3.6 Geology, Soils, and Paleontological Resources

This section describes the regulatory and environmental setting for geology, soils, and paleontological resources in the project area. It also describes impacts on geology, soils, and paleontological resources that would result from implementation of the Initial and Full Repower phases.

3.6.1 Existing Conditions

Regulatory Setting

Regulations and policies applicable to geology and seismicity in the project area are summarized below.

Federal

See Chapter 3.9, *Hydrology*, for information on the CWA Section 402.

International Building Code

The design and construction of engineered facilities in the state of California must comply with the requirements of the International Building Code (IBC) (International Code Council 2011) and the adoptions to that code by the State of California (see *California Building Standards Code*).

U.S. Geological Survey Landslide Hazard Program

To fulfill the requirements of Public Law 106-113, USGS created the National Landslide Hazards Program to reduce long-term losses from landslide hazards by improving understanding of the causes of ground failure and suggesting mitigation strategies. The Federal Emergency Management Agency (FEMA) is the responsible agency for the long-term management of natural hazards.

State

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Earthquake Fault Zoning Act (PRC Section 2621 et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy[1] across the traces of active faults and strictly regulates construction in the corridors along active faults (*earthquake fault zones*). It also defines criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals in and adjacent to Earthquake Fault Zones.

[1] With reference to the Alquist-Priolo Act, a *structure for human occupancy* is defined as one "used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year" (CCR, Title 14, Div. 2, Section 3601[e]).

Under the Alquist-Priolo Act, faults are zoned, and construction along or across them is strictly regulated if they are *sufficiently active* and *well defined*. A fault is considered sufficiently active if one or more of its segments or strands show evidence of surface displacement during Holocene time (defined for purposes of the Alquist-Priolo Act as referring to approximately the last 11,000 years). A fault is considered well-defined if its trace can be identified clearly by a trained geologist at the ground surface or in the shallow subsurface using standard professional techniques, criteria, and judgment (Bryant and Hart 2007).

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act 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, and cities and counties are required to regulate development within mapped seismic hazard zones.

Under the 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 carried out and measures to reduce potential damage have been incorporated into the development plans. Geotechnical investigations conducted within Seismic Hazard Zones must incorporate standards specified by California Geological Survey Special Publication 117a, *Guidelines for Evaluating and Mitigating Seismic Hazards* (California Geological Survey 2008).

California Building Standards Code

The State's minimum standards for structural design and construction are given in the California Building Standards Code (CBSC) (24 CCR). The CBSC is based on the IBC (International Code Council 2011), which is used widely throughout the United States (generally adopted on a state-by-state or district-by-district basis) and has been modified for California conditions with numerous, more detailed or more stringent regulations. The CBSC requires that "classification of the soil at each building site will be determined when required by the building official" and that "the classification will be based on observation and any necessary test of the materials disclosed by borings or excavations." In addition, the CBSC states that "the soil classification and design-bearing capacity will be shown on the (building) plans, unless the foundation conforms to specified requirements." The CBSC provides standards for various aspects of construction, including (i.e., not limited to) excavation, grading, and earthwork construction; fills and embankments; expansive soils; foundation investigations; and liquefaction potential and soil strength loss. In accordance with California law, certain aspects of the project would be required to comply with all provisions of the CBSC.

The California Building Code (CBC) requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design.

Construction Activities Storm Water Construction General Permit (2010-0014-DWQ Permit)

Dischargers whose projects disturb 1 or more acres of soil, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the Construction General Permit Order 2010-0014-DWQ (Construction General Permit). Construction activity subject to this permit includes clearing, grading, and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

Coverage under the Construction General Permit is obtained by submitting permit registration documents to the State Water Board that include a risk level assessment and a site-specific stormwater pollution prevention plan (SWPPP) identifying an effective combination of erosion control, sediment control, and non-stormwater BMPs. The Construction General Permit requires that the SWPPP define a program of regular inspections of the BMPs and, in some cases, sampling of water quality parameters. The San Francisco Bay Regional Water Quality Control Board (San Francisco Bay Regional Water Board) administers the NPDES stormwater permit program in Alameda County. The 14 cities, the unincorporated area, and the two flood control districts of Alameda County share one NPDES permit that is managed through a consortium of agencies called the Alameda Countywide Clean Water Program (ACCWP).

California Public Resources Code

Several sections of the California PRC protect paleontological resources. Section 5097.5 prohibits *knowing and willful* excavation, removal, destruction, injury, and defacement of any paleontological feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted express permission. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands.

Local

Alameda County General Plan

The Alameda County General Plan specifies numerous policies and actions to meet its goal "To minimize risks to lives and property due to seismic and geologic hazards." These policies and actions are listed below.

Policies

P1. To the extent possible, projects should be designed to accommodate seismic shaking and should be sited away from areas subject to hazards induced by seismic shaking (landsliding, liquefaction, lurking, etc.) where design measures to mitigate the hazards will be uneconomic or will not achieve a satisfactory degree of risk reduction. (Source: Seismic Safety and Safety Element, pg. 6)

P2. Structures should be located at an adequate distance away from active fault traces, such that surface faulting is not an unreasonable hazard. (Source: Seismic Safety and Safety Element, pg. 6)

P3. Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. (Source: Seismic Safety and Safety Element, pg. 6)

P4. Within areas of demonstrated or potential slope instability, development should be undertaken with caution and only after existing geological and soil conditions are known and considered. In areas subject to possible widespread major landsliding, only very low density development should be permitted, consistent with site investigations; grading in these areas should be restricted to minimal amounts required to provide access. (Source: Seismic Safety and Safety Element, pg. 7)

P5. All existing structures or features of structures which are hazardous in terms of damage, threat to life or loss of critical and essential function in the event of an earthquake should be, to the extent feasible, brought into conformance with applicable seismic and related safety (fire, toxic materials storage and use) standards through rehabilitation, reconstruction, demolition, or the reduction in occupancy levels or change in use. (Source: Seismic Safety and Safety Element, pg. 7, with a minor revision)

P6. The County shall not approve new development in areas with potential for seismic and geologic hazards unless the County can determine that feasible measures will be implemented to reduce the potential risk to acceptable levels, based on site-specific analysis. The County shall review new development proposals in terms of the risk caused by seismic and geologic activity. (Source: ECAP, pg. 74)

P7. The County, prior to approving new development, shall evaluate the degree to which the development could result in loss of lives or property, both within the development and beyond its boundaries, in the event of a natural disaster. (Source: ECAP, pg. 74)

P8. The County shall ensure that new major public facilities, including emergency response facilities (e.g., hospitals and fire stations), and water storage, wastewater treatment and communications facilities, are sited in areas of low geologic risk. (Source: ECAP, pg. 74)

P9. Site specific geologic hazard assessments, conducted by a licensed geologist, shall be completed prior to development approval in areas with landslide and liquefaction hazards as indicated in Figures S-2 and S-4 and for development proposals submitted in Alquist-Priolo Zones as indicated in Figure S-1, hazards to be mapped include:

- Seismic features
- Landslide potential
- Liquefaction potential

Mitigation measures needed to reduce the risk to life and property from earthquake induced hazards should be included. (Source: Eden Area Plan, pg. 8-11)

P10. Buildings shall be designed and constructed to withstand ground shaking forces of a minor earthquake (1–4 magnitude) without damage, of a moderate (5 magnitude) earthquake without structural damage, and of a major earthquake (6–8 magnitude) without collapse of the structure. The County shall require that critical facilities and structures (e.g. hospitals, emergency operations centers) be designed and constructed to remain standing and functional following an earthquake. (Source: ECAP, pg. 75)

P11. All construction in unincorporated areas shall conform to the Alameda County Building Ordinance, which specifies requirements for the structural design of foundations and other building elements within seismic hazard areas.

