The Conservation and Safety Elements of the City of Los Angeles General Plan contain policies for the protection of geologic features and avoidance of geologic hazards (City of Los Angeles 1996). Local grading ordinances establish detailed procedures for excavation and earthwork required during construction in backland areas.

City of Los Angeles Building Code, Sections 91.000–91.7016

The City of Los Angeles Building Code (LABC) and building design standards for the Port establish requirements for the construction of aboveground structures (City of Los Angeles 2011). Most local jurisdictions rely on the latest California Uniform Building Code (UBC) as a basis of seismic design; however, LAHD would also apply its standards and specifications to the design of the proposed Project or alternatives. LAHD also has developed a seismic code to provide construction standards. LAHD seismic design codes are contained in the *Proceedings of the Port of Los Angeles Seismic Workshop on Seismic Engineering* and *The Port of Los Angeles Code for Seismic Design, Upgrade, and Repair of Container Wharves* (Pyke 1990; Port of Los Angeles 2004).

City of Los Angeles Emergency Operations Organization Manual Tsunami Response Plan Annex

The City of Los Angeles Emergency Preparedness Department provides citywide emergency leadership, continuity, and direction to enable the City and all of its various departments and divisions to respond to, recover from, and mitigate the impact of natural, human-made, or technological disasters upon its people or property (City of Los Angeles 2008). The department has prepared a City of Los Angeles Emergency Operations Organization Manual that describes the organization, responsibilities, and priorities of all City departments and local agencies in case of an emergency (City of Los Angeles Emergency Operations Organization 2006). The manual is maintained by the Emergency Preparedness Department and is organized by type of emergency as well as by the City departments that are responsible for responding to certain emergencies. The manual includes the following sections applicable to the Port area:

- LAHD Plan,
- Hazardous Materials Annex, and
- Tsunami Response Plan Annex.

The Tsunami Response Plan Annex identifies the Port area as a Tsunami Inundation Zone and outlines policies and procedures of nine different City departments (including LAHD, LAPD, LAFD, and Los Angeles Emergency Preparedness Department) in the event of a tsunami (City of Los Angeles 2008). The Tsunami Response Plan identifies evacuation routes for the San Pedro area and the harbor area and specifies evacuation locations to which evacuees should retreat. The plan identifies that the mission of LAHD with respect to a tsunami is to provide employees, tenants, and the public with a safe, well-planned, and organized method of evacuating the Port district. It outlines several actions that the Port Police are responsible for, including following the established evacuation checklist, evacuating the affected Tsunami Inundation Zone, and activating notification procedures. The divisional organization and basic functions that would

support the Tsunami Response Plan for the Port area are consistent with LAHD's emergency plan and procedures.

3.5.4 Impacts and Mitigation Measures

3.5.4.1 Methodology

In this document, geological impacts are evaluated in two ways: (1) impacts of the proposed Project or alternative on the local geologic environment and (2) impacts of geological hazards on components of the proposed Project or alternative that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury are considered. Impacts would be significant if the proposed Project or alternative meets the significance criteria listed in Section 3.5.4.2.

3.5.4.2 CEQA Baseline

Section 15125 of the CEQA Guidelines requires EIRs to include a description of the physical environmental conditions in the vicinity of a project that exist at the time of the NOP. These environmental conditions normally would constitute the baseline physical conditions by which the CEQA lead agency determines if an impact is significant. The NOP for the proposed Project was published in April 2013. For purposes of this Draft EIS/EIR, the CEQA baseline takes into account the throughput for the 12-month calendar year preceding NOP publication (January through December 2012) in order to provide a representative characterization of activity levels throughout the complete calendar year preceding release of the NOP. In 2012, the YTI Terminal encompassed approximately 185 acres under its long-term lease, supported 14 cranes (10 operating), and handled approximately 996,109 TEUs and 162 vessel calls. The CEQA baseline conditions are also described in Section 2.7.1 and summarized in Table 2-1.

The CEQA baseline represents the setting at a fixed point in time. The CEQA baseline differs from the No Project Alternative (Alternative 1) in that the No Project Alternative addresses what is likely to happen at the proposed project site over time, starting from the existing conditions. Therefore, the No Project Alternative allows for growth at the proposed project site that could be expected to occur without additional approvals, whereas the CEQA baseline does not.

3.5.4.3 NEPA Baseline

For purposes of this Draft EIS/EIR, the evaluation of significance under NEPA is defined by comparing the proposed Project or other alternative to the NEPA baseline. The NEPA baseline conditions are described in Section 2.7.2 and summarized in Table 2-1. The NEPA baseline condition for determining significance of impacts includes the full range of construction and operational activities the applicant could implement and is likely to implement absent a federal action, in this case the issuance of a USACE permit.

Unlike the CEQA baseline, which is defined by conditions at a point in time, the NEPA baseline is not bound by statute to a "flat" or "no-growth" scenario. Instead, the NEPA baseline is dynamic and includes increases in operations for each study year (2015, 2016, 2017, 2020, and 2026), which are projected to occur absent a federal permit. Federal permit decisions focus on direct impacts of the proposed Project to the aquatic environment, as well as indirect and cumulative impacts in the uplands determined to be

within the scope of federal control and responsibility. Significance of the proposed Project or the alternatives under NEPA is defined by comparing the proposed Project or the alternatives to the NEPA baseline.

The NEPA baseline, for purposes of this Draft EIS/EIR, is the same as the No Federal Action Alternative. Under the No Federal Action Alternative (Alternative 2), no dredging, dredged material disposal, in-water pile installation, or crane installation/extension would occur. Expansion of the TICTF and extension of the crane rail would also not occur. The No Federal Action Alternative includes only backlands improvements consisting of slurry sealing, deep cold planning, asphalt concrete overlay, restriping, and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. These activities do not change the physical or operational capacity of the existing terminal.

The NEPA baseline assumes that by 2026 the terminal would handle up to approximately 1,692,000 TEUs annually, accommodate 206 annual ships calls at two berths, and be occupied by 14 cranes (10 operating).

3.5.4.4 Thresholds of Significance

The *L.A. CEQA Thresholds Guide* (City of Los Angeles 2006) is the basis for the following significance criteria and determining the significance of impacts associated with geology resulting from development of the proposed Project or alternatives.

To consider geologic hazard impacts significant, the proposed Project or alternative would cause or accelerate hazards that would result in substantial damage to structures or infrastructure or exposes people to substantial risk of injury. Because the region is geologically active, there is exposure of most projects to some risk from geologic hazards, such as earthquakes. Therefore, geologic impacts are significant only if the proposed Project or alternative would result in substantial damage to structures or infrastructure or expose people to substantial risk of loss, injury, or death involving:

GEO-1: Fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure;

GEO-2: Tsunamis or seiches;

GEO-3: Land subsidence/settlement;

GEO-4: Expansive soils;

GEO-5: Landslides or mudflows;

GEO-6: Unstable soil conditions from excavation, grading or fill; or

GEO-7: Substantial soil erosion or the loss of topsoil.

