4.5 GEOLOGY/SOILS

This section evaluates the potential for significant impacts to occur due to the proposed project. Consistent with the discussion in Section 4.0 (Introduction to the Analysis), based on a preliminary environmental analysis of the proposed project prepared prior to commencement of this EIR and analysis completed for the BECSP Program EIR, substantial additional analysis of geology and soil impacts is not required. Rather, this section includes a discussion of the current environmental setting, the proposed project and its relationship to the BECSP, where applicable; a discussion of consistency with the environmental analysis prepared for the BECSP, where applicable; any new information or analysis pertinent to the current analysis and identification of impacts; identification of mitigation measures required to address potential impacts of the proposed project; and significance conclusions regarding the proposed project after mitigation incorporation. Mitigation measures included applicable measures from the BECSP EIR as well as any new or additional mitigation measures required to reduce potential impacts. All impacts are considered to be less than significant with incorporation of mitigation.

Data used to prepare this section were taken primarily from the geotechnical investigation prepared for the project site by Leighton and Associates, Inc. (Leighton);[5] the Environmental Hazards Element of the City of Huntington Beach (General Plan 1996); and the Beach and Edinger Corridors Specific Plan (BECSP) Environmental Impact Report (EIR). The Leighton report can be found in Appendix B (Geotechnical Study). Other sources of information include maps and reports published by the California Geological Survey (CGS) and the United States Geological Survey (USGS); and other geotechnical or environmental investigations pertinent to the conditions at the project site. Full bibliographic entries for selected reference materials are provided in Section 4.5.4 (References) at the end of this section. Some reference materials are included in the appendices to this EIR.

4.5.1 Environmental Setting

The 12.5-acre, proposed project site is currently occupied by a two-story, big-box retail structure, a two-story EZ Lube business, and a large surface parking lot. The project site is a rectangular shaped parcel, bound by Gothard Street to the west, commercial development to the north, the UPRR right-of-way and development to the east, and Edinger Avenue to the south. The project is roughly level and there are no pronounced topographic highs or lows, with the exception of a depression for stormwater detention located in the Levitz parking lot.

Geologic Setting

The City is on a coastal plain underlain by relatively recent sediments ranging in age from Quaternary deposits of the Pleistocene epoch (11,000 to 1, 600,000 years) through the Holocene epoch (less than 11,000 years). The older sediments typically are shallow marine terrace deposits that have been uplifted by ongoing seismic movement and eroded to form the Bolsa Chica and Huntington Beach mesas. The mesas are bordered by younger (unconsolidated) alluvial soils that fill the gaps near Seal Beach, Bolsa

[5] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).

Chica, and the Santa Ana River. Older alluvial and/or terrace deposits are present at this site. These sediments are estimated to be in excess of 50 feet thick. The project site is several miles inland from the coastal bluffs and the surface geology varies from the majority of Huntington Beach.

The major active fault of most concern to the City is the Newport-Inglewood fault, located approximately 2.9 miles southwest of the project site. The fault zone is visible on the surface as a series of northwest-trending elongated hills, including Signal Hill and the Dominguez Hills, extending from Newport Beach to Beverly Hills.

Soil and Groundwater Conditions

The proposed project site is located within the southern portion of the Los Angeles Basin (LA Basin), a structural depression located within the northern margin of the Peninsular Ranges geomorphic province of California. According to the Geotechnical Investigation prepared for the proposed project, the project site is underlain by up to 15,000 feet of Cenozoic-age sediments overlying older Triassic to Late Jurassic metasedimentary rocks. The soils beneath the site are comprised of varying proportions of silts, sands, and gravels largely of the San Pedro Formation with lesser proportions of younger alluvial deposits.

