3.6 Geology and Soils

This Section evaluates potential impacts related to geology and soils resulting from construction and operation of the Project against significance thresholds derived from applicable local, state, or federal policies, or from Appendix G of the CEQA Guidelines. Information in this section is based in part on the Preliminary Geotechnical Investigation Report (SHN 2020).

3.6.1 Study Area

The Project Site is located on the North Spit of the Samoa peninsula between the Pacific Ocean and the western edge of Humboldt Bay. The Study Area includes the entirety of the Project Site, up to the edge of Humboldt Bay to the east and the coastal dunes to the west.

3.6.2 Setting

Regional and Local Geology

The Project Site is located on the North Spit of the Samoa peninsula between the Pacific Ocean and the western edge of Humboldt Bay. The northern and southern portions of Humboldt Bay (referred to as Arcata Bay and South Bay, respectively) occupy broad, shallow depressions. Both Arcata Bay and South Bay developed due to coseismic subsidence and elastic rebound of the upper plate related in response to slip on the underlying Cascadia Subduction Zone (CSZ). Near the Project Site, Humboldt Bay is constricted to a relatively narrow, deep channel (referred to as the Eureka Channel). This constricted section of Humboldt Bay coincides with the Eureka anticline and uplifted marine terraces to the east and southeast that ascend to an elevation of about 200 feet.

The entire North Spit is underlain by late Pleistocene to Holocene age marine shoreline and eolian deposits. The deepest and oldest sediments encountered in borings and CPT probes at the project site consist of middle Pleistocene age Hookton Formation, which are reported be less than ~450,000 years old. Hookton Formation sediments are composed of coarse granular nearshore marine deposits that transition to fine-grained coastal plain deposits. A deep water well drilled at the project site indicates Hookton Formation sediments to be at least 200 feet thick at this location.

Deep boreholes in and around Humboldt Bay and Eureka reveal Hookton Formation to be laterally continuous toward the east and south of the project site. On-land exposures of these sediments occur within deeply incised drainages that have formed in the higher elevation surfaces to the east and southeast of Eureka, as well as in the low-lying landforms south of Eureka. At the Project Site, Hookton Formation is overlain by a sequence of Pleistocene age bay mud deposits, Holocene age (<11,000 years old) nearshore marine and beach deposits, and latest Holocene (<1,000 years old) to recent dune deposits. The Pleistocene bay mud is generally about 10 feet thick and is in sharp depositional contact with the underlying granular sediments of the Hookton Formation. These fine-grained bay sediments are composed of elastic silt and are well indurated with moderate to strong cementation and medium stiff consistency. These low-energy deposits form a distinct stratigraphic marker horizon that has been observed in geotechnical borings throughout Eureka and on the North Spit and is interpreted to represent a paleo-bay that formerly occupied these locations.

Overlying the bay mud sediments is very high-energy and much more youthful nearshore marine and beach deposits composed of coarse sand and fine gravel containing abundant shell fragments. The coarse-grained marine and beach deposits are in turn overlain by clean fine sand containing organics; this sand is interpreted to represent wind-blown dune deposits. Previous studies by SHN indicate that along the Eureka waterfront area and presumably within Humboldt Bay, the dune sediments are capped by a thin veneer of recent and very soft bay mud deposits.

Seismicity and Faulting

The Project Site is in proximity to numerous latest Quaternary faults located in both the onshore and offshore areas. The Humboldt County coast in general is a highly active tectonic region that has been subjected to numerous earthquakes of low to moderate strength and occasionally to very strong earthquakes during the brief 170-year or so period of written record. Seismicity in the region is attributed primarily to the interaction between the Pacific, Gorda, and North American plates. The convergence of the Gorda and North American plates and interaction of the Pacific plate results in both northeast-southwest compressive strain of the leading edge of the North American plate and internal deformation of the Gorda plate.

Several different primary earthquake sources have been identified from the interaction of these plates including:

1. an interplate convergence zone consisting of the CSZ,
2. an intra-slab zone consisting of the internal deformation of the subducting Gorda plate,
3. a shallow crustal zone in the overriding North American plate, and
4. interplate transform boundaries consisting of the Mendocino fault zone and San Andreas fault.

Historical earthquakes have been correlated mainly with the intraslab zone and interplate transform boundaries. A brief description of each zone and the relative hazard posed by earthquakes generated from these sources are provided below.

Cascadia Subduction Zone

The leading edge of the CSZ is as close as 35 miles offshore of the Humboldt Bay region. The CSZ is a regional-scale thrust fault (megathrust) that forms the plate boundary between the subducting Gorda plate and Juan de Fuca plate to the north, and the overriding North America plate in the offshore areas of the Pacific Northwest. The subduction zone extends a length of 750 miles from offshore northern California to southern British Columbia. Although there is Native American oral history, there have been no written historical records of CSZ earthquakes. However, geologic evidence from the Humboldt Bay region and elsewhere along the Pacific Northwest coast (such as, drowned coastal forests, buried tidal marshes, and tsunami wave deposits) indicate that great subduction zone earthquakes have repeatedly occurred in the past. A great subduction earthquake along the CSZ would generate long duration, very strong ground shaking followed by the high likelihood of tsunami inundation at the Project Site.

Gorda Plate Earthquakes

Earthquakes generated from the intraslab zone are caused by the deformation and breakup of the subducting Gorda plate in the offshore areas and beneath the leading edge of the North American plate. Gorda plate earthquakes account for most of the historical seismicity in the region. A recent strong intra-slab, 6.8 magnitude (M_W), strike-slip event occurred less than 50 miles offshore of Eureka in March 2014 and produced moderate ground shaking along the Humboldt County coast. One of the largest recent intraslab events was the M_W 7.2 oblique-slip event, which occurred less than 7 miles offshore of Trinidad in November 1980. Damage to infrastructure that occurred because of this earthquake included the partial collapse of a U.S. Highway 101 overpass south of Eureka.

Shallow Upper Plate Earthquakes

Shallow, crustal earthquakes are those that occur in the overriding North American plate generated from surface or near-surface (blind) thrust faults. These fault zones are comprised of multiple northwest-striking and northeast-dipping low-angle reverse faults located in both the onshore and offshore areas between southern Humboldt Bay and Big Lagoon to the north. These fault zones are part of a broad fold and thrust belt actively deforming the accretionary wedge in both the offshore and onshore areas of north coastal California, and offshore the Oregon and Washington coast. These thrust faults and their associated hanging wall anticlinal folds are the result of active east-northeast directed compression produced by the convergence of the Gorda and Juan de Fuca plates with the North American plate along the CSZ.