In addition, a project or alternative would normally have a significant impact with respect to landform alteration or mineral resources if:

GEO-8: One or more distinct prominent geologic or topographic features would destroy, permanently cover, or materially and adversely modify one or more

distinct and prominent geologic or topographic features. Such features may include, but not be limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands; or

GEO-9: It would result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

There are no established sea level rise significance thresholds, nor has the federal government or the state adopted any regulations. In the absence of an adopted threshold, USACE has elected to not use the Port of Los Angeles' proposed **GEO-9** CEQA standard, propose a new standard, or make a NEPA impact determination if the proposed Project or any alternative would be affected by sea level rise. Rather, in compliance with the NEPA implementing regulations, the anticipated impacts relative to the NEPA baseline will be disclosed for the proposed Project and each alternative without expressing a judgment as to significance.

3.5.4.5 Analysis Assumptions

This assessment of the proposed Project and its alternatives is based on regulatory controls and the following assumptions:

- As applicable, proposed project elements would be implemented in accordance with the Los Angeles Building Code (under the Los Angeles Municipal Code [LAMC]) to minimize impacts associated with seismically induced geological hazards. These building codes and criteria provide requirements for construction, grading, excavations, use of fill, and foundation work, including type of materials, design, procedures, etc. The intention of these codes is to limit the probability of occurrence and the severity of consequences from geological hazards. Necessary permits, plan checks, and inspections are also specified. The LAMC also incorporates structural seismic requirements of the UBC, which classifies almost all of coastal California (including the proposed project site) as Seismic Zone 4, on a scale of 1 to 4, with four being most severe. The proposed Project's engineers would review the proposed project plans for compliance with the appropriate standards in the building codes.
- The LAHD would design and construct wharf improvements in accordance with LAHD seismic design and engineering criteria (including recommendations in geotechnical reports prepared as part of the design process) to minimize potential risks to new terminal features in the event of seismically induced geological hazards. Such design and construction practices would include, but not be limited to, completion of site-specific geotechnical investigations regarding construction and foundation engineering. The design would incorporate measures pertaining to temporary construction conditions, such as maximum temporary slope gradient. A licensed geologist or engineer would monitor construction to verify concurrence with the proposed project design.

3.5.4.6 Impact Determination

Proposed Project

Impact GEO-1: Construction and operation of the proposed Project would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.

As mentioned in the Environmental Setting section, segments of the active Palos Verdes fault cross beneath portions of the Los Angeles Harbor and run just southwest of the proposed project site. This increases the level of risk related to exposure to seismic hazards for people and property under current and future conditions. Because of the fault's proximity to the proposed project area and the presence of water-saturated hydraulic fill, strong to intense ground shaking, surface rupture, and liquefaction could occur.

Fault Rupture

The proposed project does not include the addition of any new structures meant for human occupancy and therefore would not be subject to Alquist-Priolo Earthquake Fault Zoning Act requirements.

Strong Seismic Shaking

Earthquake-related hazards, such as seismic ground shaking, cannot be avoided in the Los Angeles region, particularly in the harbor area where the Palos Verdes fault is located. Projects in construction phases are especially susceptible to earthquake damage because of temporary construction conditions. During construction, temporary slopes and unfinished structures are usually not able to withstand intense ground shaking. Strong ground shaking could damage unfinished structures, resulting in injury to construction workers who may be on-site at the time.

Liquefaction

As mentioned in the Environmental Setting, historically, Port berths have been backfilled, including berths located at the YTI Terminal. Also, natural alluvial deposits are found in the area; these are generally unconsolidated, saturated, and soft. The shallow groundwater depth throughout the Port contributes to saturation of these soils. Soil saturation, along with the alluvial deposit characteristics, makes liquefaction possible. Liquefaction could cause ground settlement, foundation failures, and the buoyant rise of buried structures. Because liquefaction can damage infrastructure and structures, it can be considered a significant seismic impact.

Implementation of the proposed Project is expected to follow seismic code standards and specifications developed by LAHD and the City of Los Angeles for the LABC. These building codes and criteria provide requirements for construction, grading, excavation, use of fill, and foundation work, including type of materials, design, procedures, etc. The intention of these codes is to minimize structural damage from geological hazards, such as earthquakes. Necessary permits, plan checks, and inspections are required.

CEQA Impact Determination

The proposed project site is located near an active fault. Therefore, the potential exists for seismic impacts such as fault rupture, seismically induced ground shaking, or liquefaction. These impacts could result in injury to Port or construction personnel as well as damage to Port property. As mentioned above, it is expected that structures built as part of the proposed Project would be designed and built in accordance with seismic code standards and specifications developed by LAHD and the City of Los Angeles for the LABC. Therefore, impacts due to fault rupture, seismically induced ground shaking, or liquefaction would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There would be a minor increase in the level of exposure of people and property to seismic hazards relative to NEPA baseline conditions. Seismic hazards are common to the Los Angeles region and the proposed Project does not increase such hazards. With incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of the proposed Project would not expose people or structures to substantial risk involving tsunamis or seiches.

Because of historic occurrences of earthquakes, tsunamis, and seiches along the Pacific Rim, the placement of any development on or near the shore in Southern California, including at the proposed project site, would involve some risk of impacts from a tsunami or seiche. Although relatively rare, should a large tsunami or seiche occur, it would be expected to cause damage and possibly injuries at most on- or near-shore locations. This is considered by LAHD to be the average, or normal, condition for most on- and near-shore locations in Southern California. Therefore, a tsunami- or seiche-related impact would be significant if it would exceed this normal condition and cause substantial damage and/or injuries. Under a theoretical maximum worst-case scenario, construction of the proposed Project would expose people or property to substantial damage or injuries in the event of a tsunami or seiche.

Because tsunamis and seiches are forms of wave action, the risk of damage or injuries from these events at a particular location is less if the location is high enough above sea

level, inland, or protected by manmade structures such as dikes or concrete walls. The height of a given site above sea level is either the result of an manmade structure (e.g., a dock or wall), topography (e.g., a hill or slope), or both, and a key variable related to the height of a site's location relative to sea level is the behavior of tides. During high tide, for instance, the distance between the site and sea level is less. During low tide, the distance is greater. How high a site must be located above sea level to avoid substantial wave action during a tsunami or seiche depends on the height of the tide at the time of the event and the height of the potential tsunami or seiche wave.

The Port is subject to diurnal tides, meaning two high-tide and two low-tide cycles during a 24-hour period. The average of the lowest water level during low-tide periods each day is typically set as a benchmark of 0 feet and is the MLLW. For purposes of this discussion, the proposed Project's structures and land surfaces are expressed in terms of the height above (or below) MLLW. The MSL at the Port is +2.82 feet above MLLW. This height reflects the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch (19 years) and therefore reflects the mean of both high and low tides in the Port. The Port Complex model described in the tsunami discussion under Environmental Setting predicts tsunami wave heights with respect to MSL rather than MLLW and therefore can be assumed to be a reasonable average condition under which a tsunami might occur.

The Los Angeles/Long Beach Port Complex model identified the lowest deck elevations throughout the Port using various sources of data. The deck elevations that are the lowest within the Port area are those surrounding the West Channel and in the Cabrillo Marina. These elevations are based on an aerial survey performed in February 1999 and information from LAHD. According to the study, the lowest deck elevations near the proposed project site are adjacent to the East Basin Channel at approximately 11.2 feet above MSL (Moffatt and Nichol 2007).