P12. To the extent feasible, major infrastructure including transportation, pipelines, and water and natural gas mains, shall be designed to avoid or minimize crossings of active fault traces and to accommodate fault displacement without major damage that could result in long-term service disruptions. (Source: Eden Area Plan, pg. 8-12)

P13. The County shall encourage the retrofitting of existing structures and other seismically unsafe buildings and structures to withstand earthquake ground-shaking. (Source: Eden Area Plan, pg. 8-12)

P14. In order to minimize off-site impacts of hillside development, new construction on landslide-prone or potentially unstable slopes shall be required to implement drainage and erosion control provisions to avoid slope failure and mitigate potential hazards. (Source: Eden Area Plan, pg. 8-12)

Actions

A1. Require all new construction to meet the most current, applicable, lateral force requirements. (Source: Seismic Safety and Safety Element, pg. 6)

A2. Require applications for development within Alquist-Priolo Study Zones to include geological data that the subject property is not traversed by an active or potentially active fault, or that an adequate setback can be maintained between the fault trace and the proposed new construction. (Source: Seismic Safety and Safety Element, pg. 6)

A3. Require sites to be developed in accordance with recommendations contained in the soil and geologic investigations reports. (Source: Seismic Safety and Safety Element, pg. 6)

A4. Establish standards for areas previously in Alquist-Priolo Study Zones, and eliminated in the last update. (Source: Seismic Safety and Safety Element, pg. 6)

A5. Regulate, with collaboration from utility owners, the extension of utility lines in fault zones. (Source: Seismic Safety and Safety Element, pg. 6, with minor revisions)

A6. Establish (with collaboration from utility owners) and enforce design standards for transportation facilities and underground utility lines to be located in fault zones. (Source: Seismic Safety and Safety Element, pg. 6)

A7. Require soils and/or geologic reports for development proposed in areas of erodible soils and potential slope instability. (Source: Seismic Safety and Safety Element, pg. 7)

A8. Pursue programs to identify and correct existing structural hazards, with priority given to hazards in critical, essential and high occupancy structures and in structures built prior to the enactment of applicable local or state earthquake design standards. (Source: Seismic Safety and Safety Element, pg. 7)

A9. Support regional or statewide programs providing funding or technical assistance to local governments to allow identification of existing structural hazards in private development and providing assistance to public and private sectors to facilitate and to minimize the social and economic costs of hazards abatement. (Source: Seismic Safety and Safety Element, pg. 7)

A10. Continue to require the upgrading of buildings and facilities to achieve compliance with current earthquake bracing requirements as a condition of granting building permits for major additions and repairs. (Source: Seismic Safety and Safety Element, pg. 7)

A11. Continue, and as required, expand programs to provide the public information regarding seismic hazards and related structural hazards. (Source: Seismic Safety and Safety Element, pg. 7)

A12. Require geotechnical studies prior to development approval in geologic and/or seismic hazard areas as identified by future studies by federal, state, and regional agencies. Require or undertake comprehensive geologic and engineering studies for critical structures regardless of location. (Source: Castro Valley Plan, pg. 10-30)

A13. Adopt and amend as needed the most current version of the California Building Code (CBC) to ensure that new construction and renovation projects incorporate earthquake resistant design and materials that meet or exceed the current seismic engineering standards of the CBC. (Source: Castro Valley Plan, pg. 10-30, with minor revision)

A14. Periodically update detailed guidelines for preparation of site-specific geologic hazard assessments. These guidelines shall be prepared in consultation with the County Building Official, County Engineer, County Counsel and the County Risk Manager and shall ensure that site-specific assessments for development requiring discretionary permits are prepared according to consistent criteria. (Source: Eden Area Plan, pg. 8-13, with revisions)

A15. Develop and implement an earthquake retrofit plan to reduce hazards from earthquakes. The plan should identify and tally the seismically unsafe buildings and structures, including unreinforced masonry, unreinforced concrete and soft-story buildings, and require inspection for these structures. It should also identify sources of funding to help reconstruct or replace inadequate structures and assist homeowners with earthquake retrofitting. (Source: Eden Area Plan, pg. 8-13)

A16. On sites with slopes greater than 30 percent, require all development to be clustered outside of the 30 percent slope area. (Source: Castro Valley Plan, pg. 10-31) With the exception that development upon any area outside of the Urban Growth Boundary where the slope exceeds 25% shall not be permitted. (Source: ECAP, pg. 74)

A17. Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. The County's development standards and guidelines, permit application review process, Section 15.08.240 of its Building Ordinance, the Grading Erosion and Sediment Control Ordinance (Chapter 15.36 of the Alameda County General Ordinance Code), the Stormwater Management and Discharge Control Ordinance (Chapter 13.08), and Subdivision Ordinance (Title 16) shall serve to implement this policy.

East County Area Plan

The ECAP also specifies numerous policies to meet its goal "To minimize risks to lives and property due to seismic and geologic hazards." These policies and implementation programs are listed below.

Goal: To minimize the risks to lives and property due to seismic and geologic hazards.

Policies

Policy 309: The County shall not approve new development in areas with potential for seismic and geologic hazards unless the County can determine that feasible measures will be implemented to reduce the potential risk to acceptable levels, based on site-specific analysis. The County shall review new development proposals in terms of the risk caused by seismic and geologic activity.

Policy 310: The County, prior to approving new development, shall evaluate the degree to which the development could result in loss of lives or property, both within the development and beyond its boundaries, in the event of a natural disaster.

Policy 311: The County shall ensure that new major public facilities, including emergency response facilities (e.g., hospitals and fire stations), and water storage, wastewater treatment and communications facilities, are sited in areas of low geologic risk.

Policy 312: The County shall ensure that major transportation facilities and pipelines are designed, to the extent feasible, to avoid or minimize crossings of active fault traces and to accommodate fault displacement without major damage that could result in long-term disruption of service.

Policy 313: The County shall require development in hilly areas to minimize potential erosion and disruption of natural slope stability which could result from grading, vegetation removal, irrigation, and drainage.

Policy 314: The County shall prohibit the construction of any structure intended for human occupancy within 50 feet on either side of the Calaveras, Greenville, or Verona earthquake fault zones as defined by the Alquist-Priolo Earthquake Fault Zoning Act.

Policy 315: The County shall require that buildings be designed and constructed to withstand groundshaking forces of a minor earthquake without damage, of a moderate earthquake without structural damage, and of a major earthquake without collapse of the structure. The County shall require that critical facilities and structures (e.g., hospitals, emergency operations centers) be designed and constructed to remain standing and functional following an earthquake.