The Little Salmon and Mad River fault zones are the two main thrust fault zones in the Humboldt Bay region and straddle the Project Site to the south and north, respectively. The Little Salmon fault is the nearest Holocene active fault to the project site and projects offshore in proximity to the Humboldt Bay harbor entrance, approximately 3.5 miles to the south of the site. The Project Site lies in the hanging wall of the fault and overlies the rupture plane, which presumably is as shallow as 2 miles beneath the site, assuming a fault dip of 30 degrees. Paleoseismic evidence suggests that coseismic displacement on the Little Salmon fault is related to great megathrust earthquakes on the subduction zone. Radiocarbon dating suggests earthquakes have occurred on the Little Salmon fault about 300, 800, and 1,600 years ago. Based on published fault parameters, the maximum moment magnitude earthquake for the Little Salmon fault is reported to be between M_W 7 and M_W 7.3. Displacement on the Little Salmon fault would subject the proposed developments at the Project Site to very strong ground shaking due to the proximity of the fault rupture plane beneath the Project Site.

Transform Boundary Earthquakes

Other significant seismic sources capable of generating strong ground motion at the project site include the Mendocino fault zone and the northern San Andreas fault. The Mendocino fault zone is an east-west trending right-lateral strike-slip fault that represents the plate boundary between the Pacific plate and southern edge of the Gorda plate. The Mendocino fault zone is the second most frequent source of earthquakes in the region. Historical earthquakes have ranged in magnitude from M_W 5 to M_W 7.5. The northern San Andreas fault is a right-lateral strike-slip fault that represents the plate boundary between the Pacific and North American plates. The fault traverses Point Delgada at Shelter Cove and terminates at the Mendocino triple junction. The 1906 San Francisco earthquake (M_W 8.3) ruptured the ground surface at Shelter Cove and caused the most significant damage in the north coast region, with the possible exception of the 1992 Petrolia earthquake.

Surface Fault Rupture

The surface trace of the Little Salmon fault is projected to be 3.5 miles south of the Project Site and is the nearest Holocene age fault designated by the State of California as being active. The Project Site, however, is not located within an Alquist-Priolo Fault Hazard Zone associated with this or any other active fault. No known active or recently inactive fault crosses the Project Site, and we found no field evidence to suggest that a previously unrecognized active fault may be present.

Soil Liquefaction and Lateral Spreading

Liquefaction is a soil behavior phenomenon in which soil located below the groundwater table temporarily loses strength during and immediately after a seismic event because of strong earthquake ground motions. Recently deposited sediments (such as, geologically young Holocene age sediments) consisting of relatively loose, saturated, non-cemented granular materials are most susceptible. Clay-rich soils and bedrock, for example, form the opposite end of the spectrum and are not susceptible to liquefaction.

Liquefaction occurs as seismic shear stresses propagate through a saturated soil and distort the soil structure, causing loosely packed groups of particles to contract or collapse. If drainage is impeded and cannot occur quickly, the collapsing soil structure increases the porewater pressure between the soil grains. When porewater pressures increase to a level approaching the weight of the overlying soil, the granular layer temporarily behaves as a viscous liquid rather than a solid. As strength is lost, there is an increased risk of settlement. Liquefaction-induced settlement occurs as the elevated porewater pressures dissipate and the soil consolidates after the earthquake. In addition to settlement, lateral spreading may occur where a steep embankment borders the edge of a bay or other water body. The potential for liquefaction to occur at the Project Site was calculated by comparing the cyclic shear stresses induced within the soil profile during an earthquake to the ability of the soils to resist these stresses. The cyclic shear stresses within the soil profile are estimated by computing the seismic response of horizontally layered soil deposits in response to the peak horizontal ground acceleration. The equivalent uniform stress profile is normalized by the vertical effective stress to develop a cyclic stress ratio (CSR) profile. The ability of the soils to resist these stresses, known as the cyclic resistance ratio (CRR), is based on soil strength as characterized by SPT N-values normalized for overburden pressures and corrected for such factors as fines content in accordance with the recommendations of Boulanger and Idriss. The factor of safety against liquefaction is then defined as the ratio of CRR to CSR.

The peak horizontal ground acceleration and earthquake magnitude chosen to represent the design earthquake hazard level for our liquefaction analysis was determined based on the U.S. Geological Survey (USGS) interactive deaggregations web application. To evaluate the potential for liquefaction, groundwater was conservatively estimated to be at an elevation of 15 feet (that is, at minimum 10 feet below the lowest site grades) in all building locations.

In general, for the effects of liquefaction to be manifested, groundwater levels must be shallow enough to saturate the loosely consolidated soils considered susceptible to liquefaction. The analysis indicates that the non-cohesive granular soils below the groundwater surface between the depths of about 10 to 25 feet have a low to moderate likelihood of liquefying during the design earthquake. The effects of liquefaction, including seismically-induced settlement and a reduction in bearing capacity due to soil strength loss are discussed below.

3.6.3 Regulatory Framework

Federal

Uniform Building Code

The International Conference of Building Officials published the family of Uniform Codes to provide jurisdictions with a complete set of building-related regulations for adoption. Standard 18-2 provides the Expansion Index Test, and Table 18-1-B includes a classification of expansive soil.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called “earthquake fault zones,” around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Because many active faults are complex and consist of more than one branch, each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace.

Title 14 of the California Code of Regulations (CCR), Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year.

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (Public Resources Code [PRC] Sections 2690 to 2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act. The state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, with cities and counties required to regulate development within mapped Seismic Hazard Zones.

Under the California Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within Seismic Hazard Zones until appropriate site-specific geologic and/or geotechnical investigations have been conducted by a state-licensed engineering geologist or civil engineer, and measures to reduce potential damage have been incorporated into the development plans.

According to the California Geological Survey (CGS), the California Earthquake Hazards Zone Application (or EQ Zapp) is the best official resource for locating Seismic Hazard Zones. However, official Seismic Hazard Zone Maps are also available in certain areas. The CGS has not yet published an official Seismic Hazard Zone map for the Study Area (CGS 2019). The EQ Zapp includes information on fault traces and fault zones in the Study Area, but has not evaluated the Study Area for liquefaction or seismically induced landslides (DOC 2019). According to the EQ Zapp, the closest fault line to the Study Area is approximately 3.5 miles to the south near Fairhaven, California. Cities and counties are to incorporate the Seismic Hazard Zone Maps into the Safety Element of their General Plan. Liquefaction Hazard Zones have been mapped in Humboldt County (Humboldt County Planning and Building 2015).