The Los Angeles/Long Beach Port Complex model predicts maximum tsunami wave heights in the Port area of approximately 5.2 to 6.6 feet above MSL for the earthquake scenario and approximately 7.2 to 23.0 feet above MSL for the landslide scenario. The highest anticipated water levels from these scenarios would occur in the Outer Harbor area (Mofatt and Nichol 2007). Based on the lowest deck elevation (near the YTI Terminal) presented above and the data provided in the Los Angeles/Long Beach Port Complex model, tsunami-induced flooding would not occur at the proposed project site under any of the earthquake and landslide scenarios. Therefore, localized tsunami-induced flooding is not expected to occur within the proposed project site. Specifically, the highest water level rise near the proposed project site, along the East Basin Channel, would occur during the Santa Catalina (Segments 1–7) earthquake scenario and the Palos Verdes landslide scenario at 6.04 and 7.50 feet above MSL, respectively.

All of the studies previously cited indicate that modeled worst-case tsunami scenarios from earthquake and landslide events would have long recurrence intervals. For initiating events in offshore Southern California, this is likely to be at least 5,000 to 10,000 years. Additionally, there is no certainty that any of these earthquake or landslide events would result in a tsunami because only about 10% of earthquakes worldwide result in a tsunami.

CEQA Impact Determination

As mentioned above, the lowest deck elevations found throughout the Port are higher than the maximum tsunami wave heights projected by the Port Complex model; therefore, a substantial risk of flooding from seiches or earthquake-related tsunamis does not exist. Additionally, none of the Port Complex model scenarios depicted an impact on the proposed project location. In-water construction would be subject to impacts if a large tsunami were to occur. However, historical data suggest that the likelihood of this occurring is low. LAHD has implemented various measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, lease requirements involving emergency response and training, and implementation of LAHD's Risk Management Plan (LAHD 1983), which contains applicable risk management measures and policies. Additionally, as discussed further in Section 3.9, Hazards and Hazardous Materials, LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts. Furthermore, YTI's Emergency Action Plan is controlled by means of a proper pre-emergency plan, involving training and routine drills and exercises. All employees are expected to follow this plan in preventing or responding to emergency circumstances. The Emergency Action Plan adopts procedures under the existing safety programs and combines them with the governmental Emergency Action Plan criteria for operations at YTI Terminals. Therefore, impacts related to tsunamis or seiches during implementation of the proposed Project would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As mentioned above, the lowest deck elevations found throughout the Port are approximately 11.2 and 12.2 feet above MSL; therefore, a substantial risk of flooding from seiches or earthquake-related tsunamis does not exist. In-water construction would be subject to impacts if a large tsunami were to occur. However, historical data suggest that the likelihood of this occurring is low. LAHD has implemented measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, lease requirements involving emergency response and training, implementation of the Port-wide emergency notification system, and implementation of YTI's Emergency Action Plan. Therefore, impacts related to tsunamis or seiches during implementation of the proposed Project would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction or operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.

Terminal operations would increase under the proposed Project and would be greater than the CEQA baseline conditions. As a result, the terminal would have a greater number of employees and stored containers in the future.

As mentioned in the Environmental Setting, water injection continues at the Wilmington Oil Field (near the proposed project site), which offsets the total volume of extracted oil. However, this is not anticipated to affect the proposed Project. During the preliminary design phases of the proposed Project, it is expected that settlement potential in areas where future structures may be located will be evaluated, and such structures will be designed to withstand the anticipated settlement.

An evaluation of the settlement potential of existing onshore soils would be made through a site-specific geotechnical investigation, which would include subsurface soil sampling, laboratory analysis of samples collected to determine soil compressibility, and an evaluation of the geotechnical engineer's laboratory test results. Recommendations, which would be based on the results, would be incorporated into the design specifications for the proposed Project. In addition, implementation of the proposed Project would comply with seismic code standards and specifications developed by LAHD and the City of Los Angeles for the LABC.

Recommendations regarding soils that would be subject to settlement typically include over-excavation and recompaction of compressible soils, which would allow for construction of a conventional slab-on-grade structure or, alternatively, installation of concrete or steel foundation piles through settlement-prone soils to the depth of competent soils. Such geotechnical engineering would substantially reduce the potential for soil settlement and ensure that construction of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

CEQA Impact Determination

Subsidence and soil settlement impacts in backland areas would be less than significant under CEQA because the design and construction of the proposed Project would comply with the recommendations of a geotechnical engineer and standards and specifications developed by LAHD and the City of Los Angeles for the LABC. Construction and operation of the proposed Project would not cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Construction and operation of the proposed Project is not expected to cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction or operation of the proposed Project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving expansive soils.

Expansive soil may be present in the proposed project area. Expansive soils beneath foundations and pavement or behind retaining structures could result in cracking and distress for these structures. It is expected that, during the design phase, the geotechnical engineer would evaluate the expansion potential associated with on-site soils through a site-specific geotechnical investigation. As described under Impact GEO-3, a geotechnical investigation would include subsurface soil sampling, laboratory analysis of samples collected to determine soil expansion potential, and an evaluation of laboratory testing results. The results would be used to develop recommendations that would be incorporated into the design specifications for the proposed Project, which would comply with city design guidelines, the LABC, and requirements established by LAHD.

Impacts from expansive soils can be minimized by the following:

- over-excavating and replacing expansive soils with sandy, non-expansive soils, a typical solution that allows for construction of a conventional slab-on-grade structure;
- constructing post-tensioned concrete slabs, which can accommodate the movement of underlying expansive soils; and
- installing concrete or steel foundation piles through expansion-prone soils to the depth of non-expansive soils.

CEQA Impact Determination

Impacts from expansive soils at the proposed project site would be less than significant because the proposed Project would be designed and constructed in compliance with the recommendations of the site-specific geotechnical investigation and consistent with seismic code standards and specifications developed by LAHD and the City of Los Angeles for the LABC. Therefore, the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. The impact would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There would be an increase in the level of exposure of people and property to seismic hazards relative to NEPA baseline conditions. Seismic hazards are common to the Los Angeles region, and the proposed Project would not increase them. With incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of landslides or mudflows.

The project site is relatively flat and not located near hills, mountains, or other topography that has a probability of landslides or mudflows.

CEQA Impact Determination

Because of its topography, the proposed project area is not considered to be an area that would be subject to landslides or mudflows. Therefore, implementation of the proposed Project would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

Because of its topography, the proposed project area is not considered to be an area that would be subject to landslides or mudflows. Therefore, implementation of the proposed Project would not result in impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-6: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.

Natural alluvial and estuarine deposits as well as imported fill consisting of dredged deposits of imported soils comprise the soil in the proposed project area. Because the proposed project site is partially constructed in fill areas and the presence of compressible and collapsible soil, the proposed Project could be subject to lateral spreading, subsidence, liquefaction, or collapse and the site could become unstable. Furthermore, backland improvements would consist of shallow ground repairs and maintenance activities involving slurry sealing, cold planing, asphalt concrete overlay, etc., along with possible removal/relocation/modification of underground conduits and pipes. Excavations performed during utility modifications would be subject to collapse if not properly shored.