The project site lies within the Newport-Inglewood Structural Zone, a northwest-trending belt of anticlinal folds and right-lateral faults disrupting Late Pleistocene and older deposits. Tilted and structurally deformed Holocene sediments have also been observed within the Newport-Inglewood Structural Zone, but evidence of surface rupture within the project site has not been documented.[6]

During field explorations performed for the geotechnical study, soils classified as fill were encountered to depths of approximately 3 to 5 feet below the current grade. Fill soils consisted of stiff consistency clayey silts. The native soil conditions that underlie the pavement and fill consist of interbedded layers of silts, fine sands, and clays to depths of 43 to 60 feet below current grade where firm to dense sands and gravels were encountered and extended to at least the maximum depths explored of 60 feet. The sands and silts generally exhibited loose to medium dense relative density while the clays typically exhibited medium stiff comparative consistency although zones of softer consistency material were encountered. Near the entrance to the former store, located centrally on the project site, thin seams of peat were encountered at depths of 11 and 20 feet. The thickness of the peat deposits appeared to be on the order of inches.

Groundwater was encountered at a depth of approximately 15 feet during the drilling operations. However, on further consideration, the geotechnical study concluded that the groundwater table is considered to have existed at depths on the range of 7 to 8 feet below grade. Perched water conditions may develop depending on seasonal precipitation. According to the California Geologic Survey, the historical high groundwater in the area is reported to be approximately 5 to 10 feet below the existing ground.[7]

[6] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).
[7] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).

Regional and Local Faults

All of Southern California is seismically active. The region is crossed by a network of major regional faults and minor local faults. This faulting and seismicity is dominated by the San Andreas Fault System, which separates two of the major tectonic plates that represent part of Earth's continental and oceanic crust: the Pacific plate is west of the San Andreas Fault System; the North American plate is to the east.

There are numerous faults in Southern California that are categorized as active, potentially active, and inactive by the CGS. A fault is classified as active if it has either moved during the Holocene epoch (during the last 11,000 years) or is included in an Alquist-Priolo Earthquake Fault Zone (as established by CGS). A fault is classified as potentially active if it has experienced movement within the Quaternary period (during the last 1.6 million years). Faults that have not moved in the last 1.6 million years generally are considered inactive. Surface displacement can be recognized by the existence of cliffs in alluvium, terraces, offset stream courses, fault troughs and saddles, the alignment of depressions, sag ponds, and the existence of steep mountain fronts.

The project site is not in an Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site.

As stated above, the nearest known active fault is the Newport-Inglewood Fault Zone, which is approximately 2.9 miles southwest of the project site. The closest well-documented surface projection of the Newport-Inglewood Fault Zone is the Bolsa Bay portion of the Seal Beach segment, approximately 3.1 miles west-southwest of the site. Other nearby active faults include the Palos Verdes fault, 12.5 miles southwest; the Whittier Fault Zone, 15.5 miles north-northeast; and the Elsinore Fault Zone, 21 miles northeast of the site.

There are several potentially active faults in the vicinity of the project site. These include the Los Alamitos fault, approximately 5.6 miles to the northwest; the Pelican Hill fault, 8.5 miles southeast; the El Moderno fault, 8.9 miles southeast; and the Norwalk fault, 10 miles north of the site.

Historic and Future Seismicity

According to the City's General Plan Environmental Hazards Element, the estimated maximum earthquake assigned to the Newport-Inglewood fault zone is Richter magnitude (M) 7.0. The expected (average) amount of surface fault rupture on any given fault trace would range from zero to about one foot for events with magnitudes under M 6.0, and from 1 foot to about 10 feet for events with magnitudes between M 6.0–7.5. Large earthquakes occurred in the area of the City in 1769 (fault unknown), 1812 (possibly the Newport-Inglewood fault), 1855 (the Newport-Inglewood fault or an unnamed concealed fault), and in 1920, 1933, and 1941 (all the Newport-Inglewood fault).