Implementation Programs

Program 111: The County shall delineate areas within East County where the potential for geologic hazards (including seismic hazards, landslides, and liquefaction) warrants preparation of detailed site specific geologic hazard assessments. Areas shall be delineated based upon data from published sources and field investigations. Maps shall be maintained and updated as new

data become available. These maps shall not be used by the County to determine where hazardous conditions exist, but instead to identify the presence of conditions which warrant further study.

Program 112: The County shall develop detailed guidelines for preparation of site-specific geologic hazard assessments. These guidelines shall be prepared in consultation with the County Building Official, the County Engineer, County Geologist, County Counsel, and the County Risk Manager, and shall ensure that site-specific assessments for development requiring discretionary permits are prepared according to consistent criteria.

Alameda County Code of Ordinances

Through its Code of Ordinances, Section 15.08, Building Code, the County sets forth requirements for new construction in areas affect by seismic and geologic hazards. These requirements include the submission of soil and geologic reports before the approval of the foundation will be granted. In addition, Section 15.36, Grading Erosion and Sediment Control, set forth requirements for grading, construction and the control of erosion and sediments in order to safeguard human health and property, protect waterways, and ensure that the graded site is prepared in accordance with the general plan.

Alameda County Stormwater Management Plan

The ACCWP's Stormwater Management Plan for unincorporated Alameda County is discussed in Chapter 3.9, *Hydrology*.

Alameda County Septic and Water System Ordinance

The purpose of the Alameda County Onsite Wastewater Treatment System & Individual/Small Water System Ordinance (including amendments effective January 15, 2009) is to provide for the safe and sanitary treatment and disposal of private sewage. The ordinance requires that all structures within 200 feet of a public sewer line connect to the public sewer system. Buildings not within 200 feet of a public sewer line that opt to build a septic system must comply with this ordinance and its associated regulations. A building permit will not be granted until a construction permit has been approved for the septic system. Requirements of the permit include a site evaluation, soil profile and percolation tests, a plan review, and other requirements as directed by the county building department. The soil profile and percolation tests must be performed by a registered professional. The ordinance also requires that the septic system be properly operated and maintained.

Environmental Setting

Topography

The project area parcels are located in the Altamont Pass, a mountain pass in the Diablo Range of the Coast Ranges. The pass is situated between the eastern edge of Livermore Valley and the western edge of the San Joaquin Valley. Elevations at the project parcels range from approximately 300 to 400 feet on the west parcels, from 160 to 300 feet on the northeast parcels, and from 380 to 400 feet on the southeast parcels. The topography in the project areas varies. According to the soil data for the project area (Natural Resources Conservation Service 2012), slopes in the west parcels are steepest, ranging from 3 to 75%; slopes in the northeast and southwest parcels are less steep, ranging from 3 to 30% and 3 to 45%, respectively.

Regional and Local Geology

The project area is located near the east flank of the Coast Ranges, in the east-central portion of California's Coast Ranges geomorphic province (e.g., Norris and Webb 1990:359–363; California Geological Survey 2002:3).

The Coast Ranges province is characterized by en echelon (i.e., parallel to subparallel) northwest-trending mountain ranges formed by active uplift related to complex tectonics of the San Andreas fault/plate boundary system (Norris and Webb 1990:359–380).

The eastern Coast Ranges are broadly antiformal. At the general latitude of the project area, they consist of a central *core* of Mesozoic units—primarily the Cretaceous Panoche Formation—flanked on the east by an upward younging sequence of marine and terrestrial sedimentary units that include the San Pablo Formation, a Miocene fanglomerate (an alluvial fan deposit that has become consolidated over time), and Quaternary alluvial deposits (Wagner et al. 1991).

The surficial geology of the project vicinity is shown in Figure 3.6-1. The geologic unit exposed at the west parcel is the Panoche Formation. This unit is a marine sandstone and shale of Cretaceous age. The geologic units exposed at the northeast parcel are the San Pablo Group and a fanglomerate. The San Pablo Group is a marine sandstone of Miocene age. The fanglomerate is contemporaneous to the San Pablo Group and consists of alluvial fan deposits that are only slightly worn from water erosion. The geologic units exposed at the southeast parcel are this same fanglomerate and a very small exposure of Quaternary alluvium (Wagner et al. 1991).

Seismicity

Primary Seismic Hazards

The State of California considers two aspects of earthquake events as primary seismic hazards: surface fault rupture (visual disruption of the Earth's surface as a result of fault activity) and seismic ground shaking.

Surface Fault Rupture

The project area is in the vicinity of an active fault zone designated by the California Geological Survey (CGS), and a fault of uncertain age occurs near the southeast and west parcels.

Alameda County is in a seismically active region, and Alquist-Priolo special studies maps have been prepared for much of the county (California Geological Survey 2007). Faults in the project vicinity are shown in Figure 3.6-2. However, the project area is not in an Alquist-Priolo Earthquake Fault Zone, and no active faults have been designated by CGS in the project area. Two of the project parcels (southern and eastern project parcels) are located in the Midway quadrangle, for which an Alquist Priolo special studies map has been prepared (California Division of Mines and Geology 1982). The parcels are approximately 6 miles east of the Greenville fault zone, an active fault that has experienced movement in historic times (i.e., in the last 200 years) (Bryant and Cluett 2002).

It should also be noted that the Midway fault, though not a designated Alquist-Priolo fault, runs directly through the project area—it is adjacent to the southeast parcels and terminates just east of the west parcels. This fault is of concern because its age is unclear: although the USGS Quaternary Fault Database (2010) designates this fault as potentially active (i.e., experienced movement in the