CEQA Impact Determination

With the implementation of standard engineering and construction practices (including proper shoring while excavating) regarding saturated, collapsible soils, there would be no increased exposure of risk to substantial adverse effects from construction of the proposed Project, and impacts associated with shallow groundwater would be less than significant under CEQA. During operation of the proposed Project, no additional excavation activities, either with or without shoring, are anticipated, and thus on-site soils would not be subject to collapse or caving. Therefore, impacts associated with unstable soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There would be an increase in the level of exposure of people and property to seismic hazards relative to NEPA baseline conditions. Seismic hazards are common to the Los Angeles region, and the proposed Project does not increase them. Furthermore, standard engineering and construction practices would be employed during the construction phase of the proposed Project, and on-site soils would not be subject to collapse or caving because excavation would not occur during operation of the proposed Project.

With incorporation of the aforementioned standard construction practices and compliance with current building regulations, impacts due to unstable collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction or operation of the proposed Project would not result in substantial soil erosion or the loss of topsoil.

A portion of the proposed project improvements would require backland repairs. These repairs would involve pavement removal and repaving. As part of implementation of a site-specific SWPPP, construction activities would employ standard BMPs—such as dust control, impoundment dikes, interceptor ditches, desilting basins, erosion control, and revegetation or similar methods—to minimize the potential for increases in sediment transport and soil erosion during construction. The SWPPP would be completed in accordance with the regulatory mandates of the Los Angeles Watershed Protection Program. Post-construction conditions would be similar to existing conditions as the site would be repaved and asphalted.

CEQA Impact Determination

Implementation of the SWPPP would minimize the potential impact of the proposed Project as it pertains to soil erosion or loss of topsoil during project construction. Post-construction the site would be paved and not subject to erosion. Therefore, impacts related to substantial soil erosion or the loss of topsoil would be less than significant under CEQA.

Mitigation Measures

No mitigation is required**.**

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

During backland improvements, the risk of temporary soil exposure and loss of topsoil could occur. However, implementation of the SWPPP would minimize the potential impact of the proposed Project as it pertains to soil erosion or loss of topsoil during project construction. With incorporation of the aforementioned SWPPP, impacts due to soil erosion would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-8: Construction or operation of the proposed Project would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

The proposed project area is flat, with no prominent geologic or topographic features. Therefore, implementation of the proposed Project would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

CEQA Impact Determination

Because the proposed project area is flat, with no prominent geologic or topographic features, implementation of the proposed Project would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The proposed project area is flat, with no prominent geologic or topographic features. Therefore, implementation of the proposed Project would not result in the destruction, permanent covering, or the material and adverse modification of one or more distinct and prominent features. Therefore, there would be no impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-9: Construction or operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

In the RAND Corporation study *Characterizing Uncertain Sea Level Rise Projections to Support Investment Decisions,* sea level projections were mapped to assess the potential effects of sea level rise at the Port under three scenarios: 1 meter, 2 meters, and 3 meters (LAHD 2011). As the Port currently exists (i.e., at the existing elevation), the maps indicate the following for each sea-level-rise scenario:

- Sea level rise of 1 meter (39.37 inches, or approximately 3 feet) would have no direct effect on the proposed project site or access to the site;

- Sea level rise of 2 meters (78.74 inches, or approximately 7 feet) would have no direct effect on the proposed project site but may have limited effects on access to the site (i.e., access roads may be flooded); and
- Sea level rise of 3 meters (118.11 inches, or approximately 10 feet) could result in flooding on some portions of the proposed project site and limit access because of flooding.

The California Energy Commission through its Public Interest Energy Research (PIER) Climate Change Research Program reported that, under medium to medium-high emissions scenarios, mean sea level along the California coast will rise 1.0 to 1.4 meters by 2100 (Pacific Institute 2009a). Additionally, *California Flood Risk: Sea Level Rise, Torrance Quadrangle* (Pacific Institute 2009b) suggests that sea level rise of 1.4 meters (55.11 inches) would have a limited effect on the proposed project site and surroundings. According to the report, sea level rise of 1.4 meters would have a more significant impact on the area southeast of the proposed Project.

As mentioned in the Environmental Setting of this document, sea level rise ranges presented in the *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* report project a sea level rise of 1.92 feet by 2100. This projection has a lower sea level rise value than any of the scenarios modeled in the RAND study discussed above.

Furthermore, measures to minimize impacts from seiches or tsunamis, such as constructing facilities at an appropriate elevation, are currently in place throughout the Port, and, as such, would limit the effects of sea level rise. Additionally, it is expected that any future construction activities would reference the appropriate studies such as the RAND report mentioned above and implement recommended strategies during the design phase.

CEQA Impact Determination

Pursuant to CEQA Guidelines Section 15126.2, an EIR should evaluate any potential significant impacts resulting from locating development in areas that are susceptible to hazard conditions, as identified in authoritative hazard maps, risk assessments, or land use plans that address issues related to such hazards. This analysis would be required if the potential hazard is likely to occur within the projected life of the proposed Project and some degree of certainty regarding a potential hazard exists (California Natural Resources Agency 2009). As discussed in the Environmental Setting, climate models on sea level rise run through 2100, but because it is not known at this time if the YTI Terminal will still be operating at the proposed project site in 2050, this analysis focuses on potential sea level rise occurring through 2050.

The sea level rise projection for the California coast in 2050 is expected to be 0.59 feet. Based on lower deck elevations found near the proposed project site, sea level rise of 0.59 feet is not expected to cause impacts under CEQA. Furthermore, measures to minimize sea level rise impacts from seiches or tsunamis, such as creating the breakwater and constructing facilities at an appropriate elevation, are currently in place throughout the Port. Future strategies would take into account data obtained from the sea level rise study and limit the effects of sea level rise. Therefore, the proposed Project would not expose people or property to substantial risk or injuries related to sea level rise, and impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts under NEPA would be the same as those described above under CEQA. However, there are no established significance thresholds for sea level rise, nor has the federal government or the state adopted any regulations. In the absence of an adopted threshold or standard and in compliance with the NEPA implementing regulations, a significance determination regarding sea level rise will not be made under NEPA.

As described above, measures to minimize impacts from sea level rise, such as constructing facilities at an appropriate elevation, are currently in place throughout the Port. Furthermore, future strategies would take into account data obtained from the aforementioned sea level rise studies and limit the effects of sea level rise. Therefore, the proposed Project would not expose people or property to substantial risk or injuries related to sea level rise.

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Alternative 1 – No Project

Under Alternative 1, no construction activities would occur in water or in water-side or backland areas. LAHD would not implement any terminal improvements. No new cranes would be added, and no dredging would occur. The No Project Alternative would not include the 100-foot gauge crane rail extension, expansion of the Terminal Island Container Transfer Facility (TICTF) on-dock railyard, or backland repairs.

The No Project Alternative would not preclude future improvements to the YTI Terminal; however, any change in use or new improvements with the potential to significantly affect the environment would need to be analyzed in a separate environmental document in accordance with CEQA and/or NEPA.

Under the No Project Alternative, the existing YTI Terminal would continue to operate as an approximately 185-acre container terminal. Based on the Port's throughput projections, the YTI Terminal is expected to operate at its existing capacity of approximately 1,692,000 TEUs in 2026. Alternative maritime power (AMP) facilities are currently under construction at the YTI Terminal as an independent activity and will be completed and available at all operating berths by the end of December 2013.

Any adopted rules or regulations, such as from SCAQMD or other regulatory agencies, would be applied to the No Project Alternative.

Impact GEO-1: Construction and operation of Alternative 1 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.