California Building Code

The State of California provides minimum standards for building design through the California Building Code (CBC). CBC Chapter 29 regulates excavation, foundations, and retaining walls. The CBC applies to building design and construction in the state and is based on the federal Uniform Building Code (UBC) used widely throughout the country. The CBC has been modified for California conditions with numerous more detailed and/or more stringent regulations. Specific minimum seismic safety and structural design requirements are set forth in CBC Chapter 16. The Code identifies seismic factors that must be considered in structural design. Chapter 18 of the CBC regulates the excavation of foundations and retaining walls, and Appendix Chapter A33 regulates grading activities, including drainage and erosion control, and construction on unstable soils, such as expansive soils and areas subject to liquefaction.

Section 1803.5.11

For structures assigned to Seismic Design Category C, D, E or F, a geotechnical investigation shall be conducted, and shall include an evaluation of all of the following potential geologic and seismic hazards:

- *Slope instability;*
- *Liquefaction;*
- *Total and differential settlement;*
- *Surface displacement due to faulting or seismically induced lateral spreading or lateral flow.*

Section 1803.5.12

For structures assigned to Seismic Design Category D, E or F, the geotechnical investigation required by Section 1803.5.11 shall also include all of the following as applicable:

The determination of dynamic seismic lateral earth pressures on foundation walls and retaining walls supporting more than 6 feet (1.83 m) of backfill height due to design earthquake ground motions.

The potential for liquefaction and soil strength loss evaluated for site peak ground acceleration, earthquake magnitude and source characteristics consistent with the maximum considered earthquake ground motions. Peak ground acceleration shall be determined based on one of the following:

a. A site-specific study in accordance with Section 21.5 of ASCE 7;

b. In accordance with Section 11.8.3 of ASCE 7.

An assessment of potential consequences of liquefaction and soil strength loss including, but not limited to, the following:

a. Estimation of total and differential settlement;

b. Lateral soil movement;

c. Lateral soil loads on foundations;

d. Reduction in foundation soil-bearing capacity and lateral soil reaction;

e. Soil downdrag and reduction in axial and lateral soil reaction for pile foundations;

f. Increases in soil lateral pressures on retaining walls;

g. Flotation of buried structures.

Discussion of mitigation measures such as, but not limited to, the following:

a. Selection of appropriate foundation type and depths;

b. Selection of appropriate structural systems to accommodate anticipated displacements and forces;

c. *Ground stabilization;*

d. *Any combination of these measures and how they will be considered in the design of the structure.*

Water Quality

The Porter Cologne Water Quality Control Act is the primary state statute for protection of water quality in California. Under the Act, the nine RWQCBs, with oversight from the SWRCB, regulate discharges to waters of the State based on the regulatory standards and objectives set forth in Water Quality Control Plans (also referred to as Basin Plans) prepared for each region. The North Coast RWQCB has regulatory oversight of the Study Area, with standards and objectives provided in the Water Quality Control Plan for the North Coast Region (NCRWQCB 2018).

Responsibility for implementation of Section 402 of the Clean Water Act has also been delegated to the SWRCB/RWQCBs, where they implement and enforce the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) (Order No. 2009-0009, as amended by Order No. 2010-0014). The Order applies to discharges from construction sites that include one or more acre of soil disturbance. Construction activities include clearing, grading, grubbing, excavation, stockpiling, and reconstruction of existing facilities involving removal or replacement.

Regional and Local

Humboldt County Geologic Hazards Ordinance

Humboldt County Code Section 336 regulations apply to those projects and activities which fall within the County's land use and development jurisdiction. The purpose of these regulations is to ensure that risks to life and property in moderate and high geologic hazard areas are minimized and further to assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability or destruction of development sites or surrounding areas.

Humboldt County Code Title VI Division 1 Water and Sewage

Provides local authority for management of onsite wastewater treatment systems.

Humboldt County Grading Excavation, Erosion and Sedimentation Control Ordinance

Humboldt County Code Section 331-14 regulates grading activities exceeding 50 cubic yards.

Humboldt Bay Area Plan – Local Coastal Plan

<u>*3.17 Hazards –B. Development Policies*</u>

1. *New development shall be consistent with the adopted Humboldt County Safety and Seismic Safety element of the General Plan.*

2. *The County shall amend Chapter 70, Section 7006, of the Uniform Building Code to require soil engineering and geological engineering investigations, prepared by a registered geologist or by a professional civil engineer with experience in soil mechanics or foundation engineering, or by a certified engineering geologist, for classes of development and hazard areas as shown in Table 1 and Plate III and maps as shown in Humboldt Bay Area Plan Appendices C, D & E.*

   a. *The report should consider, describe, and analyze the following.*

      (1) *Cliff geometry and site topography, extending the surveying work beyond the site as needed to depict unusual geomorphic conditions that might affect the site;*

(2) Historic, current, and foreseeable cliff erosion, including investigation of recorded land surveys and tax assessment records in addition to the use of historic maps and photographs where available and possible changes in shore configuration and sand transport;

(3) Geologic conditions, including soil, sediment and rock types and characteristics in addition to structural features, such as bedding, joint and faults;

(4) Evidence of past or potential landslide conditions, the implications of such conditions for the proposed development, and the potential effects of the development on landslide activity;

(5) Impact of construction activity on the stability of the site and adjacent area;

(6) Ground and surface water conditions and variations, including hydrologic changes caused by the development (i.e. introduction of sewage effluent and irrigation water to the ground water system; alterations in surface drainage);

(7) Potential erodibility of site and mitigating measures to be used to ensure minimized erosion problems during and after construction (i.e. landscaping and drainage design);

(8) Effects of marine erosion on seacliffs;

(9) Potential effects of seismic forces resulting from a maximum credible earthquake;

(10) Any other factors that might affect slope stability.

b. The report should evaluate the off-site impacts of development (e.g., development contributing to geological instability on access roads) and the additional impacts that might occur due to the proposed development (e.g., increased soil moisture from a septic system). The report should also detail mitigation measures for any potential impacts and should outline alternative solutions. The report should express a professional opinion as to whether the project can be designed so that it will neither be subject to nor contribute to significant geologic instability throughout the lifespan of the project. The report should use a currently acceptable engineering stability analysis method and should also describe the degree of uncertainty of analytical results due to assumptions and unknowns. The degree of analysis required should be appropriate to the degree of potential risk presented by the site and the proposed project.

c. The developments permitted in the hazard areas shall be sited and designed to assure stability and structural integrity for their expected economic life spans while minimizing alteration of natural landforms. Bluff and cliff developments (including related storm runoff, foot traffic, site preparation, construction activity, irrigation, wastewater disposal and other activities and facilities accompanying such development) shall not create or contribute significantly to problems of erosion or geologic instability on the site or on surrounding geologically hazardous areas.