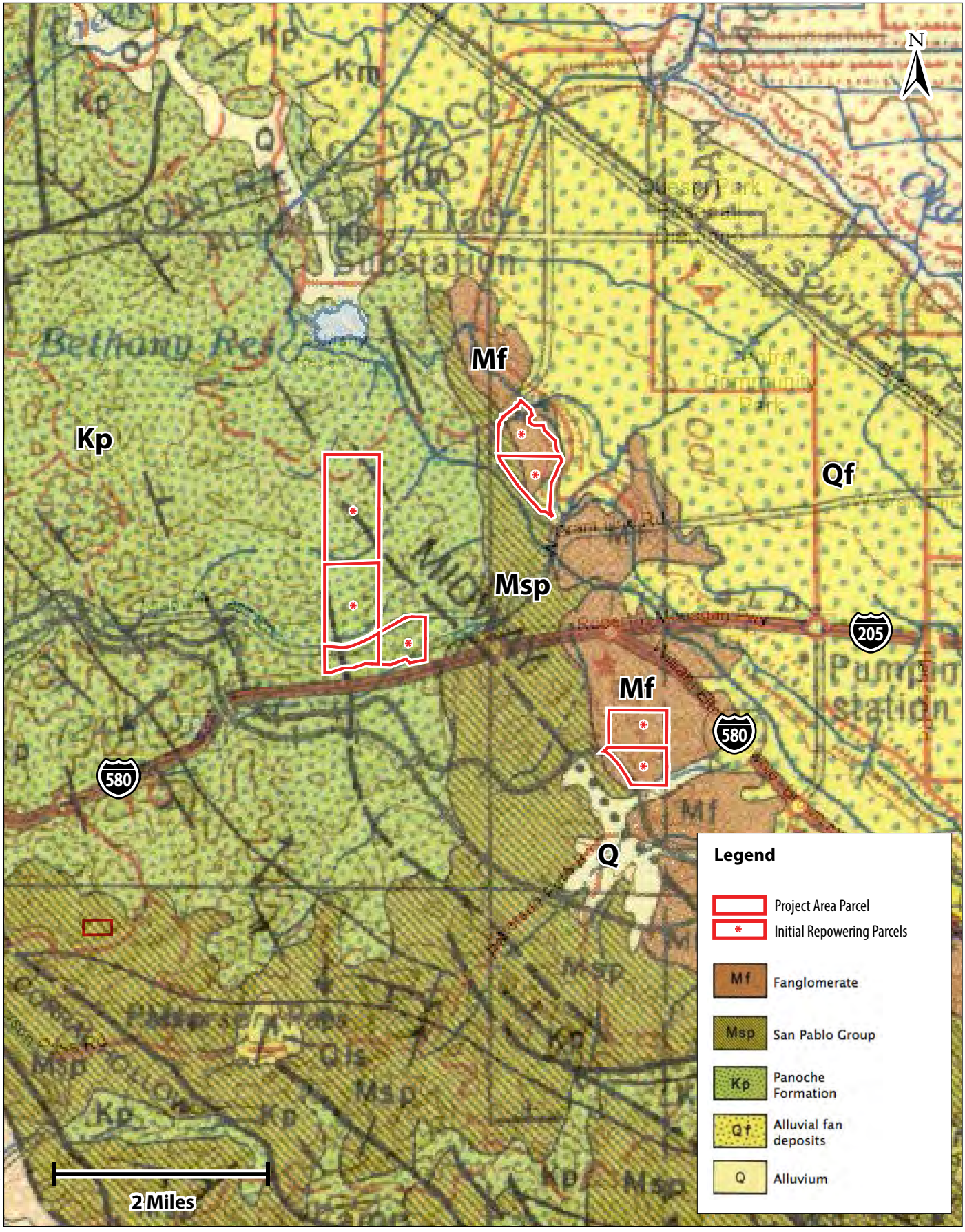

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Figure 3.6-1
Geologic Map of the Project Area

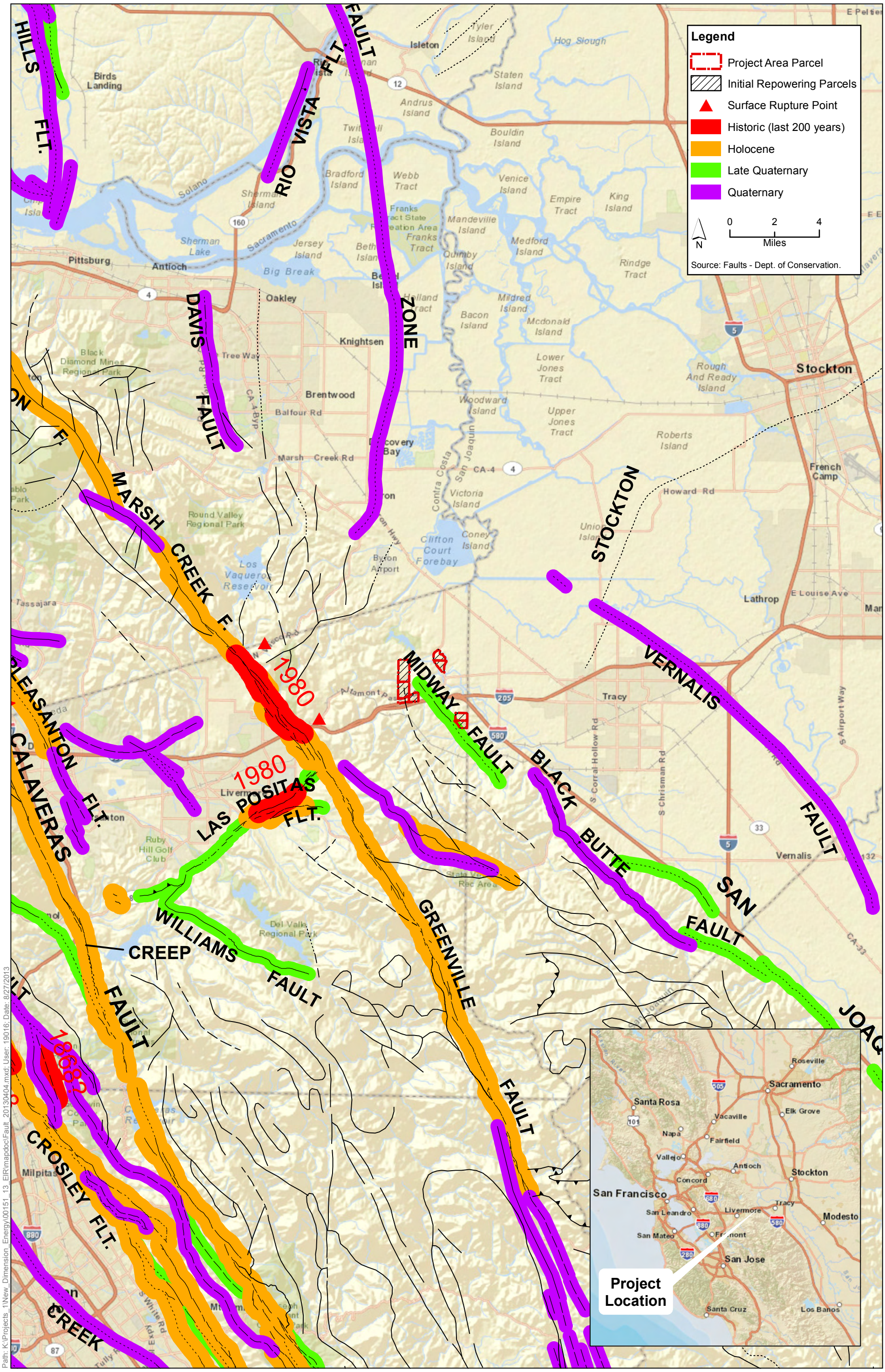

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Figure 3.6-2
Fault Map of the Project Area and Vicinity

last 130,000 years), rather than active (i.e., experienced movement in the last 11,000 years), work conducted by Unruh and Krug (2007) for the USGS concluded "that the Midway fault is an active structure that primarily accommodates strike-slip displacement."

Seismic Ground Shaking

Unlike surface rupture, ground shaking is not confined to the trace of a fault, but rather it propagates into the surrounding areas during an earthquake. The intensity of ground shaking typically diminishes with distance from the fault, but ground shaking may be locally amplified and/or prolonged by some types of substrate materials. These factors are used to map the probabilistic shaking hazards throughout the state.

Based on the probabilistic seismic hazard map, which depicts the peak horizontal ground acceleration values exceeded at a 10% probability in 50 years (California Geological Survey 2003; Cao et al. 2003), the probabilistic peak horizontal ground acceleration values for the project area are 0.4–0.5g (where g equals the acceleration of gravity) (Figure 3.6-3). As a point of comparison, probabilistic peak horizontal ground acceleration values for the San Francisco Bay Area range from 0.4g to more than 0.8g. The acceleration value for the project area indicates a moderate ground-shaking hazard.