Under the No Project Alternative, terminal operations would increase, and the terminal is projected to operate at its existing capacity of approximately 1,692,000 TEUs in 2026. Because of the proximity of the active Palos Verdes fault and liquefaction-prone hydraulic fill throughout the YTI Terminal area, there is a risk that seismic activity, including fault ruptures, seismic ground shaking, and liquefaction, could affect future terminal operations. However, the No Project Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards.

CEQA Impact Determination

Under Alternative 1, construction of improvements would not occur, which is the same as the CEQA baseline conditions. Terminal operations would be greater than the CEQA baseline condition (996,109 TEUs). Because the No Project Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards, impacts due to rupture of a known earthquake fault would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-2: Construction and operation of Alternative 1 would not expose people or structures to substantial risk involving tsunamis or seiches.

Under the No Project Alternative, construction of the proposed improvements would not occur. Terminal operations would increase and the site would have a greater number of employees and stored containers in the future. As previously discussed, the lowest deck elevations found throughout the Port are higher than the maximum tsunami wave heights projected by the Port Complex model discussed under the proposed Project's tsunami analysis; therefore, a substantial risk of flooding from seiches or earthquake-related

tsunamis is not likely at the proposed project site. Additionally, the Port has implemented measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, and lease requirements involving emergency response and training. Furthermore, YTI's Emergency Action Plan would be implemented at the terminal should any seismic or other disaster event occur.

CEQA Impact Determination

Under Alternative 1, no construction would occur, and the terminal facilities would be the same as the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of impacts from a tsunami or seiche is very low due to preventative measures the Port and YTI have in place. Therefore, impacts involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-3: Construction or operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.

Under the No Project Alternative, construction of proposed improvements would not occur. Terminal operations would increase, and the site would have a greater number of employees and stored containers in the future. However, recommendations from the geotechnical engineer during design and construction of the terminal, along with construction engineering and safety standards, have been incorporated into existing structures located at the YTI Terminal. Therefore, impacts due to land subsidence and settlement are not anticipated to occur under this Alternative.

CEQA Impact Determination

Under Alternative 1, construction of proposed improvements would not occur, and the terminal facilities would be the same as the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of

impacts from land subsidence and settlement is remote. Because no changes to the terminal would be made, impacts due to land subsidence/settlement would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-4: Construction or operation of Alternative 1 would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving expansive soils.

Under the No Project Alternative, construction of proposed improvements would not occur. Terminal operations would increase, and the site would have a greater number of employees and stored containers in the future. Because of the proximity of the active Palos Verdes fault and liquefaction-prone hydraulic fill throughout the YTI Terminal area, there is a risk that seismic activity could affect future terminal operations. However, the No Project Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards. Additionally, it is expected that geotechnical investigations were conducted prior to construction of on-site structures in an effort to evaluate the potential for soil expansion. Consequently, future terminal operations are not expected to result in substantial damage to structures or infrastructure or to expose people to substantial risk of injury.

CEQA Impact Determination

Under Alternative 1, construction of proposed improvements would not occur, and the terminal facilities would be the same as the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of impacts from expansive soils is remote. Because no changes to the terminal would be constructed, impacts associated with expansive soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-5: Construction and operation of Alternative 1 would not result in or expose people or property to a substantial risk of landslides or mudflows.

Under the No Project Alternative, construction of proposed improvements would not occur. Terminal operations would increase, and the site would have a greater number of employees and stored containers in the future. Because of its topography, the YTI Terminal area is not considered an area that would be subject to landslides or mudflows.

CEQA Impact Determination

Because the YTI Terminal area is not considered an area that would be subject to landslides or mudflows because of its topography, implementation of Alternative 1 would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-6: Construction and operation of Alternative 1 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.

Under the No Project Alternative, construction of the proposed improvements would not occur. Thus, no excavation, dredging, grading, or fill would occur that could result in unstable soil conditions.

CEQA Impact Determination

Under Alternative 1, construction of the proposed improvements would not occur, and the terminal facilities would be the same as the CEQA baseline conditions. No significant impacts under CEQA would occur because no excavation, grading, or filling would occur.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable

Impact GEO-7: Construction or operation of Alternative 1 would not result in substantial soil erosion or the loss of topsoil.

Under the No Project Alternative, construction of the proposed improvements would not occur. Thus, no grading would occur that could have the potential to result in soil erosion.

CEQA Impact Determination

Under Alternative 1, construction of the proposed improvements would not occur, and terminal facilities would be the same as the CEQA baseline conditions. No impact under CEQA would occur because no exposure of soils would occur.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-8: Construction or operation of Alternative 1 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

The YTI Terminal area is flat, with no prominent geologic or topographic features. Under the No Project Alternative, construction of the proposed improvements would not occur. Therefore, implementation of Alternative 1 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

CEQA Impact Determination

Under Alternative 1, construction of the proposed improvements would not occur, and the terminal facilities would be the same as the CEQA baseline conditions. Because the YTI Terminal area is flat, with no prominent geologic or topographic features, implementation of Alternative 1 would not result in adverse impacts on prominent geologic or topographic features. Therefore, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-9: Construction or operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

Under the No Project Alternative, construction of the proposed improvements would not occur. Terminal operations would increase under this alternative and the terminal would have a greater number of employees and stored containers in the future. As discussed under impacts for the proposed Project, the sea level rise projection for the California coast in the future is not expected to cause impacts at the YTI Terminal. Measures to minimize sea level rise impacts from seiches or tsunamis, such as constructing a breakwater structure and constructing facilities at adequate elevation, are currently in place throughout the Port. Therefore, implementation of Alternative 1 would not expose people or property to substantial risk or injuries related to sea level rise.

CEQA Impact Determination

Under Alternative 1, construction of the proposed improvements would not occur, and the terminal facilities would be the same as the CEQA baseline conditions. While terminal operations would increase under this alternative and be greater than the CEQA baseline conditions, sea level rise is not expected to cause impacts at the YTI Terminal due to existing measures that have been put in place throughout the Port to minimize sea level rise impacts. Therefore, impacts from implementation of Alternative 1 would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Alternative 2 – No Federal Action

Alternative 2 is a NEPA-required no-action alternative for purposes of this Draft EIS/EIR. This alternative includes the activities that would occur absent a USACE permit and could include improvements that require a local permit. Absent a USACE

permit, no dredging, dredged material disposal, in-water pile installation, or crane installation/extension would occur. Expansion of the TICTF and extension of the crane rail also would not occur. The No Federal Action alternative includes only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. These activities would not change the capacity of the existing terminal.

The site would continue to operate as an approximately 185-acre container terminal where cargo containers are loaded to/from vessels, temporarily stored on backlands, and transferred to/from trucks or on-dock rail lines. Similar to Alternative 1, the YTI Terminal is expected to operate at its existing capacity of approximately 1,692,000 TEUs by 2026.

Any future legally enacted Port-wide CAAP measure would be applied to the No Federal Action Alternative, although, in general, applicable tariff changes that conflict with the terms of an individual operating lease would not apply.

Any adopted rules and regulations, such as from SCAQMD or other regulatory agencies, would be applied to the No Federal Action Alternative.

Impact GEO-1: Construction and operation of Alternative 2 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.