3.6.4 Evaluation Criteria and Thresholds of Significance

Evaluation Criteria	Significance Thresholds	Sources
Would the Project directly or indirectly cause potential substantial adverse effects 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?	Placement of a structure intended for human occupancy within an Alquist-Priolo earthquake fault zone	CEQA Guidelines Appendix G, Checklist Item VII(a)(i)

Evaluation Criteria	Significance Thresholds	Sources
Would the Project directly or indirectly cause strong seismic ground shaking?	Non-compliance with California Building Code Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(a)(ii) Humboldt County Geologic Hazards Ordinance
Would the Project directly or indirectly cause seismic-related ground failure, including liquefaction?	Non-compliance with California Building Code Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(a)(iii) California Building Code Section 1803.5.11 and 1803.5.12 Humboldt County Geologic Hazards Ordinance
Would the Project directly or indirectly cause landslides?	Non-compliance with California Building Code Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(a)(iv) California Building Code Section 1803.5.11 and 1803.5.12 Humboldt County Geologic Hazards Ordinance
Would the Project result in substantial soil erosion or the loss of topsoil?	Non-compliance with the Grading, Excavation, Erosion and Sedimentation Control County Code language.	CEQA Guidelines Appendix G, Checklist Item VII(b) Grading Excavation, Erosion and Sedimentation Control (Humboldt County Code Section 331-14).
Would the Project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	Non-compliance with California Building Code Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(c) California Building Code Section 1803.5.11 and 1803.5.12 Humboldt County Geologic Hazards Ordinance
Would the Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	Non-compliance with Uniform Building Code Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(d) 1994 Uniform Building Code Chapter 18, Division 1, Table 18-1-B and Standard 18-2
Would the Project 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?	Non-compliance with recommendations of Project-specific geotechnical reports	CEQA Guidelines Appendix G, Checklist Item VII(e)
Would the Project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	Disturbance of a known vertebrate fossil locality or within a geologic unit that has high sensitivity for vertebrate fossils	CEQA Guidelines Appendix G, Checklist Item VII(f)

3.6.5 Methodology

Impact assessment utilizes the Geotechnical Investigation prepared for the Project (SHN 2020). A number of published geologic maps and reports were reviewed to develop the conclusions included in the completed report. Evaluation of the potential impacts are based on information obtained from available literature, state policies regarding geologic hazards (surface fault rupture), Humboldt County policies and codes, and field visits. In accordance with CEQA, the effects of a project are evaluated to determine if they would result in a significant adverse impact on the environment. Geology and soil impacts are analyzed below according to topic. Mitigation measures directly correspond with an identified impact.

3.6.6 Impacts and Mitigation Measures

Impact GEO-a.i: **Would the Project directly or indirectly cause 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? Refer to Division of Mines and Geology Special Publication 42. (No Impact)**

Terrestrial Development

The surface trace of the Little Salmon fault is projected to be 3.5 miles south of the proposed Terrestrial Development and is the nearest active Holocene age fault designated by the State of California (SHN 2020). However, the proposed Terrestrial Development is not located within an Alquist-Priolo Fault Hazard Zone associated with this or any other active fault. No known active or recently inactive fault crosses the area planned for the Terrestrial Development, and SHN (2020) did not observe field evidence to suggest that a previously unrecognized active fault may be present. SHN (2020) concluded the risk of surface fault rupture at the Terrestrial Development is considered negligible. No impact related to fault rupture would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Ocean Discharge

The surface trace of the Little Salmon fault is projected to be approximately 3.5 miles south of the Ocean Discharge component and is the nearest active Holocene age fault designated by the State of California (SHN 2020). However, the Ocean Discharge site is not located within an Alquist-Priolo Fault Hazard Zone associated with this or any other active fault. No known active or recently inactive fault crosses the Ocean Discharge site, and SHN (2020) did not observe field evidence to suggest that a previously unrecognized active fault may be present. SHN (2020) concluded the risk of surface fault rupture at the Ocean Discharge site is considered negligible. No impact related to fault rupture would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No impact

Humboldt Bay Water Intakes

The surface trace of the Little Salmon fault is projected to be approximately 3.5 miles south of the southern extent of the Humboldt Bay Water Intakes component and is the nearest active Holocene age fault designated by the State of California (SHN 2020). However, the Humboldt Bay Water Intake structures and pipeline alignment are not located within an Alquist-Priolo Fault Hazard Zone associated with this or any other active fault. No known active or recently inactive fault crosses the Humboldt Bay Intake structures and pipeline alignment, and SHN (2020) did not observe field evidence to suggest that a previously unrecognized active fault may be present. SHN (2020) concluded the risk of surface fault rupture at the Humboldt Bay Water intake structures or along the pipeline alignment is considered negligible. No impact related to fault rupture would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Compensatory Off-Site Restoration

The compensatory off-site restoration component associated with the Kramer Dock is not located within an Alquist-Priolo Fault Hazard Zone. Furthermore, removal of non-weight bearing piles and vegetation removal would not be affected by a fault rupture should one occur. Removal of Spartina would not result in any adverse effects associated with an Alquist Priolo Fault Hazard Zone. No impact related to fault rupture would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Impact GEO-a.ii: Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking? (Less than Significant)

The Project is situated within a seismically active area close to several seismic sources capable of generating moderate to strong ground motions. The Project Site is in proximity to numerous latest Quaternary faults located in both the onshore and offshore areas, including the Cascadia subduction zone, Gorda plate, and shallow upper plates (e.g., Little Salmon and Mad River fault zones (SHN 2020)). The Mendocino fault zone and San Andreas fault also have the potential to generate strong ground motion at the Project Site (SHN 2020). The Humboldt County coast is a highly active tectonic region that has been subjected to numerous earthquakes of low to moderate strength (magnitude 4 to 5.9) and occasionally to strong (magnitude 6 to 6.9) earthquakes. Seismicity in the region is attributed primarily to the interaction between the Pacific, Gorda, and North American plates (SHN 2020).