Earthquakes greater than Moment Magnitude (M_W) 7.0 (refer to Section 4.5.5 [Glossary]) may occur on the Newport-Inglewood fault once in 200 to 2000 years. According to the Uniform California Earthquake Rupture Forecast, the probability of a M_W7.0 earthquake occurring in the Los Angeles area

(although probably on the San Andreas fault rather than on the Newport-Inglewood fault) during the next 30 years is 82 percent.[8]

Seismic Hazards

The principal seismic hazard to the project site is groundshaking resulting from an earthquake occurring along any of several major active and potentially active faults in Southern California. Secondary seismic hazards affecting the project site may include fault rupture, soil liquefaction, dynamic settlements, earthquake-induced lateral displacement, landslide, earthquake-induced flooding, seiches, and tsunamis. A summary of these effects is provided in the geotechnical study and is summarized below.

As there are no significant ground slopes in the vicinity of the site, the potential for seismically induced landslides are not considered to be a potential seismic hazard for the proposed project site. No major dams or water-retaining structures are located near the project site which could be caused to fail as the result of an earthquake, the potential for earthquake induced flooding to occur at the project site is considered to be very low. Seiches are large waves generated in enclosed bodies of water in response to groundshaking. Due to the lack of the presence of enclosed bodies of water in the vicinity of the project site, seiches are not considered to be a seismic hazard to the site. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the location of the project site relative to the coast and the elevation above sea level, tsunamis are not anticipated to be a hazard to the project site.

Groundshaking

The major cause of structural damage from earthquakes is groundshaking. The intensity of ground motion expected at a particular site depends on the magnitude of the earthquake, the distance and direction to the epicenter, and the geology of the area between the epicenter and the property. Greater movement can be expected at sites on poorly consolidated material, such as loose alluvium, in proximity to the causative fault, or in response to an earthquake of great magnitude.

Known regional active faults that could produce significant groundshaking at the project site include the Newport-Inglewood and San Joaquin Blind Thrust, among others. The nearest known active fault is the North Branch of the Newport-Inglewood Fault Zone, located within the BECSP area, at the intersection of Beach Boulevard and Adams Avenue.

As part of the geotechnical study prepared for the proposed project, a Probabilistic Seismic Hazard Analysis (PSHA) was performed to estimate the Peak Horizontal Ground Accelerations (PHGA) that could occur on the project site. The PHGA is used to evaluate the intensity of ground shaking at the proposed project site based on earthquake magnitude, the distance from the source and the project site's response characteristics. The PSHA considered both active and potentially active faults within a 60-mile radius of the project site. Based on the findings of the PSHA, the PHGA at the project site in the event of an earthquake would range from 0.33 to 0.57 g.

[8] Southern California Earthquake Center, Uniform California Earthquake Rupture Forecast 2 (December 31, 2007; modified April 13, 2008), http://www.scec.org/ucerf/ (accessed by PBS&J geologist on April 14, 2008).

Fault Rupture

According to the geotechnical study prepared for the proposed project, the project site is not located within a currently designated Alquist-Priolo Earthquake Zone. No known active faults are mapped on the site. As such, the potential for surface fault rupture is considered to be low at the site.[9]

Liquefaction

Liquefaction is the phenomenon in which uniformly sized, loosely deposited, saturated, granular soils with low clay content undergo rapid loss of shear strength through the development of excess pore pressure during strong earthquake-induced groundshaking of sufficient duration to cause the soil to behave as a fluid for a short period of time. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low-density, fine, clean sandy soils; and (3) high-intensity ground motion. Liquefaction generally occurs in saturated or near-saturated cohesionless soils at depths shallower than 50 feet below the ground surface. If the liquefying layer were near the surface, the effect for any structure supported on it would be much like that of quicksand, resulting in sinking or tilting. If the layer were deeper in the subsurface, it could provide a sliding surface for materials above it, resulting in lateral motion (spreading or lurching) toward any nearby 'free face' (shore bluff, river embankment, excavation wall).