The main source of strong ground shaking is the Greenville fault zone, which has experienced movement as recently as 1980 during the Livermore Valley earthquakes. It runs along the eastern edge of the Livermore Valley and is considered to be part of the larger San Andreas fault system (Bryant and Cluett 2002). Other active faults in the project vicinity include the Hayward-Rogers Creek fault, the Los Positas fault (associated with the Greenville fault), and the Calaveras fault (Figure 3.6-2). Other active faults of engineering significance are the Concord, Pleasant Hill, San Andreas, and Seal Cove faults, which are all progressively west of the project area. (See Appendix H, *Desk Top Geologic and Seismic Assessment*).

Secondary Seismic Hazards

Secondary seismic hazards are seismically induced landslide, liquefaction, and related types of ground failure events. As discussed in *Regulatory Setting* in Section 3.6.1, *Existing Conditions*, the State of California maps areas that are subject to secondary seismic hazards pursuant to the Seismic Hazards Mapping Act. These hazards are addressed briefly below based on available information.

Landslide and Other Slope Stability Hazards

Although the project area is not in an earthquake-induced landslide hazard zone (California Geological Survey 2010), several factors make slope instability (both seismically and nonseismically induced) a concern in this area. These factors include the steep topography, the potential for moderate groundshaking, and the proximity to areas designated as landslide hazard zones. Much of the adjacent Altamont quadrangle is designated as an earthquake-induced landslide hazard zone (California Geological Survey 2009). In addition, a damaging landslide occurred just west of the west parcel in early 1998 as a result of heavy rainstorms (U.S. Geological Survey 1999). Also, the preliminary geotechnical report prepared for the project (Appendix H) notes that, though no landslides appear to have occurred on the project parcels, the steeply dipping bedding structure of the geologic units in the west and northeast parcels make landsliding a concern.

Liquefaction and Related Ground Failure

Liquefaction is the process in which soils and sediments lose shear strength and fail during seismic ground shaking. The vibration caused by an earthquake can increase pore pressure in saturated materials. If the pore pressure is raised to be equivalent to the load pressure, this causes a temporary loss of shear strength, allowing the material to flow as a fluid. This temporary condition can result in severe settlement of foundations and slope failure. The susceptibility of an area to liquefaction is determined largely by the depth to groundwater and the properties (e.g., grain size, density, degree of consolidation) of the soil and sediment within and above the groundwater. The sediments most susceptible to liquefaction are saturated, unconsolidated sand and silt within 40 feet of the ground surface (California Geological Survey 2004). According to the CGS report prepared for the adjacent Altamont quadrangle (California Geological Survey 2009), CGS evaluations focus on areas covered by Quaternary (less than about 1.6 million years) sedimentary deposits.

The liquefaction hazard in the project area is likely low because of the age of the rock units (Tertiary and Cretaceous) (Appendix H).

Other types of ground-failure related to liquefaction include lateral spreading and differential settlement. Lateral spreading is a failure of soil/sediment within a nearly horizontal zone that causes the soil to move toward a free face (such as a streambank or canal) or down a gentle slope. Lateral spreading can occur on slopes as gentle as 0.5%. Even a relatively thin seam of liquefiable sediment can create planes of weakness that could cause continuous lateral spreading over large areas (California Geological Survey 2008). The potential for lateral spread in the project area is unknown.

Differential settlement—the uneven settling of soil—is the most common fill displacement hazard (California Geological Survey 2008).

Soils

Several soils occur in the project area. Table 3.6-1 summarizes the characteristics of soil units in the project area by parcel. All soils in the project area are well drained. As seen in Table 3.6-1, one issue of concern is the shrink-swell potential of the soils (i.e., linear extensibility or expansiveness). All soils in the project area have a moderate to high shrink-swell potential at shallow depths.