Terrestrial Development

Since the proposed Terrestrial Development component of the Project is located within a seismically active area, the probability that strong ground shaking associated with large magnitude earthquakes would occur during the design life of the Project is high.

Under existing conditions, the area planned to be converted into the proposed Terrestrial Development is primarily unoccupied and unused but does have tenants in one structure proposed for demolition. During operation, the Terrestrial Development component would provide up to 150 employment opportunities over the lifetime of the Project. Consequently, the Terrestrial Development would necessitate the presence of additional employees on-site in comparison to existing conditions, thereby potentially increasing exposure of the future employees that may be present in the event of an earthquake to strong seismic ground shaking. The Terrestrial Development buildings would be built to California Building Code (CBC) standards, which account for earthquake resiliency. Other existing buildings located on the parcel are occupied with tenants but are located outside the Project boundary; buildings located outside the Project boundary on the parcel would be unaffected by the Project.

Additionally, the proposed steel super- structure would be designed in accordance with the CBC (as mentioned above) and the American Society of Civil Engineers (ASCE) 7-16 *Minimum Design Loads for Buildings and Other Structures*. The super-structure would be designed to resist lateral loads from seismic and wind forces using steel buckling-restrained braced frames. The frames would be distributed around the structure to resist applied loads with consideration for torsional forces created by asymmetric loading. Foundation design would provide support for the super-structure's vertical and lateral load resisting systems, tanks, and other processing equipment. Foundation Settlement would be mitigated by densification of existing site soils. Sliding restraint of the building would be provided by reinforced concrete shear keys, integral to the foundation. Collectively the structural design would provide code-based strength to minimize loss of life as well as catastrophic damage to the process systems during a seismic event (GHD, SHN, & SMRT 2021).

Given the Project would be constructed to meet CBC earthquake resiliency standards and ASCE 7-16, the impact to people working on-site and structures from strong seismic ground shaking would be less than significant.

Mitigation Measures: No mitigation is necessary

Level of Significance: Less than Significant

Ocean Discharge

The Ocean Discharge component is currently existing and is proposed for use during operational phase of the proposed Project. During the operational phase, existing inspection, and maintenance of the ocean outfall by the Harbor District would continue as required by the State Lands Commission. Therefore, the Ocean Discharge component of the Project is not anticipated to significantly expose people or structures to risk of loss, injury, or death resulting from strong seismic ground shaking. A less than significant impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: Less than Significant

Humboldt Bay Water Intakes

Two intake structures would be enhanced in order to be utilized for the purposes of the proposed Project. These structures would not be for human occupancy. Maintenance of these structures and associated pipelines would be minimal and infrequent. Therefore, the Humboldt Bay Water Intakes component of the Project is not anticipated to significantly expose people or structures to risk of loss, injury, or death resulting from strong seismic ground shaking. A less than significant impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: Less than Significant

Compensatory Off-Site Restoration

The compensatory off-site restoration component would not install new structures or other infrastructure that would be utilized for human occupancy. Therefore, the restoration component does not have the potential to expose people or structures to risk of loss, injury or death resulting from strong seismic ground shaking. No impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Impact GEO-a.iii, a.iv, c, d: Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving liquefaction, landslides, or otherwise unstable soils? (Less than Significant with Mitigation)

Terrestrial Development

Seismically-Induced Liquefaction

SHN (2020) calculated the potential for liquefaction to occur at the location of the proposed Terrestrial Development by comparing the cyclic shear stresses induced within the soil profile during an earthquake to the ability of the soils to resist these stresses. Results indicated that the non-cohesive granular soils below the groundwater surface between the depths of about 10 to 25 feet would have a low to moderate likelihood of liquefying during the design earthquake

(SHN 2020). Results further indicated up to 3.5 inches of post-liquefaction settlement may occur below the groundwater table following the design earthquake hazard level (SHN 2020). SHN concluded that the general uniformity of the soils encountered and the relative minor differences in settlement potential between each test location could result in seismic settlement up to 3.5 inches, which would likely result in vertical ground surface displacements and partial loss of bearing support (SHN 2020). Based on the estimated amounts of total and differential settlement, SHN (2020) included geotechnical recommendations to ensure buildings included as part of the Project are properly constructed to avoid future settlement as a result of seismically induced liquefaction. As an outcome of the geotechnical recommendations, the facility would be designed to withstand predicted liquefaction potential. Soil densification will occur as described elsewhere in this document. With the implementation of Mitigation Measure GEO-1, the potential impact that would result from seismically-induced liquefaction would be less than significant.

Liquefaction - Lateral Spreading

In addition to settlement, liquefaction resulting in lateral spreading may occur where a steep embankment borders the edge of a bay or other water body, such as Humboldt Bay (SHN 2020). SHN (2020) conducted an analysis of the potential for and magnitude of liquefaction-induced lateral spread based on geotechnical borings located closest to Humboldt Bay. Topographical information indicates that the ground surface at the Project Site is relatively flat from the nearest proposed structure to the shoreline of Humboldt Bay, although the ground surface descends at a moderately steep gradient from the edge of the Terrestrial Development Site toward the intertidal mudflat at the immediate shoreline (SHN 2020). Results indicate the magnitude of lateral spread deformation at the eastern edge of the Terrestrial Development Site was estimated to be less than 0.5 feet (SHN 2020). The estimated horizontal displacements indicate that some lateral movement could occur near the eastern edge of Building 2 during the design earthquake hazard level and induce lateral spreading earth pressures on structural components (SHN 2020).

SHN (2020) included geotechnical recommendations to ensure buildings included as part of the Terrestrial Development are properly constructed to account for potential lateral spreading and are incorporated into Mitigation Measure GEO-1. With the implementation of Mitigation Measure GEO-1, the potential impact that would result from liquefaction and lateral spreading would be less than significant.

Landslides and Unstable Soils

The proposed Terrestrial Development is located on the Samoa Peninsula and is generally flat. The Terrestrial Development area does not include steep slopes or hillsides and thus does not have the potential for landslides, although there are some slope dunes between the proposed Terrestrial Development and Vance Avenue. The Project Area is an existing industrial area that includes extensive paving. Through implementation of the Terrestrial Development, the Site will be redeveloped, and any exposed (unpaved) soils shall be limited to natural habitats excluded from development. Areas excluded to preserve natural habitats have sand fill substrate, are vegetated (GHD 2021c, SHN 2020), and do not include bare or unstable soils, cut slopes, or other embankments that could result in geologic instability. No impact would result.