The project site is located within an area that has been identified by the State of California as being potentially susceptible to liquefaction.[10] According to the Liquefaction Potential map included as Figure EH-7 of the Huntington Beach General Plan, Environmental Hazards Element the project site is located in area identified as having a high to very high potential for liquefaction. Based on the geotechnical study, the relative density characteristics exhibited by the sands indicate the potential for liquefaction to occur under strong groundshaking such as the magnitude associated with the seismic design requirements of the current California Building Code (CBC). The primary effect of liquefaction is expected to be ground surface settlement due to the consolidation of the liquefied material. According to the geotechnical study the estimated settlement of ground surface ranged from 2.5 to 3.5 inches with a maximum of 4.5 inches in the vicinity of the southwestern corner of the existing building. The greater settlement at one location is due to the presence of two relatively thick layers, the first extending from 20 to 30 feet below grade and the next from 36 to 46 feet. The liquefaction characteristics exhibited by exploration at this location may be indicative of a localized condition, but could equally be representative of conditions in unexplored areas of the site due to the widely spaced locations of field exploration.

The estimated magnitude of settlement related to liquefaction is greater than typically considered tolerable for structures. The actual effect on the structures will, however, be related to the differential settlement that occurs. The variance in the calculated settlement magnitudes (2 inches) is relatively low when considered over large spans as may be expected to occur.

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[9] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).
[10] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).

Seismically Induced Lateral Spreading

Lateral spreading is the result of liquefaction within sloping terrain where the non-liquefied overlying material displaces down gradient. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. However, if lateral containment is present for those zones, then no significant risk of lateral spreading will exist. Since the project site is located in an area of little topographic relief, the potential for significant lateral spread is considered to be low.

Expansive and Collapsible Soils

Expansive soils contain types of clays (principally montmorillonite, illite, and kaolinite) that can give up water (shrink) or take on water (swell) during changes in soil moisture content. The change in volume exerts stress on building foundations and other loads placed on these soils. The occurrence of these clays often is associated with geologic units of marginal stability. Expansive soils can be widely dispersed and are found in hillside areas as well as low-lying areas in alluvial basins. Soils testing to identify expansive characteristics and appropriate remediation measures are required routinely by grading and building codes.

According to the Expansive Soil Distribution Map in the Environmental Hazard Element of the City's General Plan, the project site is in an area of "very high" potential for expansive soils. Soils in this area are required by Section 1802.2.2 Expansive Soils, of the 2007 CBC, to be tested for expansive characteristics and, if unacceptable, be treated to reduce the hazards they pose. As such soils underlying the project site were tested for expansive characteristics. The tests, summarized in the geotechnical study, concluded that the near surface soils encountered above the groundwater table did not exhibit clay content that would suggest a high expansion potential. Soils of high plasticity were encountered at depths below the groundwater, but their location and natural saturation results in no significant expansion potential.

Collapsible soils undergo a rearrangement of their grains, and a loss of cementation, resulting in substantial and rapid settlement under relatively low loads. Soils prone to collapse are commonly associated with man-made fill, wind-lain sands and silts, and alluvial fan and mudflow sediments deposited during flash floods. Soils of this type are required by Section 1802.2.1 (Questionable Soils) of the 2007 CBC to be tested for load-bearing value and, if unacceptable, treated to reduce the hazards they pose. Examples of common problems associated with collapsible soils include tilting floors, cracking or separation in structures, sagging floors, and nonfunctional windows and doors. The City's Building Code requires construction sites containing organic and other collapsible soils to be investigated and treated. Because collapsible soils are unsuitable for foundation support, the simplest approach for light structures with shallow foundations usually is to remove the soils and replace them with suitable material: for heavier structures, deep foundation support (piles, piers) often is recommended.

Shrinkage and Subsidence

Shrinkage is the loss of soil volume caused by compaction of fills to a higher density than before grading. Subsidence is the settlement of in-place subgrade soils caused by loads generated by the weight of large

earthmoving equipment or overlying fill or structures. Actual shrinkage and subsidence would depend on the types of earthmoving equipment used and the final fill and structural loads.