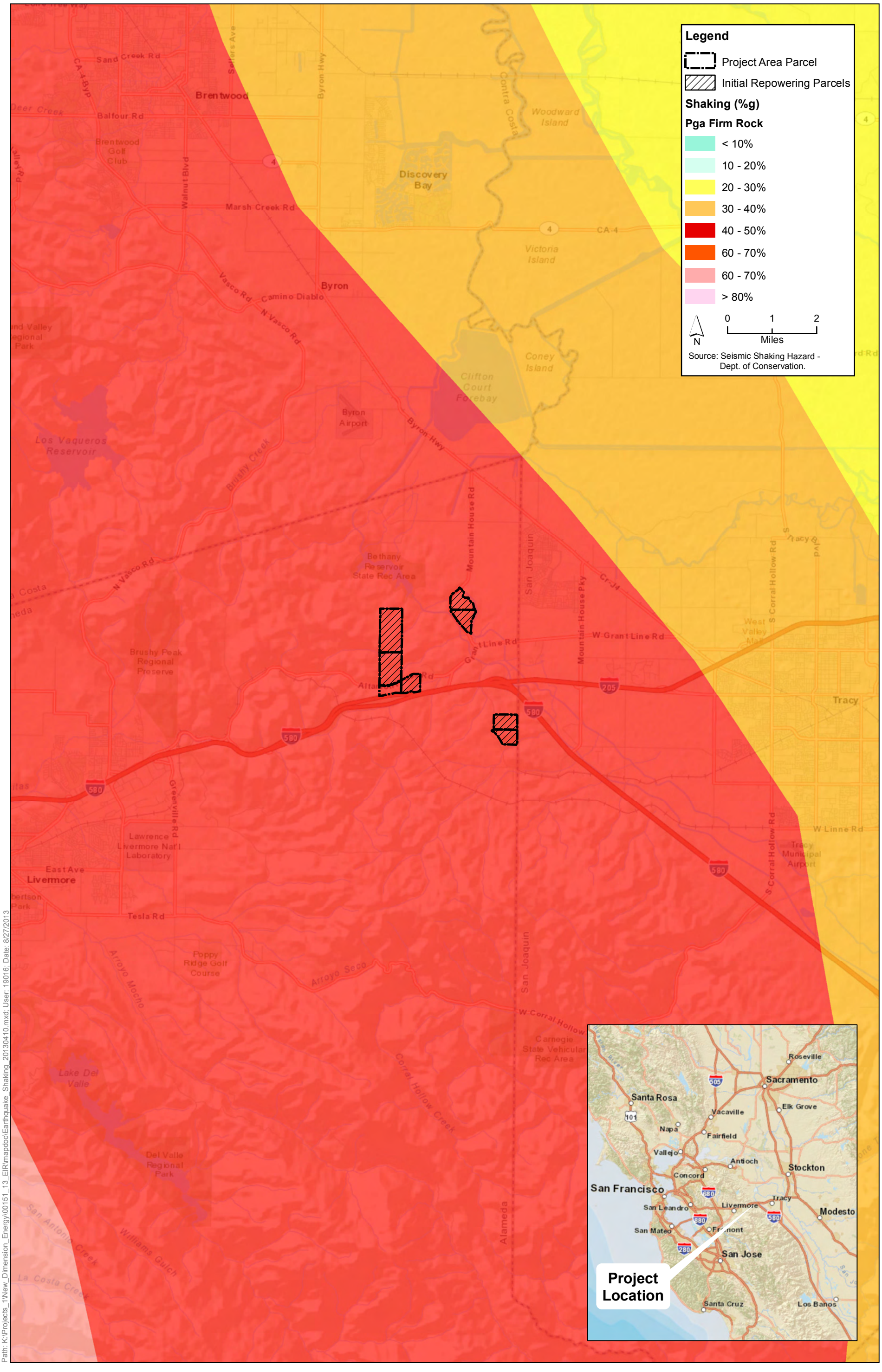

Figure 3.6-3
Earthquake Shaking Potential Map

Table 3.6-1. General Characteristics of Soils in the Project Area

Map Symbol	Soil Name	Landform	Shrink-Swell Potential
West Parcels			
AmF2	Altamont clay, moderately deep, 45 to 75 percent slopes, eroded	Hills	High in the upper 24 inches of soil; low below 24 inches
ArD	Altamont rocky clay, moderately deep, 7 to 30 percent slopes	Hills	High in the upper 28 inches of soil; low below 28 inches
AmE2	Altamont clay, moderately deep, 30 to 45 percent slopes,	Hills	High in the upper 28 inches of soil; low below 28 inches
AaD	Altamont clay, 15 to 30 percent slopes	Hills	High in the upper 50 inches of soil; low below 50 inches
AaC	Altamont clay, 3 to 15 percent slopes	Hills	High in the upper 50 inches of soil; low below 50 inches
Northeast Parcels			
LaD	Linne clay loam, 15 to 30 percent slopes	Hills	Moderate in the upper 36 inches of soil; low below 36 inches
GP	Gravel pit		
LaC	Linne clay loam, 3 to 15 percent slopes	Hills	Moderate in the upper 36 inches of soil; low below 36 inches
RdB	Rincon clay loam, 3 to 7 percent slopes	Fans, valley floors	Moderate in the upper 16 inches of soil, high between 16 to 52 inches, and moderate below 52 inches
Southeast Parcels			
LaC	Linne clay loam, 3 to 15 percent slopes	Hills	Moderate in the upper 36 inches of soil; low below 36 inches
LaE2	Linne clay loam, 30 to 45 percent slopes, eroded	Hills	Moderate in the upper 36 inches of soil; low below 36 inches
LaD	Linne clay loam, 15 to 30 percent slopes	Hills	Moderate in the upper 36 inches of soil; low below 36 inches
RdA	Rincon clay loam, 0 to 3 percent slopes	Fans, valley floors	Moderate in the upper 16 inches of soil, high between 16 to 52 inches, and moderate below 52 inches

Paleontological Resources

Paleontological Sensitivity

Paleontological sensitivity is a qualitative assessment based on the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and other factors relevant to fossil preservation and potential yield. According to the Society of Vertebrate Paleontology (SVP) (2010), standard guidelines for sensitivity are (1) the potential for a geological unit to yield abundant or significant vertebrate fossils or to yield a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (Table 3.6-2).

Table 3.6-2. Paleontological Sensitivity Ratings

Potential	Definition
High	Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources…Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data.
Undetermined	Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources.
Low	Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule.
No	Some rock units, have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require neither protection nor impact mitigation measures relative to paleontological resources.

Source: Society of Vertebrate Paleontology 2010.

Paleontological Sensitivity of Potentially Affected Units

The geologic units exposed in the project area are Panoche Formation (west parcel), San Pablo Group (northeast parcel), a fanglomerate (northeast and southeast parcels), and very small exposure of Quaternary alluvium. The paleontological sensitivity of these units is described below.

Panoche Formation—This marine sandstone and shale of Cretaceous age contains abundant invertebrate fossils, and there is one record of a vertebrate fossil found in the unit (University of California Museum of Paleontology 2013a). This unit is therefore considered sensitive.

San Pablo Group— This marine sandstone of Miocene age is rich in a wide variety of fossils. The University of California Museum of Paleontology (UCMP) (2013b) database contains 1,234 records of vertebrate fossils, as well as plant and invertebrate fossils. Vertebrate fossils found in this unit include rabbit, pronghorn, several species of horse, and probiscid (relative of the elephant). This unit is therefore considered sensitive.

Fanglomerate—This alluvial fan deposit of Miocene age has the potential to contain fossils because it is a sedimentary rock. This unit is therefore considered sensitive.

Quaternary alluvium—The sensitivity of this unit depends on whether it is older than the Holocene (less than 11,000 years old), but this information is not available from the Wagner (1991) map. In addition, it can be difficult to distinguish Pleistocene (i.e., greater than 11,000 years old, deposited during the early Quaternary). As a conservative approach, this unit is therefore considered to be older than the Holocene. Alluvial deposits of Pleistocene age are considered to have high sensitivity for paleontological resources because California's Pleistocene nonmarine strata have yielded a wealth of stratigraphically important vertebrate fossils. This unit is therefore considered sensitive.

3.6.2 Environmental Impacts

The impacts associated with the exposure of the Initial Repower and Full Repower to the existing known geologic and soils hazards on the project parcels are discussed below. Mitigation measures are provided, where appropriate.

Methods for Analysis

Evaluation of the geology and soils impacts in this section is based on information from published maps, reports, and other documents that describe the geologic, seismic, and soil conditions of the project area, and on professional judgment. The analysis assumes that the project proponents will conform to the latest CBSC standards, county general plan seismic safety standards, county grading ordinance, and NPDES requirements.

Evaluation of impacts on paleontological resources in this section is based primarily on information from the paleontological database at the University of California, Berkeley. Effects on paleontological resources were analyzed qualitatively on a large-scale level, based on professional judgment and the SVP guidelines below.

SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* provides standard guidelines that are widely followed (Society of Vertebrate Paleontology 2010). These guidelines reflect the accepted standard of care for paleontological resources. The SVP guidelines identify two key phases in the process for protecting paleontological resources from project impacts.

- Assess the likelihood that the project's area of potential effect contains significant nonrenewable paleontological resources that could be directly or indirectly impacted, damaged, or destroyed as a result of the project.
- Formulate and implement measures to mitigate potential adverse impacts.

An important strength of SVP's approach to assessing potential impacts on paleontological resources is that the SVP guidelines provide some standardization in evaluating a plan area's paleontological sensitivity. Table 3.6-3 defines the SVP's sensitivity categories for paleontological resources and summarizes SVP's recommended treatments to avoid adverse effects in each sensitivity category.

Table 3.6-3. Society of Vertebrate Paleontology's Recommended Treatment for Paleontological Resources

Sensitivity Category	Mitigation Treatment
High or Undetermined	• An intensive field survey and surface salvage prior to earth moving, if applicable. • Monitoring by a qualified paleontological resource monitor of excavations. • Salvage of unearthed fossil remains and/or traces (e.g., tracks, trails, burrows). • Screen washing to recover small specimens, if applicable. • Preliminary survey and surface salvage before construction begins. • Preparation of salvaged fossils to a point of being ready for curation (i.e., removal of enclosing matrix, stabilization and repair of specimens, and construction of reinforced support cradles where appropriate). • Identification, cataloging, curation, and provision for repository storage of prepared fossil specimens. • A final report of the finds and their significance.
Low or No	Rock units with low or no potential typically will not require impact mitigation measures to protect fossils.