Under the No Federal Action Alternative, only backland improvements would be constructed. Similar to Alternative 1, terminal operations would increase under this alternative, and the terminal is projected to operate at its existing capacity of approximately 1,692,000 TEUs by 2026. Because of the proximity of the active Palos Verdes fault, there is a risk that seismic activity could affect future terminal operations, including through the exposure of people or property to risk of loss, injury, or death involving an earthquake fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. However, the No Federal Action Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards.

CEQA Impact Determination

Under Alternative 2, backland improvements would be constructed, and terminal operations would be greater than the CEQA baseline condition of 996,109 TEUs. Because the No Federal Action Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards, impacts due to fault ruptures, seismic ground shaking, liquefaction, or other seismically induced ground failure would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-2: Construction and operation of Alternative 2 within the Port area would not expose people or structures to substantial risk involving tsunamis or seiches.

Under the No Federal Action Alternative, only construction of backland improvements would occur. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. As previously discussed, the lowest deck elevations found throughout the Port are higher than the maximum tsunami wave heights projected by the Port Complex model discussed under the proposed Project's tsunami analysis; therefore, a substantial risk of flooding from seiches or earthquake-related tsunamis is not likely at the proposed project site. Additionally, the Port has implemented measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, and lease requirements involving emergency response and training. Furthermore, YTI's Emergency Action Plan would be implemented at the terminal should any seismic or other disaster event occur. Therefore, impacts involving tsunamis or seiches would be less than significant under CEQA.

CEQA Impact Determination

Under Alternative 2, no construction-related impacts involving tsunamis or seiches would be expected to occur due to preventative measures the Port and YTI have in place to minimize impacts from tsunamis and seiches. Therefore, impacts involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-3: Construction or operation of Alternative 2 within the Port area would not result in substantial damage to structures or infrastructure or expose people to substantial risk injury from land subsidence/settlement.

Under the No Federal Action Alternative, only minor backland improvements would occur. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. However, recommendations from the geotechnical engineer during design and construction of the terminal, along with construction engineering and safety standards, have been incorporated into existing structures located at the YTI Terminal. Therefore, impacts due to land subsidence and settlement are not anticipated to occur under this Alternative.

CEQA Impact Determination

Under Alternative 2, only backland improvements would occur, and terminal operations would increase under this alternative and would be greater than the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of impacts from land subsidence and settlement is remote. Therefore, impacts due to land subsidence/settlement would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No

construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-4: Construction or operation of Alternative 2 would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving expansive soils.

Under the No Federal Action Alternative, only backland improvements would occur. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. Because of the proximity of the active Palos Verdes fault and liquefaction-prone hydraulic fill throughout the YTI Terminal area, there is a risk that seismic activity could affect future terminal operations. However, the No Federal Action Alternative would not cause or accelerate geologic hazards, and the existing terminal has incorporated modern construction engineering and safety standards. Additionally, it is expected that geotechnical investigations were conducted prior to construction of on-site structures in an effort to evaluate the potential for soil expansion. Consequently, future terminal operations are not expected to result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

CEQA Impact Determination

Under Alternative 2, only backland improvements would occur, and terminal operations would be greater than the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of impacts from expansive soils is remote. Therefore, impacts associated with expansive soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur

under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-5: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of landslides or mudflows.

Under the No Federal Action Alternative, construction of only backland improvements would occur. Terminal operations would increase, and the site would have a greater number of employees and stored containers in the future. Because of its topography, the YTI Terminal area is not considered an area that would be subject to landslides or mudflows.

CEQA Impact Determination

Because the YTI Terminal area is not considered to be an area that would be subject to landslides or mudflows because of its topography, implementation of the Alternative 2 would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-6: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.

Under the No Federal Action Alternative, construction of only the backland improvements would occur. Thus, no excavation, dredging, grading, or fill would occur that could result in unstable soil conditions.

CEQA Impact Determination

Under Alternative 2, terminal facilities and operations would be largely the same as the CEQA baseline conditions, with the exception of the backland improvements. No significant impacts under CEQA would occur because no excavation, grading, or filling would occur.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-7: Construction or operation of Alternative 2 within the Port area would not result in substantial soil erosion or the loss of topsoil.

Under the No Federal Action Alternative, only backland improvements would occur. The proposed improvements would require repairs that would involve pavement removal and repaving. These activities could result in temporary exposure and loss of topsoil.

CEQA Impact Determination

As part of implementation of a site-specific SWPPP, construction activities would employ standard BMPs—such as dust control, impoundment dikes, interceptor ditches,

desilting basins, erosion control, and revegetation or similar methods—to minimize the potential for increases in sediment transport and soil erosion during construction. The SWPPP would be completed in accordance with the regulatory mandates of the Los Angeles Watershed Protection Program.

As such, implementation of the SWPPP would minimize the potential impact of the proposed Project as it pertains to soil erosion or loss of topsoil during project construction. Therefore, impacts related to substantial soil erosion or the loss of topsoil would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-8: Construction or operation of Alternative 2 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

The YTI Terminal area is flat, with no prominent geologic or topographic features. Under the No Federal Action Alternative, only construction of the backland improvements would occur, which would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

CEQA Impact Determination

Because the YTI Terminal area is flat, with no prominent geologic or topographic features, implementation of Alternative 2 would not result in adverse impacts on prominent geologic or topographic features. Therefore, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-9: Construction or operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

Under the No Federal Action Alternative, construction of the backland improvements would occur, and terminal operations would increase to have a greater number of employees and stored containers in the future. As discussed under impacts for the proposed Project, the sea level rise projection for the California coast in the future is not expected to cause impacts at the YTI Terminal. Measures to minimize sea level rise impacts from seiches or tsunamis, such as constructing a breakwater structure and constructing facilities at adequate elevation, are currently in place throughout the Port. Therefore, implementation of Alternative 2 would not expose people or property to substantial risk or injuries related to sea level rise.

CEQA Impact Determination

Under Alternative 2, terminal operations would increase, and be greater than the CEQA baseline conditions. While terminal operations would increase under this alternative and be greater than the CEQA baseline conditions, sea level rise is not expected to cause impacts at the YTI Terminal due to existing measures that have been put in place throughout the Port to minimize sea level rise impacts. Therefore, implementation of Alternative 2 would result in less-than-significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 2 would include only backlands improvements consisting of slurry sealing; deep cold planing; asphalt concrete overlay; restriping; and removal, relocation, or modification of any underground conduits and pipes necessary to complete repairs. No construction of in-water or over-water features would occur under Alternative 2. The No Federal Action Alternative would involve the same construction activities as would occur under the NEPA baseline. Therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Alternative 3 – Reduced Project: Improve Berths 217–220 Only

This alternative includes all components of the proposed Project except dredging and pile driving at Berths 214–216. The following components of the proposed Project are unchanged under the Reduced Project Alternative:

- modifying up to six existing cranes;
- replacing up to four existing non-operating cranes;
- dredging 6,000 cy from a depth of -45 to -47 feet MLLW (with an additional 2 feet of overdredge depth, for a total depth of -49 feet MLLW), and installing 1,200 linear feet of sheet piles and king piles to support and stabilize the existing wharf structure at Berths 217–220;
- disposing of dredged material at LA-2, the Berths 243–245 CDF, or another approved upland location;
- extending the existing 100-foot gauge landside crane rail through Berths 217–220;
- performing ground repairs and maintenance activities in the backlands area; and
- expanding the TICTF on-dock rail by adding a single rail loading track.

