

1 **3.6 GEOLOGY AND SOILS**

GEOLOGY AND SOILS – Would the Project:	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 **3.6.1 Environmental Setting**

3 **Regional Setting**

4 The Project area lies within the Coast Range Geomorphic Province of California, a
 5 region with independent and discontinuous northwest-trending mountain ranges, ridges,
 6 and intervening valleys (California Geological Survey [CGS] 2002). The Coast Range
 7 province is the largest of the state’s geomorphic provinces and rises abruptly from the
 8 shore in northern Humboldt County extending 400 miles south to the Santa Ynez River
 9 in Santa Barbara County. In general, the Coast Range province is composed of marine
 10 sedimentary bedrock, occasional volcanic rocks, and alluvial deposits (CGS 2002).
 11 Historically active faults in the region include the Concord, Hayward, Greenville-Marsh

1 Creek-Clayton, Calaveras, and San Andreas Faults. Of the major fault zones, the San
2 Andreas Fault is capable of generating the largest maximum credible earthquake
3 (MCE), estimated at a magnitude of 8.3 on the Richter scale (Borcherdt et al. 1975).
4 The Hayward and Calaveras Faults can generate an MCE of magnitude 7.5, the
5 Greenville-Marsh Creek-Clayton Fault can generate an MCE of magnitude 7.2, and the
6 Concord Fault can generate an MCE of magnitude 7.0 (Borcherdt et al. 1975; Hart and
7 Byrant 1997). Earthquakes of this magnitude are sufficient to create severe ground
8 accelerations in bedrock and unconsolidated deposits that could potentially cause major
9 damage to structures and foundations (Greensfelder 1974).

10 **Project Setting**

11 *Geology*

12 The Project site is located in northern Contra Costa County along the southern shore of
13 the Suisun Bay near the town of Bay Point. The outfall pipe to be removed terminates in
14 the waters of the Suisun Bay. The onshore portion of the Project area is composed of a
15 soil that is referred to as Joice Muck. Joice Muck is characterized as black, acidic muck
16 mixed with silt and clay. The lower levels of Joice Muck are black, clayey, and can be
17 strongly acidic when oxidized. Due to its proximity to salt water, Joice Muck is also very
18 saline. Joice Muck is unique to the Suisun Bay.

19 *Faults and Seismicity*

20 Seismic hazards include ground shaking, liquefaction, land sliding, lateral spreading,
21 differential settlement, and inundation by encroaching waves. The region around the
22 Project area is home to the Concord Fault and Greenville-Marsh Creek-Clayton Fault,
23 which are active faults. Faults zoned as active by the CGS are those that have
24 undergone seismic activity within the past 11,000 years (Holocene epoch). The Concord
25 Fault lies approximately 5 miles to the west of the Project area. The Greenville-Marsh
26 Creek-Clayton Fault is located approximately 5.5 miles to the southeast. Though the
27 Project is in relative close proximity to these active faults, a search of the Alquist-Priolo
28 Earthquake Fault Zone Maps indicates that the Project does not lie within an Alquist-
29 Priolo Earthquake zone. No known active faults cross the Project site; therefore, fault
30 rupture is not considered a potential geologic hazard that could affect the Project.

31 *Liquefaction*

32 Liquefaction is a phenomenon in which saturated granular sediments temporarily lose
33 their shear strength during periods of earthquake-induced, strong ground shaking. The
34 susceptibility of a site to liquefaction is a function of the depth, density, and water
35 content of the granular sediments and the magnitude of earthquakes likely to affect the
36 site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the

1 ground surface are most susceptible to liquefaction. The primary liquefaction-related
 2 phenomena include vertical settlement and lateral spreading. Based on the Association
 3 of Bay Area Governments (ABAG) Liquefaction Susceptibility Map, the onshore portions
 4 of the Project have a moderate risk of liquefaction (ABAG 2013). The mapping program
 5 does not include the submerged areas of the Suisun Bay.

6 *Landslides and Soil Erosion*

7 The Project site is within waters of the Suisun Bay. According to Contra Costa County,
 8 the Project area has a low risk for landslide. The nearest significant elevation change is
 9 the hills over a mile to the south. It is very unlikely that a landslide or soil erosion could
 10 occur at the Project site.

11 **3.6.2 Regulatory Setting**

12 **Federal and State**

13 Federal and State laws and regulations pertaining to this issue area and relevant to the
 14 Project are identified in Table 3.6-1.