Source: Society of Vertebrate Paleontology 2010.

No new field work, research, or engineering level design was conducted for the preparation of this EIR.

Determination of Significance

Based on Appendix G of the State CEQA Guidelines, a proposed project would normally be required to determine if it would result in any of the conditions listed below.

- 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 ground shaking
  - 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 an onsite or offsite 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 in areas where sewers are not available for the disposal of wastewater.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

The Initial Repower would not include installation of septic systems or alternative wastewater disposal. Therefore, this topic is dismissed from further discussion for the Initial Repower. The Full Repower would include installation of a septic; impacts related to this CEQA criterion are addressed under the Full Repower analysis.

Impacts and Mitigation Measures

Initial Repower

Impact GEO-1: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of rupture of a known fault (less than significant with mitigation)

Fault rupture could damage a turbine or cause harm to personnel on the site. If a turbine were constructed on a fault and the fault ruptured, the turbine could be damaged or collapse and possibly injure personnel in the immediate area. Although there are no known active faults in the area, the potentially active Midway fault crosses the west parcel and runs nearby the southeast parcel. Rupture of this fault and the subsequent damage and harm that could result would be a significant impact. The CBC requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design, and the Alameda County Code of Ordinances requires submission of soil and geologic reports before the approval of the foundation would be granted. However, some residual risk may be present. Implementation of Mitigation Measure GEO-1 would reduce this impact to a less-than-significant level by ensuring that turbine foundations were appropriately located and designed. Accordingly, the impact on people or structures from exposure to potential substantial adverse effects as a result of rupture of a known fault would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Prior to any construction activities, the project proponent will retain a geotechnical firm with local expertise in geotechnical investigation and design to prepare a site-specific geotechnical report. This report, which will comply with all state and local code requirements, will be submitted to the County building department as part of the approval process. This report will address the following issues.

- Potential for surface fault rupture at turbine site location: The geotechnical report will investigate the Midway fault and determine whether it poses a risk of surface rupture. Turbine foundations will be sited according to recommendations in this geotechnical report.
- Strong ground shaking: The geotechnical report will analyze the potential for strong ground shaking in the project area, using accepted methodologies, and provide site-specific foundation design recommendations. The structural design requirements will be based on conformance with the most current version of the CBC, including applicable County amendments, to ensure that the project will withstand ground accelerations expected from known active faults.
- Slope failure: The geotechnical report will investigate the potential for slope failure (both seismically and nonseismically induced) and develop site-specific foundation plans engineered for the terrain, rock and soil types, and other conditions present at the project

parcels. Site-specific engineering requirements for mitigation of slope failure will specify proven methods generally accepted by registered engineers, including measures described in CGS Special Publication 117A (2008).

- Expansive soils: The geotechnical report will assess the soil types present at each project parcel and determine the best engineering designs to accommodate the soil conditions at the parcels.

Design requirements: Site-specific design to address the issues of surface fault rupture, strong ground motion, slope failure, and expansive soils will include final design parameters for earthwork, foundations, site preparation, structure, and infrastructure. The project structural engineer will review the site-specific design, provide additional mitigation, if necessary, to meet building code requirements, and incorporate all applicable mitigation from the investigation into the structural design plans to ensure that the final plans meet current building code requirements. Geologic hazards, including the potential for grading to create unstable cut or fill slopes, are addressed through the County's adopted building codes. The County enforces compliance with geotechnical report recommendations via the building permit process. Design and engineering recommendations in the geotechnical report will be implemented by the project proponent during construction. The County's registered geotechnical engineer or third-party registered engineer retained to review the geotechnical report will review the geotechnical investigation, approve the final report, and require compliance with all geotechnical mitigation described in the report in the plans submitted for the grading, foundation, structural, infrastructure and all other relevant construction permits. The County building department personnel will review project plans for grading, foundations, structural, infrastructure and all other relevant construction permits to ensure compliance with the applicable geotechnical investigation and other applicable building code requirements.

Impact GEO-2: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of strong seismic ground shaking (less than significant with mitigation)

The project area is in a seismically active area, with the potential for moderately strong ground shaking from sources such as the Greenville fault and the Calaveras fault. If turbine foundations were not designed to withstand this ground shaking, they could fail and cause damage to or collapse of the turbine towers. The potential damage and harm that could result would be a significant impact. The CBC requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design, and the Alameda County Code of Ordinances requires submission of soil and geologic reports before the approval of the foundation would be granted. However, some residual risk may be present. Implementation of Mitigation Measure GEO-1 would reduce this impact to a less-than-significant level by ensuring that turbine foundations were appropriately designed to withstand strong ground shaking. Accordingly, the impact on people or structures from potential exposure to strong seismic ground shaking would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Impact GEO-1.

Impact GEO-3: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of seismic-related ground failure, including liquefaction and landslides (less than significant with mitigation)

The project parcels are located in a generally hilly area with potential for land sliding. Construction in this area could have the potential to expose persons or structures to landslides, either by destabilizing existing slopes or by creating unstable (poorly designed or constructed) cut or fill slopes. If turbine foundations were not designed appropriately, land sliding could cause damage to or collapse of the turbine towers. The potential damage and harm that could result would be a significant impact. Landsliding is a concern in the project area and site-specific geotechnical design is necessary (Appendix H). The CBC requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design, and the Alameda County Code of Ordinances requires submission of soil and geologic reports before the approval of the foundation would be granted. However, some residual risk may be present. Implementation of Mitigation Measure GEO-1 would reduce this impact to a less-than-significant level by ensuring that turbine foundations were appropriately designed. Accordingly, the impact on people or structures from exposure to seismic-related ground failure would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Impact GEO-1.

Impact GEO-4: Result in substantial soil erosion or the loss of topsoil (less than significant)

Ground-disturbing earthwork associated with construction of the Initial Repower may increase soil erosion rates. These activities, which include excavation, grading, trenching, and compaction, would cause groundbreaking and vegetation removal during turbine foundation construction and power collection system and communication lines installation and, to a lesser extent, during preparation of the laydown/staging areas. As a result, soil would be exposed to rain and wind, potentially causing accelerated erosion, thereby resulting in significant impacts. An approved SWPPP, as required by the Regional Water Quality Control Board (Regional Water Board), is required when a project involves greater than 1 acre of disturbance. A SWPPP specifies BMPs that would prevent construction pollutants from contacting storm water with the intent of keeping all products of erosion from moving off site into receiving waters. Compliance with the federal and local erosion-related regulations applicable to the Initial Repower (i.e., the SWPPP that is developed for the site and the requirements of the County's Stormwater Quality Management Plan) would ensure that the construction activities do not result in significant erosion and that impacts would be reduced to a less-than-significant level. Accordingly, the impact on soil erosion or loss of topsoil in the project area would be less than significant. No mitigation is required.

Impact GEO-5: Be located on expansive soil creating substantial risks to life or property (less than significant with mitigation)

The Initial Repower could potentially be exposed to impacts from unstable soils. As seen in Table 3.6-1, expansive soils underlie most of the project area. If improperly designed or installed, turbine foundations, power collection systems, and communication lines could be subject to damage. This damage would result in a significant impact. Expansive soil is a concern in the project area and site-specific geotechnical design is necessary (Appendix H). Implementation of Mitigation Measure GEO-1

would reduce this impact to a less-than-significant level by ensuring that turbine foundations, power collection systems, and communication lines were appropriately designed. Accordingly, the impact on life or property from locating the proposed project on expansive or unstable soils would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Impact GEO-1.