According to the City's Environmental Hazard Element, the site is in an area of known peat deposits. The soils encountered from depths of approximately 5 to 12 feet consisted of clays that exhibited medium stiff and locally soft consistency. Soils of similar consistency were also encountered to a lesser vertical extent at depths of 20 and 30 to 35 feet below grade. In addition to these clays, thin zones of fibrous organic peat deposits were also encountered. Peat and organic soils are highly susceptible to long-term consolidation settlement, causing the ground above them to subside. Given the presence of organic material in the soil, the project site is in an area of known subsidence associated with hydrocompaction (the settling and hardening of land caused by application of large amounts of water), or peat oxidation (the decomposition of organic materials in the soil).

4.5.2 Regulatory Framework

Refer to Section 4.5.2 (Regulatory Framework) of the BECSP Program EIR, for applicable federal, state, and local regulations that would apply to the proposed project. No new regulations have been implemented since the certification of the Program EIR.

The BECSP Development Code, which includes development standards, development regulations, and guidelines, governs all development actions with the BECSP area, including the proposed project site. The proposed project would be subject to development standards specific to the proposed project site's BECSP designations of Town Center Core and Town Center Neighborhood, included as BECSP Section 2.1.3 (Town Center Core) and Section 2.1.4 (Town Center Neighborhood).

General Plan and BECSP Consistency Analysis

The proposed project would be required to be constructed in accordance with *Huntington Beach Municipal Code* design requirements for structures for human occupancy. Minimum requirements for protection from seismic hazards, including foundation support and structural design, are specified in the *Building Code* (see above). Minimum grading requirements, including erosion control, excavation stability, and fill material acceptability are specified in the Grading and Excavation Code (see above). The proposed project would incorporate the required site preparation and structural design recommendations included in the geotechnical reports prepared for the project site. The incorporated recommendations would ensure that earthquake survivability is a primary concern in the design and construction of the proposed development. Implementation of the proposed project would not conflict with applicable regulations, including Policy EH 1.2-1 of the City's General Plan, which requires appropriate engineering and building practices for all new structures to withstand groundshaking and liquefaction through adherence with the City's Building Code, Grading and Excavation Code and all State requirements pertaining to geologic, soil, and seismic hazards.

Although peat layers are known to be present beneath the project site, hazards associated with the subsidence or collapse of these organic soils would be avoided through the use of a pile foundation or through other foundation recommendations per soils report and geotechnical analysis that would not

depend on the peat for its support (see above). Implementation of the proposed project would not conflict with applicable regulations.

4.5.3 Project Impacts and Mitigation

This section provides a discussion of impacts related to geology/soil based on Appendix G of the 2010 CEQA Guidelines thresholds of significance, as follows:

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

Seismic Hazards

According to the geotechnical study prepared for the proposed project, the project site is not located within a currently designated Alquist-Priolo Earthquake Zone. No known active faults are mapped on the site. As such, the potential for surface fault rupture is considered to be low at the site.[11] However, the project site is within the seismically active Southern California region, and would be subject to moderate to strong groundshaking in the event of an earthquake on one of the many active Southern California faults.

Potential effects associated with strong seismic ground shaking include ground failure, including liquefaction, and landslide. As discussed in the setting section, seismically induced landslides are not considered to be a potential seismic hazard for the proposed project site due to the lack of significant ground slopes in the vicinity of the project site. However, the proposed project site is located in an area identified as being potentially susceptible to liquefaction. Impacts associated with seismic hazards, including liquefaction, would be addressed through adherence to applicable regulations including the City of Huntington Beach Building Code, which has adopted the 2007 CBC, the Grading and Excavation Code, and State requirements pertaining to geologic, soil and seismic hazards. Additionally, as required

[11] Leighton and Associates, Inc., *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California* (October 30, 2009).

by mitigation measure BECSP MM4.5-1, design, grading, and structural recommendations of the final soil and geotechnical report to be prepared for the proposed project would be incorporated into the project's grading plan. In view of the strict regulations in place to control development of structures in a seismically active region, and the incorporation of project-specific design recommendations into the project's grading plan, the project's impact due to exposure to fault-line ground-surface rupture, seismically induced groundshaking, and seismic-related ground failure would not be significant. This is considered a ***less than significant*** impact.