Table 3.6-1 Laws, Regulations, and Policies (Geology and Soils)

CA	Alquist-Priolo Earthquake Fault Zoning Act (Pub. Resources Code, §§ 2621-2630)	This Act requires that "sufficiently active" and "well-defined" earthquake fault zones be delineated by the State Geologist and prohibits locating structures for human occupancy across the trace of an active fault.
	California Building Code (CBC) (Cal. Code Regs., tit. 23)	The CBC contains requirements related to excavation, grading, and construction of pipelines alongside existing structures. A grading permit is required if more than 50 cubic yards of soil are moved. Sections 3301.2 and 3301.3 contain provisions requiring protection of adjacent properties during excavations and require a 10-day written notice and access agreements with adjacent property owners.
	California Seismic Hazards Mapping Act (Pub. Resources Code, § 2690 and following as Division 2, Chapter 7.8)	This Act and the Seismic Hazards Mapping Regulations (Cal. Code Regs., tit. 14, Div. 2, Ch. 8, Art. 10) are designed to protect the public from the effects of strong ground shaking, liquefaction, landslides, other ground failures, or other hazards caused by earthquakes. The Act requires that site-specific geotechnical investigations be conducted identifying the hazard and formulating mitigation measures prior to permitting most developments designed for human occupancy. Special Publication 117, <i>Guidelines for Evaluating and Mitigating Seismic Hazards in California</i> (California Geological Survey 2008), constitutes guidelines for evaluating seismic hazards other than surface fault rupture and for recommending mitigation measures (as required by § 2695, subd. (a)).

15 **Local**

16 The Safety Element of the Contra Costa County General Plan includes goals and
 17 policies to address seismic hazards within the County. No seismic hazard goals or
 18 policies are applicable to the Project site.

1 **3.6.3 Impact Analysis**

2 **a) Expose people or structures to potential substantial adverse effects, including**
3 **the risk of loss, injury, or death involving:**

4 **(i) Rupture of a known earthquake fault, as delineated on the most recent**
5 **Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for**
6 **the area or based on other substantial evidence of a known fault? (Refer to**
7 **Division of Mines and Geology Special Publication 42.)**

8 **(ii) Strong seismic ground shaking?**

9 **No Impact.** Though the Project area is in close proximity to active faults, risk of loss of
10 life or property in a seismic event due to the completion of this Project will be
11 nonexistent. The Project involves the removal of an outfall pipe and does not include the
12 construction of any buildings or structures that could potentially be damaged or cause
13 injury or death. The Project involves removing material that could potentially be injurious
14 in an earthquake. Work would be conducted from a barge adjacent to the structures to
15 be removed. The Project site is not crossed by active faults and does not lie within or
16 near an Alquist-Priolo Earthquake Zone. There is the potential for workers to be
17 subjected to ground shaking in the event of a significant earthquake within the region,
18 but the likelihood of this occurring during the relatively short Project schedule (2 weeks)
19 is relatively remote. Therefore, this Project is not likely to expose people or structures to
20 potential substantial adverse effects due to rupture of a fault or seismic ground shaking.

21 **(iii) Seismic-related ground failure, including liquefaction?**

22 **Less than Significant.** The mapping compiled by ABAG shows that the onshore areas
23 adjacent to the Project site have a moderate risk of liquefaction. However, once the
24 Project is completed, the threat of damage or loss from liquefaction will be minimal,
25 since the structures on-site will be removed. Also, risk of liquefaction during Project
26 operations will be low since the Project is expected to last 2 weeks. Therefore, the
27 threat of exposing people or structures to potential substantial adverse effects due to
28 seismic-related ground failure including liquefaction is less than significant.

29 **(iv) Landslides?**

30 **No Impact.** The onshore portion of the Project is in a relatively flat shoreline area, and
31 is unlikely to be susceptible to landslides. There is also a temporary staging area within
32 the confines of an existing yard of the selected contractor, which would be located in a
33 relatively flat industrially-developed area. Therefore, this Project is not likely to expose
34 people or structures to potential substantial adverse effects due to landslides.

35 **b) Result in substantial soil erosion or the loss of topsoil?**

1 ***c) Be located on geologic unit or soil that is unstable, or that would become***
2 ***unstable as a result of the project, and potentially result in on- or off-site***
3 ***landslide, lateral spreading, subsidence, liquefaction, or collapse?***

4 ***d) Be located on expansive soil, as defined in Table 18 1 B of the Uniform***
5 ***Building Code (1994), creating substantial risks to life or property?***

6 ***e) Have soils incapable of adequately supporting the use of septic tanks or***
7 ***alternative wastewater disposal systems where sewers are not available for the***
8 ***disposal of wastewater?***

9 **No Impact.** The onshore portion of the Project is in a relatively flat shoreline area, and
10 is unlikely to be susceptible to soil erosion. There is also a temporary staging area
11 within the confines of an existing yard of the selected contractor, which would be
12 located in a relatively flat industrially-developed area. Therefore, this Project is not likely
13 to result in substantial soil erosion or the loss of topsoil. The site is not located on a
14 geologic unit or soil that is unstable or expansive. Project activities would not require
15 sewers, septic tanks, or alternative wastewater storage or disposal systems.

16 **3.6.4 Mitigation Summary**

17 The Project would not result in significant impacts to geology and soils; therefore, no
18 mitigation is required.