Under this alternative, there would be three operating berths after construction, similar to the proposed Project, but Berths 214–216 would remain at their existing depth. This alternative would require less dredging (by approximately 21,000 cy) and pile driving and a shorter construction period than the proposed Project. Based on the throughput projections, this alternative is expected to operate at its capacity of approximately 1,913,000 TEUs by 2026, similar to the proposed Project. However, while the terminal could handle similar levels of cargo, the reduced project alternative would not achieve the same level of efficient operations as achieved by the proposed Project. This alternative would not accommodate the largest vessels (13,000 TEUs). The depth achieved at Berths

217–220 would only be capable of handling vessels up to 11,000 TEUs, requiring additional vessels to call on the terminal to meet future growth projections up to the capacity of the terminal. Therefore, under this alternative, 232 vessels would call on the terminal in 2020 and 2026, compared to 206 vessels for the proposed Project. Additionally, because of the higher number of annual vessel calls, this alternative would result in a maximum of five peak day ship calls (over a 24-hour period) compared to four for the proposed Project.

Impact GEO-1: Construction and operation of Alternative 3 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.

Segments of the active Palos Verdes fault cross beneath portions of the Los Angeles Harbor and run just southwest of the proposed project site. Because of this, there would be an increased level of exposure for people and property to seismic hazards related to current and future baseline conditions. Fault ruptures, seismic ground shaking, liquefaction, or other seismically induced ground failure could occur in these areas because of the fault's proximity.

Under Alternative 3, construction activities would be expected to follow seismic code standards and specifications developed by LAHD and the City for its LABC. These building codes and criteria provide requirements for construction, grading, excavation, use of fill, and foundation work, including the types of materials, design, procedures, etc. The intention of these codes is to minimize structural damage from geological hazards, such as earthquakes. In addition, permits, plan checks, and inspections would be required.

CEQA Impact Determination

Although the active Palos Verdes fault is located near the proposed project site, no habitable structures or other features would be constructed within currently established setback zones along identified active fault traces. With incorporation of the seismic code standards and specifications developed by LAHD and the City for its LABC, impacts due to fault ruptures, seismic ground shaking, liquefaction, or other seismically induced ground failure would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Because of the potential for strands of the active Palos Verdes fault and liquefaction-prone hydraulic fill to be present under the proposed project site, there is a risk of seismic activity that could affect construction and operation. However, with incorporation of modern construction engineering and safety standards, such as seismic code standards and specifications developed by LAHD and the City for its LABC, and compliance with current building regulations, impacts due to seismically induced hazards such as fault

ruptures, seismic ground shaking, liquefaction, or other seismically induced ground failure would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of Alternative 3 would not expose people or structures to substantial risk involving tsunamis or seiches.

Under the Reduced Project Alternative, similar construction activities as the proposed Project would occur, with the exception of the Berths 214–216 dredging and pile driving. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. As mentioned previously, the lowest deck elevations found throughout the Port are higher than the maximum tsunami wave heights projected by the Port Complex model; therefore, a substantial risk of flooding from seiches or earthquake-related tsunamis is not likely. In-water construction would be subject to impacts if a large tsunami were to occur. However, historical data suggest that the likelihood of this occurring is low. Additionally, the Port has implemented measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, and lease requirements involving emergency response and training. Furthermore, YTI's Emergency Action Plan would be implemented at the terminal should any seismic or other disaster event occur.

CEQA Impact Determination

Under Alternative 3, there would be three operating berths after construction, and terminal operations would increase and would be greater than the CEQA baseline conditions. While terminal operations would increase and be greater than the CEQA baseline, the existing risk of impacts from a tsunami or seiche is very low due to preventative measures the Port and YTI have in place. Therefore, impacts related to tsunamis or seiches during implementation of the proposed Project would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As mentioned above, the lowest deck elevations found throughout the Port are approximately 11.2 and 12.2 feet above MSL; therefore, a substantial risk of flooding from seiches or earthquake-related tsunamis is not likely. In-water structures would be subject to impacts if a large tsunami were to occur. However, historical data suggest that

the likelihood of this occurring is low. Additionally, LAHD has implemented measures to minimize impacts from tsunamis and seiches. These measures include construction of a breakwater structure, construction of facilities at an adequate elevation, lease requirements involving emergency response and training, implementation of the Port-wide emergency notification system, and implementation of YTI's Emergency Action Plan. Therefore, impacts related to tsunamis or seiches during implementation of the proposed Project would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction or operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk injury from land subsidence/settlement.

As mentioned previously, water injection continues at the nearby Wilmington Oil Field to offset the total volume of oil being extracted. As such, subsidence as a result of oil extraction at the Wilmington Oil Field is not anticipated to affect Alternative 3.

Under the Reduced Project Alternative, similar construction activities as the proposed Project would occur, with the exception of the Berths 214–216 dredging and pile driving. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future.

During the design phase of the proposed Project, it is expected that the project designs would evaluate settlement potential in areas where future structures may be located and design those structures to withstand the anticipated settlement. The evaluation of settlement potential for existing onshore soils would be made through a site-specific geotechnical investigation, which would include subsurface soil sampling, laboratory analysis of samples collected to determine soil compressibility, and an evaluation of the laboratory testing results by a geotechnical engineer. Recommendations based on the results would be in the design specifications for the proposed Project. In addition, implementation of Alternative 3 would comply with seismic code standards and specifications developed by LAHD and the City of Los Angeles for its LABC.

CEQA Impact Determination

Subsidence and soil settlement impacts in backland areas would be less than significant under CEQA because the design and construction of the proposed Project would comply with recommendations of a geotechnical engineer and standards and specifications developed by LAHD and the City of Los Angeles for its LABC. Construction and operation of Alternative 3 would not cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Construction and operation of Alternative 3 is not expected to cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction or operation of Alternative 3 would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving expansive soils.

Expansive soil may be present in the proposed project area. It is expected that during the design phase of Alternative 3, a geotechnical engineer would evaluate the expansion potential associated with on-site soils through a site-specific geotechnical investigation. The results would be used to develop recommendations that would be incorporated into the design specifications for the proposed Project, which would comply with city design guidelines, the LABC, and requirements established by LAHD.

CEQA Impact Determination

Expansive soil impacts at the proposed project site would be less than significant because the proposed Project would be designed and constructed in compliance with the recommendations of the geotechnical engineer and consistent with seismic code standards and specifications developed by LAHD and the City of Los Angeles for its LABC. Therefore, the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. The impact would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 3 to manage expansive soils. Therefore, impacts associated with expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of landslides or mudflows.

Under the Reduced Project Alternative, similar construction activities as the proposed Project would occur, with the exception of the Berths 214–216 dredging and pile driving. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. Because of its topography, the YTI Terminal area is not considered an area that would be subject to landslides or mudflows.

CEQA Impact Determination

Because the YTI Terminal is not considered to be an area that would be subject to landslides or mudflows because of its topography, implementation of Alternative 3 would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The proposed project area is not considered to be an area that would be subject to landslides or mudflows because of its topography. Therefore, implementation of Alternative 3 would not result in impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-6: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.

Natural alluvial and estuarine deposits, as well as imported fill consisting of dredged deposits of imported soils, comprise the soil in the proposed project area. Because the proposed project site would be partially constructed in fill areas, it could be subject to lateral spreading, subsidence, liquefaction, or collapse and become unstable.