Result in Substantial Soil Erosion or Loss of Topsoil

Proposed development would require earth-moving activities, including excavation below the existing ground surface. Grading and excavation associated with proposed development would expose soil to erosional processes and could result in the loss of topsoil during construction. The City's *Grading and Excavation Code* sets forth rules and regulations to control excavation, grading, earthwork and site improvement construction, including erosion control systems. The potential impacts of grading and excavation would be reduced to less than significant through the implementation of Best Management Practices during construction activities as required by the Grading and Excavation Code and the City's National Pollution Discharge Elimination System (NPDES) permit. The potential for soil erosion or the loss of top soil to occur would be addressed through compliance with the Grading and Excavation Code and incorporation of the recommendations of the final soil and geotechnical report into the project's final grading plan, as required by mitigation measure BECSP MM4.5-1. As such, a ***less than significant*** impact would occur relating soil erosion and the loss of topsoil.

Located on a Unstable Geologic Unit or Soil

Groundwater was encountered at a depth of approximately 15 feet during the drilling operations. However, based upon the relative moisture and measured moisture contents of the material recovered from the test borings, the groundwater table is considered to have existed at depths on the range of 7 to 8 feet below grade. Perched water conditions may develop depending on seasonal precipitation where porous granular soils are underlain by less permeable fine-grained soils. The near surface soils that will be exposed during general site preparation and excavating are expected to consist of fine sandy silt and clayey silt which are extremely sensitive to moisture. Soils of this type require careful control of their moisture content to allow proper recompaction and maintain stable subgrades. Grading during the wet winter season may, therefore, result in significant grading difficulties which could require significant processing/aeration of the soils to facilitate recompaction or off-site disposal and import of suitable material for fill. Dewatering activities could be needed during construction of subterranean parking. The removal of groundwater to create a dry construction pit could cause porous soils to collapse when the support provided by the water is withdrawn. Temporary shoring, dewatering wells, storage tanks, filters, and erosion control measures would be required to comply with the City's Grading Manual (Chapter 17.05.030 of the Huntington Beach Municipal Code). Dewatering activities would be required in order to comply with the NPDES Permit for Groundwater Discharge from the Santa Ana Regional Water Quality Control Board. Additionally, subterranean structures would be designed according to the recommendations of the project-specific Geotechnical Feasibility Report to resist hydrostatic pressures and be watertight. Future development would be designed, constructed, and operated in conformance

with Section 1802.2.1 (Questionable Soils) of the City's Municipal Code and Title 17 Excavation and Grading Code.

As previously discussed, the proposed project site is identified as having the potential for liquefaction to occur. The primary effect of liquefaction is expected to be ground surface settlement due to the consolidation of the liquefied material. According to the geotechnical study the estimated settlement of ground surface ranged from 2.5 to 3.5 inches with a maximum of 4.5 inches in the vicinity of the southwestern corner of the existing building. In addition to settlement associated with liquefaction, settlement at the project site could also occur as a result of the organic soils, including both clay and peat, underlying the project site.

Subsidence could result in the settlement of in-place subgrade soils caused by loads generated by large earthmoving equipment. Settlement would occur as a result of the placement of new fill or structural loads above the existing grade. Soils encountered from depths of approximately 5 to 12 feet consisted of clays that exhibited medium stiff and locally soft consistency. Soils of similar consistency were also encountered to a lesser vertical extent at depths of 20 and 30 to 35 feet below grade. Thin zones of fibrous organic peat deposits were also encountered. Peat and organic soils are highly susceptible to long-term consolidation settlement, causing the ground above them to subside. Given the presence of organic material in the soil, the project site is in an area of known subsidence associated with hydrocompaction (the settling and hardening of land caused by application of large amounts of water), or peat oxidation (the decomposition of organic materials in the soil). Furthermore, based on the result of laboratory testing, clays on the project are potentially compressible, and as such typical spread footing foundations could experience significant settlement that may exceed structural tolerances depending on the magnitude of the structural loads and the resulting sizes of the foundations. Potential impacts associated with settlement would be addressed through the incorporation of specific engineering recommendations to be included in the final soils and geology report prepared for the proposed project and included in the project's final grading plans. Additionally, the proposed structures would be designed, constructed, and operated in conformance with Section 1802.2.1 (Questionable Soils) of the 2007 CBC and Title 17 Excavation and Grading Code. As such, the proposed project would not be located on an unstable geologic unit or soil or could become unstable. This is a ***less than significant*** impact.