Mitigation

Mitigation Measure GEO-1: Implement Geotechnical Recommendations

As part of the Project design process, NAFC has engaged a California-registered Geotechnical Engineer to conduct a design-level geotechnical study for the Project. NAFC shall ensure that the Project is designed to comply with the site-specific recommendations identified in the Project's geotechnical report prepared for the Project by SHN (2020) and any subsequent geotechnical recommendations prepared as the Project’s design advances. Geotechnical recommendations require designs in accordance with the seismic and foundation design criteria, as well as site preparation and grading recommendations included in the report. The geotechnical recommendations shall be incorporated into the final plans and specifications for the Project and shall be implemented during construction.

With implementation of Mitigation Measure GEO-1, the Project will not result in significant adverse effects as a result of liquefaction, landslide, or unstable soils. The potential impacts would be reduced to a less-than-significant level with mitigation.

Level of Significance: Less than Significant with Mitigation Incorporated

Ocean Discharge

The Ocean Discharge component of the Project does not include any construction of buildings or structures that could be potentially affected by liquefaction, landslides or unstable soils resulting in potential adverse effects. The Project would merely operate this existing outfall and associated infrastructure. No impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Humboldt Bay Water Intakes

Seismically-Induced Liquefaction

As discussed above, SHN found that the non-cohesive granular soils below the groundwater surface between the depths of about 10 to 25 feet would have a low to moderate likelihood of liquefying during the design earthquake (SHN 2020). Results further indicated up to 3.5 inches of post-liquefaction settlement may occur below the groundwater table following the design earthquake hazard level (SHN 2020). SHN concluded that the general uniformity of the soils encountered and the relative minor differences in settlement potential between each test location could result in seismic settlement up to 3.5 inches, which would likely result in vertical ground surface displacements and partial loss of bearing support (SHN 2020). The associated pipelines would be placed below ground, and suitable material would be used for backfill, and the backfill would be compacted. The footprint is vulnerable to liquefaction. In the event of a liquefaction event, the pipelines could be vulnerable. The design of the pipelines would ensure they are resilient to geologic hazards. Design components would include use of High Density Polyethylene (HDPE) for the pipe material and flexible joints to allow for movement should liquefaction occur. During operation, the pipeline would contain Humboldt Bay water and freshwater (associated with the fire suppression piping) only and there would be no impact to the environment as a result of a pipeline rupture should that result from a liquefaction event. Therefore, a less than significant impact would occur.

Liquefaction - Lateral Spreading

The Humboldt Bay Water Intakes component would require the installation of the Sea Chests, associated piping, and fire pipelines below ground. These pipelines could be adversely affected by potential lateral spreading. However, the pipeline contains Humboldt Bay water and freshwater (associated with the fire suppression piping) only and there would be no impact to the environment as a result of a pipeline rupture resulting from liquefaction. Therefore, a less than significant impact would occur.

Landslides and Unstable Soils

The Humboldt Bay Water Intakes component would largely be under water. The proposed Humboldt Bay Water Intakes component is located on the Samoa Peninsula and is generally flat. The area does not include steep slopes or hillsides and thus does not have the potential for landslides. Therefore, landslides would not affect this component of the Project. No Impact would occur.

Mitigation Measures: No mitigation required

Level of Significance: Less than Significant

Compensatory Off-Site Restoration

The compensatory off-site restoration component would remove deteriorating creosote piles from Humboldt Bay and remove invasive Spartina. No structures or infrastructure would be constructed or impacted by either of these aspects of the Compensatory Off-Site Restoration component that could potentially be affected by landslides, liquefaction, or unstable soils. Therefore, no impact is anticipated to occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Impact GEO-b: Would the Project result in substantial soil erosion or the loss of topsoil? (Less than Significant with Mitigation)

Terrestrial Development

Construction activities, including grading, soil densification, trenching, and operation of heavy machinery, would disturb soil and, therefore, have the potential to cause erosion. Erosion and sediment control provisions prescribed in the Humboldt County Code and the CBC would be complied with as part of the Project. Construction BMPs would be implemented as Mitigation Measure GEO-2, to ensure potential water quality impacts are at a less than significant level during and post construction. A construction SWPPP would also be prepared for the Project, as detailed in Mitigation Measure HWQ-1 (See Section 3.9 Hydrology and Water Quality). Therefore, the potential soil erosion impact from construction would be less than significant with the implementation of Mitigation Measure GEO-2 and HWQ-1.

Implementation of the landscape design, including dune restoration, would result in minor soil disturbance to remove non-native plant species and revegetate with appropriate native species. Revegetation would primarily occur via broadcast seeding, which would minimize any potential soil disturbance. Historic restoration of the dunes in other locations on the Samoa Peninsula has not resulted in dune destabilization or substantial soil erosion. The potential soil erosion impact from dune restoration and implementation of the landscape plan would be less than significant.

Mitigation

Mitigation Measure GEO-2: Construction Best Management Practices

The contractor shall implement BMPs during construction, including the following BMPs from the current California Stormwater BMP Handbook for Construction: EC-1: Scheduling; EC-2: Preservation of Existing Vegetation; NS-2: Dewatering Operations; NS-9: Vehicle Equipment and Fueling; NS-10: Vehicle & Equipment Maintenance; WM-2: Material Use; WM-4: Spill Prevention and Control. Additionally, the following conditions shall be required during construction:

- Silt fences shall be deployed as needed at onshore construction areas to prevent any sediment from flowing into Humboldt Bay. Required silt fence and erosion control locations and specifications for installation shall be included in the final construction plan set. If the silt fences are not adequately containing sediment, construction activity shall cease until remedial measures are implemented that prevents sediment from entering the waters east of the construction area;
- Construction materials and debris shall not be placed or stored where it may be allowed to enter into or washed by rainfall into Humboldt Bay;
- Best Management Practices (BMPs) shall be implemented to prevent: 1) entry of stormwater runoff into Humboldt Bay during construction, 2) the entrainment of excavated contaminated materials leaving the site, and 3) the entry of polluted stormwater runoff into coastal waters during the transportation and storage of excavated materials. These BMPS will be included in the Stormwater Pollution Prevention Program (SWPPP), which is required for the Project (see Section 3.9 – Hydrology and Water Quality);

- Construction Storm Water Pollution Prevention Plan (SWPPP): The SWPPP shall be required to be implemented during the demolition and construction phases of the project. The SWPPP shall be submitted to the SWRCB Stormwater Multiple Application and Report Tracking System website (SMARTS) and contain the following components: best management practices to address erosion and sediment control, monitoring and testing for site runoff, an inspection program, and site maps. The SWPPP shall be updated and documented in the annual reporting to the RWQCB during the project to reflect changes in conditions (Mitigation Measure HWQ-1).