CEQA Impact Determination

With implementation of standard engineering and construction practices regarding saturated, collapsible soils, there would be no increased exposure to substantial adverse effects from construction of Alternative 3. Impacts associated with unstable soils would be less than significant under CEQA. During implementation of Alternative 3, any excavation performed as part of utility removal, relocation, or modification would require appropriate safety and construction standards, such as shoring. Therefore, on-site soils would not be subject to collapse or caving. Furthermore, future project operations under Alternative 3 would not involve any additional excavation. Therefore, impacts associated with unstable soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 3 to manage saturated and collapsible soils. Construction activities under Alternative 3 would not expose people and structures to substantial adverse effects, and operation of Alternative 3 would not involve future excavation activities. Therefore, impacts associated with collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction or operation of Alternative 3 would not result in substantial soil erosion or the loss of topsoil.

Under Alternative 3, YTI Terminal backlands improvements would occur. The proposed improvements would require repairs that would involve pavement removal and repaving. These activities could result in temporary exposure and loss of topsoil.

CEQA Impact Determination

As with the proposed Project and Alternative 2, implementation of a site-specific SWPPP would employ standard BMPs during construction to minimize the potential for increases in sediment transport and soil erosion during construction. The SWPPP would be completed in accordance with the regulatory mandates of the Los Angeles Watershed Protection Program.

Implementation of the SWPPP would minimize the potential impact of the proposed Project as it pertains to soil erosion or loss of topsoil. Therefore, impacts related to substantial soil erosion or the loss of topsoil would be less than significant under CEQA

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

During backland improvements, there would be a risk of temporary exposure and loss of topsoil. However, implementation of the SWPPP would minimize the potential impact of the proposed Project as it pertains to soil erosion or loss of topsoil. With incorporation of the SWPPP, impacts due to soil erosion would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-8: Construction or operation of Alternative 3 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.

Under the Reduced Project Alternative, similar construction activities as the proposed Project would occur, with the exception of the Berths 214–216 dredging and pile driving. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. The YTI Terminal area is flat, with no prominent geologic or topographic features.

CEQA Impact Determination

Because the YTI Terminal area is flat, with no prominent geologic or topographic features, implementation of Alternative 3 would not result in adverse impacts on prominent geologic or topographic features. There would be no impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

NEPA Impact Determination

The YTI Terminal area is flat, with no prominent geologic or topographic features. Implementation of Alternative 3 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

No impacts would occur.

Impact GEO-9: Construction or operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

Under the Reduced Project Alternative, similar construction activities as the proposed Project would occur, with the exception of the Berths 214–216 dredging and pile driving. Terminal operations would increase under this alternative, and the terminal would have a greater number of employees and stored containers in the future. As discussed under impacts for the proposed Project, the sea level rise projection for the California coast in the future is not expected to cause impacts at the YTI Terminal. Measures to minimize sea level rise impacts from seiches or tsunamis, such as constructing a breakwater structure and constructing facilities at adequate elevation, are currently in place throughout the Port. Therefore, implementation of Alternative 3 would not expose people or property to substantial risk or injuries related to sea level rise.

CEQA Impact Determination

While terminal operations would increase under this alternative and be greater than the CEQA baseline conditions, sea level rise is not expected to cause impacts at the YTI Terminal due to existing measures that have been put in place throughout the Port to minimize sea level rise impacts. Therefore, impacts from implementation of Alternative 3 would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There are no established significance thresholds for sea level rise, nor has the federal government or the state adopted any regulations. In the absence of an adopted threshold or standard, in compliance with the NEPA implementing regulations, a significance determination regarding sea level rise will not be made under NEPA. Measures to minimize sea level rise impacts from seiches or tsunamis, such as construction of a breakwater and facilities at an adequate elevation, are currently in place throughout the Port. Implementation of Alternative 3 is not expected to expose people or property to substantial risk or injuries related to sea level rise.

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

3.5.4.7 Summary of Impact Determinations

The following table summarizes the CEQA and NEPA impact determinations of the proposed Project and alternatives related to geology, as described in the detailed discussion above. This table allows for easy comparison between the potential impacts of the proposed Project and alternatives with respect to this resource. Identified potential impacts may be based on federal, state, or City significance criteria; LAHD criteria; and the scientific judgment of the report preparers.

For each impact threshold, the table describes the impact, notes the CEQA and NEPA impact determinations, describes applicable mitigation measures, and notes the residual impacts (i.e., the impact remaining after mitigation). The impacts, whether significant or not, are included in this table.

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
Proposed Project	**GEO-1:** Construction and operation of the proposed Project would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-2: Construction and operation of the proposed Project within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-3: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-4: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-5: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-6: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-7: Construction or operation of the proposed Project within the Port area would not result in substantial soil erosion or the loss of topsoil.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-8: Construction or operation of the proposed Project would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-9: Construction or operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable
Alternative 1 – No Project	**GEO-1:** Construction and operation of Alternative 1 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable
	GEO-2: Construction and operation of Alternative 1 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable
	GEO-3: Construction and operation of Alternative 1would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable
	GEO-4: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-5: Construction and operation of Alternative 1 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: No impact NEPA: Not applicable
	GEO-6: Construction and operation of Alternative 1 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.	CEQA: No impact NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: No impact NEPA: Not applicable
	GEO-7: Construction or operation of Alternative 1 within the Port area would not result in substantial soil erosion or the loss of topsoil.	CEQA: No impact NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: No impact NEPA: Not applicable
	GEO-8: Construction or operation of Alternative 1 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: No impact NEPA: Not applicable
	GEO-9: Construction or operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable
Alternative 2 – No Federal Action	**GEO-1:** Construction and operation of Alternative 2 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact
	GEO-2: Construction and operation of Alternative 2 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-3: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact
	GEO-4: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact
	GEO-5: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-6: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact
	GEO-7: Construction or operation of Alternative 2 within the Port area would not result in substantial soil erosion or the loss of topsoil.	CEQA: Less than significant NEPA: No impact	No mitigation is required.	CEQA: Less than significant NEPA: No impact
	GEO-8: Construction or operation of Alternative 2 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-9: Construction or operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
Alternative 3 – Reduced Project: Improve Berths 217–220 Only	**GEO-1:** Construction and operation of Alternative 3 would not result in significant impacts from fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-2: Construction and operation of Alternative 3 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-3: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from land subsidence/settlement.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-4: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-5: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-6: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of unstable soil conditions from excavation, grading, or fill.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant
	GEO-7: Construction or operation of Alternative 3 within the Port area would not result in substantial soil erosion or the loss of topsoil.	CEQA: Less than significant NEPA: Less than significant	No mitigation is required.	CEQA: Less than significant NEPA: Less than significant

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-8: Construction or operation of Alternative 3 would not result in the destruction, permanent covering, or material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact NEPA: No impact	No mitigation is required.	CEQA: No impact NEPA: No impact
	GEO-9: Construction or operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant NEPA: Not applicable	No mitigation is required. Mitigation not applicable	CEQA: Less than significant NEPA: Not applicable

3.5.4.8 Mitigation Monitoring

In the absence of significant impacts, mitigation measures are not required.

3.5.5 Significant Unavoidable Impacts

No significant unavoidable impacts related to geology would occur as a result of construction or operation of the proposed Project or any of the alternatives.