Be Located on Expansive Soil

The proposed project site is identified as having a moderate to high potential of expansive soils on the Expansive Soils Distribution map, Figure EH-12 of the Huntington Beach General Plan Environmental Hazards Element. However, according to the geotechnical study, the near surface soils that were encountered above the groundwater table did not exhibit clay content that would suggest a high expansion potential. Soils of high plasticity were encountered at depths below the groundwater, but their location and natural saturation results in no significant expansion potential. Regardless, risks associated with expansive soil are addressed through adherence to Section 1802.2.1 Questionable Soils, of the 2007 CBC and Title 17 Excavation and Grading Code, as well the incorporation of recommendations of the final soils and geology study into the project's grading plans. As such, potential risks to life and property associated with expansive soils would be ***less than significant***.

Soils Incapable of Supporting the Use of Waste Water Disposal Systems

The proposed project site is currently provided sanitary sewer service by the City of Huntington Beach. The City would continue to provide these services to the project. No septic tanks or alternative wastewater systems are proposed. ***No impact*** would occur.

Potentially significant impacts related to geology and soils have been mitigated through compliance with BECSP code requirement CR4.5-1 and BECSP mitigation measure MM4.5-1. All other impacts were determined to be less than significant based on the project's consistency with the analysis performed in the BECSP EIR.

Applicable Mitigation of the BECSP EIR

BECSP CR4.5-1 *A California-licensed Civil Engineer (Geotechnical) shall prepare and submit to the City a detailed soils and geotechnical analysis with the first submittal of a grading plan for future development. This analysis shall include Phase II Environmental soil sampling and laboratory testing of materials to provide detailed recommendations for grading, chemical and fill properties, liquefaction, and landscaping.*

BECSP MM4.5-1 *Future development in the Beach Boulevard and Edinger Avenue Corridors Specific Plan area shall prepare a grading plan to contain the recommendations of the final soils and geotechnical report. These recommendations shall be implemented in the design of the project, including but not limited to measures associated with site preparation, fill placement, temporary shoring and permanent dewatering, groundwater seismic design features, excavation stability, foundations, soil stabilization, establishment of deep foundations, concrete slabs and pavements, surface drainage, cement type and corrosion measures, erosion control, shoring and internal bracing, and plan review.*

Cumulative Impacts

Project-related impacts for environmental issue areas that did not require substantial additional analysis from what was provided in the BECSP EIR are considered to be less than significant with mitigation. In addition, the proposed project would not result in impacts different from or greater than previously analyzed in the BECSP EIR. Therefore, additional cumulative impact analysis is not required for these issue areas, including Geology and Soils.

4.5.4 References

Huntington Beach, City of. *Beach and Edinger Corridors Specific Plan Environmental Impact Report*, November 2009.

———. *City of Huntington Beach General Plan*, May 13, 1996.

Leighton and Associates, Inc. Leighton and Associates, Inc. *Geotechnical Engineering Feasibility Study, Proposed Mixed-Use Development, 7441 Edinger Avenue, Huntington Beach, California*, October 30, 2009.

Southern California Earthquake Center. Uniform California Earthquake Rupture Forecast 2, December 31, 2007, modified April 13, 2008. http://www.scec.org/ucerf/ (accessed by PBS&J geologist on April 14, 2008).