- Non-essential work vehicles and equipment shall be parked at least 100 feet away from the shoreline;
- Sufficient erosion control supplies shall be maintained on-site at all times, available for prompt use in areas susceptible to erosion during rain events;
- Disturbance of existing vegetation shall be minimized to only areas approved for development;
- Dewatering operations shall be conducted in the event that groundwater is encountered at the work location and stored or disposed of appropriately. Any groundwater encountered during demolition and construction that requires removal would be pumped into appropriate containers, such as Baker tanks for characterization. Excavation depths for construction are not anticipated to extend to groundwater and the use of dewatering wells for the Project is not planned (SHN 2020b). Water sourced from dewatering shall not be discharged to on-site one-parameter wetlands or Humboldt Bay;
- **Dewatering and Discharge Plan (DDP):** It is not anticipated that groundwater will be encountered during demolition or construction, but in the event that it is encountered, development of a plan for water management that includes handling, storage, testing, treatment, monitoring, and discharge shall be prepared for the project and submitted to the RWQCB for approval to complete the project. The plan shall use available groundwater testing results to identify appropriate treatment and include a monitoring program to ensure discharge parameters contained in the permit are met. The approved plan shall be submitted to the Planning and Building Department prior to water management activities;
- Vehicle and equipment maintenance shall not occur within 100 feet of Humboldt Bay or wetlands;
- As required in the SWPPP, contractor shall ensure that the site is prepared with BMPs prior to the onset of any storm predicted to receive 0.5 inches or more of rain over 24 hours;
- All erosion and sediment control measures shall be maintained in accordance to their respective BMP fact sheet until disturbed areas are stabilized. Erosion and sediment control measures shall be explicitly included in the final construction plan set and shall be conditions of the Coastal Development Permit; and
- The Stormwater Pollution Prevention Plan (SWPPP) may not cover all the situations that arise during construction due to unanticipated field conditions. Variations may be made to the SWPPP in emergency circumstances in the field subject to the approval of or at the direction of The Regional Water Quality Control Board and NAFC Project Manager or Construction Manager.

Mitigation Measure HWQ-1: Implement Stormwater Pollution Prevention Plan (SWPPP)

- Refer to Section 3.9 (Hydrology and Water Quality), for the full text of Mitigation Measure HWQ-1 Implement Stormwater Pollution Prevention Plan.

With implementation of Mitigation Measure GEO-2 and HWQ-1, the Project will not result in a substantial amount of soil erosion. The potential impacts would be reduced to a less-than-significant level with mitigation.

<u>*Ocean Discharge*</u>

The Ocean Discharge component of the Project would utilize the existing ocean outfall infrastructure during the operational phase. No ground disturbing activities would be required in order to implement the Ocean Discharge component of the Project that would have the potential to result in erosion. No impact would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

<u>*Humboldt Bay Water Intakes*</u>

Implementation of the Humboldt Bay Water Intake component would require trenching, and operation of heavy machinery. Consequently, construction of this component would disturb soil and, therefore, have the potential to cause erosion. Erosion and sediment control provisions prescribed in the Humboldt County Code and the CBC would be required as part of the Project. Construction BMPs would be implemented as Mitigation Measure GEO-2, to ensure potential water quality impacts are at a less than significant level during and post construction. A construction SWPPP would also be prepared for the Project as detailed in Mitigation Measure HWQ-1 (see Section 3.9 Hydrology and Water Quality). Therefore, the potential soil erosion impact from construction would be less than significant with the implementation of Mitigation Measure GEO-2 and HWQ-1.

Mitigation

Mitigation Measure GEO-2: Construction Best Management Practices

- Refer to Impact GEO- b under the Terrestrial Development Impact description for the full text of Mitigation Measure GEO-2: Construction Best Management Practices.

Mitigation Measure HWQ-1: Implement Stormwater Pollution Prevention Plan (SWPPP)

- Refer to Section 3.9 (Hydrology and Water Quality), for the full text of Mitigation Measure HWQ-1 Implement Stormwater Pollution Prevention Plan.
- With implementation of Mitigation Measure GEO-2 and HWQ-1, the Project will not result in a substantial amount of soil erosion. The potential impacts would be reduced to a less-than-significant level with mitigation.

Level of Significance: Less than Significant with Mitigation Incorporated

Compensatory Off-Site Restoration

The compensatory off-site restoration component includes the removal of Spartina via mechanical methods. Mechanical removal may result in erosion and loss of topsoil by carrying away and potentially eroding intact soil where there is a lack of vegetation and minimal remaining root systems after mechanical removal occurs. Therefore, this aspect of the off-site restoration could be potentially significant.

The pile removal at Kramer Dock would remove existing creosote piles from Humboldt Bay. The pile removals would occur slowly, and the holes left once removed are expected to sediment back in naturally. No erosion is anticipated to occur.

Mitigation

In accordance with CEQA Guidelines Section 15150, an EIR may incorporate by reference all or portions of another document which is a matter of public record or is generally available to the public. Where all or part of another document is incorporated by reference, the incorporated language shall be considered to be set forth in full as part of the text of the EIR. The Project would implement the following mitigation measure, as defined in the 2013 Spartina PEIR (H.T. Harvey and GHD 2013), for erosion control.

Mitigation Measure Spartina PEIR GS-1/WQ-5: Erosion Control

Spartina control methods which directly impact the soil (i.e., grinding, tilling, disking, digging and excavation) shall not be conducted on salt marsh areas that are within 15 ft of a salt marsh edge that is directly exposed to wave action. Other control methods can be used in these areas. This mitigation measure only applies to salt marsh edges along Humboldt Bay proper where wave action is relatively high, not attached sloughs/channels nor the Eel River or Mad River estuaries.

Level of Significance: Less than Significant with Mitigation Incorporated

Impact GEO-e: **Would the Project 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? (Less than Significant)**

Terrestrial Development

The Terrestrial Development Site includes an existing leach field managed by the Harbor District. The leach field remains from former industrial use and includes a 10,000-gallon septic tank. The leach field measures approximately 170 by 180 feet and is connected to the septic tank via 34 leach lines (Integral Consulting 2014). The leach field was designed and approved to handle a flow of 14,700 gpd of domestic wastewater generated by the employees of the pulp mill while in operation. The leach field is currently used by other industrial businesses leasing adjoining facilities from the Harbor District.

Following Phase 1 construction, the existing leach field would be used short-term to support the Project's sanitary sewer needs. The Project's sanitary sewer would not be sent to the on-site wastewater treatment plant. Use of the leach field would be discontinued once construction begins on the Phase 2 production modules, as the second production module building is proposed to be located over the existing leach field. The leach field shall be decommissioned and removed pursuant to California Health and Safety Code Section 115700(a) and Humboldt County Code Sections 611-6 and 612-2. Before the Phase 2 production modules are under construction, the Phase 1 Project Site structures would be connected to the Peninsula Community Services District (PCSD) sewer line that would be constructed in the Vance Avenue utility corridor west of the Project Site.

As existing sanitary wastewater infrastructure would be sufficient for Phase 1 Project needs and the future PCSD wastewater treatment facility to be located near the Project Site would meet the needs at full build out, no new leach field, septic tanks, or other wastewater disposal systems would be needed. Therefore, a less than significant impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: Less than Significant

Ocean Discharge

The Ocean Discharge component of the Project does not involve septic systems or domestic wastewater disposal systems. No impact would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Humboldt Bay Water Intakes

The Humboldt Bay Water Intakes component would not require installation of septic tanks or domestic wastewater disposal systems. Therefore, no impact related to inadequate soils to support septic tanks or domestic wastewater disposal systems would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Compensatory Off-Site Restoration

The compensatory off-site restoration component would not require installation of septic tanks or domestic wastewater disposal systems. Therefore, no impact related to inadequate soils to support septic tanks or domestic wastewater disposal systems would occur.

Mitigation Measures: No mitigation required

Level of Significance: No Impact

Impact GEO-f: Would the Project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? (Less than Significant with Mitigation)

<u>Terrestrial Development</u>

Paleontological resources are the remains or traces of prehistoric animals and plants. Paleontological resources, which include fossil remains and geologic sites with fossil-bearing strata, are non-renewable and scarce and are a sensitive resource afforded protection under environmental legislation in California. Under California Public Resources Code (PRC) § 5097.5, unauthorized disturbance or removal of a fossil locality or remains on public land is a misdemeanor. State law also requires reasonable mitigation of adverse environmental impacts that result from development of public land and affect paleontological resources (PRC § 30244).

It is unlikely that Project construction would impact potentially significant paleontological resources because most of the Project occurs in relatively newly deposited alluvium and was graded in the mid-1960s. However, the possibility of encountering a paleontological resource during construction cannot be completely discounted; therefore, the impact related to the potential disturbance or damage of previously undiscovered paleontological resources, if present, is considered potentially significant. To reduce the impact to a less-than-significant level, Mitigation Measure GEO-3 provides protocol to be followed in the event of inadvertent discovery of previously undiscovered paleontological resources.

Mitigation

Mitigation Measure GEO 3: Inadvertent Discovery of Paleontological Resources

- In the event that fossils are encountered during construction (i.e., bones, teeth, or unusually abundant and well-preserved invertebrates or plants), construction activities shall be diverted away from the discovery within 50 feet of the find, and a professional paleontologist shall be notified to document the discovery as needed, to evaluate the potential resource, and to assess the nature and importance of the find. Based on the scientific value or uniqueness of the find, the paleontologist may record the find and allow work to continue, or recommend salvage and recovery of the material, if it is determined that the find cannot be avoided. The paleontologist shall make recommendations for any necessary treatment that is consistent with currently accepted scientific practices. Any fossils collected from the area shall then be deposited in an accredited and permanent scientific institution where they would be properly curated and preserved.

Implementation of Mitigation Measure GEO-4 would reduce this impact to a less-than-significant level for both construction and operation because a plan to address discovery of unanticipated paleontological resources and to preserve and/or record those resources consistent with appropriate laws and requirements would be implemented.

Ocean Discharge

The Ocean Discharge component of the Project would utilize existing infrastructure during operation of the proposed Project. No excavation or other earth moving activities would be conducted associated with the Ocean Discharge component of the Project. Therefore, there is no potential for the Ocean Discharge component of the Project to encounter unknow paleontological resources. No impact would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Humboldt Bay Water Intakes

It is unlikely that construction of the Humboldt Bay Water Intake structures and pipeline alignment would impact potentially significant paleontological resources because most of the area proposed for disturbance occurs in relatively newly deposited alluvium and was graded in the mid-1960s. Additionally, the majority of the pipeline alignment would be located on placed fill atop former tidelands. Deep excavations would not occur. Therefore, the inadvertent discovery of paleontological resources would not result. No impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

Compensatory Off-Site Restoration

The compensatory off-site restoration component would remove piles from existing bay mud and remove Spartina. No deep excavations would occur that could potentially impact paleontological resources. Therefore, inadvertent discovery of paleontological resources would not result. No impact would occur.

Mitigation Measures: No mitigation is necessary

Level of Significance: No Impact

3.6.7 Cumulative Impacts

Impact GEO-C-1: **Would the Project contribute to a cumulatively significant impact to Geology or Soils? (Less than Significant)**

The nature of most geologic impacts are site-specific, with the exception of erosion of sediment. As discussed above, with incorporation of Mitigation Measures GEO-1 and GEO-2, erosion and sedimentation impacts would be managed and reduced to a less than significant level. Most geologic hazards do not accumulate, by implementing Mitigation Measure GEO-1, the Terrestrial Development component would be designed and constructed in compliance with the site-specific recommendations made in the Project's geotechnical reports. With compliance with the recommendations of the Project-specific geotechnical report and applicable state and local regulation and policies, the Project's geologic-related impacts (limited to the Project Site) would be less than significant. Additionally, with implementation of Mitigation Measure GEO-3, impacts to Paleontological impacts would be reduced to a less than significant level. Because of the localized nature of geologic and soil impacts, no significant cumulative impacts would result.

Mitigation Measures: No mitigation is necessary

Level of Significance: Less than Significant

3.6.8 References

Integral Consulting Inc. 2014. Potential Reuse of Leach Field. January.

GHD, SHN, & SMRT Architects and Engineers. 2021. Structural Design Criteria Memorandum. June.

SHN. 2020. Preliminary Geotechnical Investigation Report: Proposed Nordic Aquafarms California, LLC Development, Redwood Marine Terminal II, Samoa Peninsula. June.