Impact GEO-6: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (less than significant with mitigation)

If fossils are present in the project area, they could be damaged by earth-disturbing activities (i.e., excavation) during construction activities, such as excavation for foundations, placement of fills, trenching, and grading for road work and staging areas. The more extensive and deeper the earth-disturbing activity, the greater the potential for damage to paleontological resources.

Geologic units with potential to contain paleontological resources include all units in the project area because they are sedimentary rocks. In particular, the San Pablo Group is known to contain vertebrate fossils. Substantial damage to or destruction of significant paleontological resources as defined by the Society of Vertebrate Paleontology (2010) would be a significant impact.

Excavation in the project area could damage paleontological resources. This impact would be significant, but implementation of Mitigation Measures GEO-6a through GEO-6c would reduce this impact to a less-than-significant level. Accordingly, the impact on paleontological resources would be less than significant with mitigation.

Mitigation Measure GEO-6a: Retain a qualified professional paleontologist to monitor significant ground-disturbing activities

The applicant will retain a qualified professional paleontologist as defined by the SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (2010) (Standard Procedures) to monitor activities with the potential to disturb sensitive paleontological resources. Data gathered during detailed design of the Initial Repower will be used to determine the activities that will require the presence of a monitor pursuant to SVP's Standard Procedures. In general, these activities include any ground-disturbing activities involving excavation deeper than 3 feet in areas with high potential to contain sensitive paleontological resources. Recovered fossils will be prepared so that they can be properly documented. Recovered fossils will then be curated at a facility that will properly house and label them, maintain the association between the fossils and field data about the fossils' provenance, and make the information available to the scientific community.

Mitigation Measure GEO-6b: Educate construction personnel in recognizing fossil material

The applicant will ensure that all construction personnel receive training provided by a qualified professional paleontologist experienced in teaching non-specialists to ensure that they can recognize fossil materials in the event any are discovered during construction.

Mitigation Measure GEO-6c: Stop work if substantial fossil remains are encountered during construction

If substantial fossil remains (particularly vertebrate remains) are discovered during earth disturbing activities, activities within a 100-foot radius will stop immediately) until a state-registered professional geologist or qualified professional paleontologist can assess the nature and importance of the find and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection and may also include preparation of a report for publication describing the finds. The applicant will be responsible for ensuring that recommendations regarding treatment and reporting are implemented.

Full Repower

As discussed in Section 2.3, *Project Overview*, the Initial Repower analyzed above would involve the foundation removal and replacement of approximately 4 MW of generating capacity and the Full Repower phase would involve repowering of the remaining existing wind farm facilities with up to 30 MW of generating capacity. The program-level discussion below analyzes the Full Repower. Construction and decommissioning activities associated with repowering of the remaining 320–330 existing 1980s-'90s-era wind turbines are expected to be the same as those for the Initial Repower, although on a much larger scale. Refer to Sections 2.4.1 and 2.4.2 for a detailed description of construction and decommissioning activities. In addition, the proposed Full Repower O&M facility would include installation of a septic system for onsite bathrooms.

Impact GEO-1[F]: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of rupture of a known fault (less than significant with mitigation)

Impacts related to surface fault rupture would be the same as under the Initial Repower but at a substantially greater scale of potential exposure to hazards. As with the Initial Repower, the construction activities associated with repowering of the remaining old technology wind turbines would require extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design (to meet CBC and Alameda County Code of Ordinances requirements) before the approval of the foundation would be granted. Implementation of Mitigation Measure GEO-1, described under Initial Repower Impact GEO-1, would reduce any residual impact to a less-than-significant level by ensuring that turbine foundations were sited and designed appropriately. Accordingly, the impact on people or structures from exposure to potential substantial adverse effects as a result of rupture of a known fault would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Initial Repower Impact GEO-1.

Impact GEO-2[F]: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of strong seismic ground shaking (less than significant with mitigation)

Impacts related to strong seismic ground shaking would be the same as under the Initial Repower but at a substantially greater scale of potential hazards. As with the Initial Repower, the construction activities associated with repowering of the remaining old technology wind turbines would require

extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design (to meet CBC and Alameda County Code of Ordinances requirements) before the approval of the foundation would be granted. Implementation of Mitigation Measure GEO-1, described under Initial Repower Impact GEO-1, would reduce any residual impact to a less-than-significant level by ensuring that turbine foundations were sited appropriately and designed to withstand seismic ground shaking and related effects. Accordingly, the impact on people or structures from potential exposure to strong seismic ground shaking would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Initial Repower Impact GEO-1.

Impact GEO-3[F]: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death as a result of seismic-related ground failure, including liquefaction and landslides (less than significant with mitigation)

Impacts related to strong seismic ground shaking would be the same as under the Initial Repower but at a substantially greater scale of potential hazards. As with the Initial Repower, the construction activities associated with repowering of the remaining old technology wind turbines would require extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design (to meet CBC and Alameda County Code of Ordinances requirements) before the approval of the foundation would be granted. Implementation of Mitigation Measure GEO-1 would reduce any residual impact to a less-than-significant level by ensuring that turbine foundations were appropriately designed. Accordingly, the impact on people or structures from exposure to seismic-related ground failure would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Initial Repower Impact GEO-1.

Impact GEO-4[F]: Result in substantial soil erosion or the loss of topsoil (less than significant)

Impacts related to topsoil erosion would be the same as under the Initial Repower because construction activities associated with repowering of the remaining old technology wind turbines would be the same as for the Initial Repower. Compliance with the federal and local erosion-related regulations applicable to the Full Repower (i.e., the SWPPP that is developed for the site and the requirements of the county's Stormwater Quality Management Plan) would reduce erosion-related impacts to a less-than-significant level. Accordingly, the impact on soil erosion or loss of topsoil in the project area would be less than significant.

Impact GEO-5[F]: Be located on expansive soil creating substantial risks to life or property (less than significant with mitigation)

Impacts related to construction on expansive soil would be the same as under the Initial Repower because construction activities associated with repowering of the remaining old technology wind turbines would be the same as for the Initial Repower. Implementation of Mitigation Measure GEO-1, described under Initial Repower Impact GEO-1, would reduce impacts related to expansive soil to a less-than-significant level. Accordingly, the impact on life or property from locating the proposed project on expansive or unstable soils would be less than significant with mitigation.

Mitigation Measure GEO-1: Prepare a site-specific geotechnical report

Please refer to discussion of Mitigation Measure GEO-1 under Initial Repower Impact GEO-1.

Impact GEO-6[F]: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (less than significant with mitigation)

Because the entire area is underlain by geologic units sensitive for paleontological resources, the impacts related to paleontological resources would be the same as under the Initial Repower. Implementation of Mitigation Measures GEO-6a through GEO-6c, described under Initial Repower Impact GEO-6, would reduce this impact to a less-than-significant level. Accordingly, the impact on paleontological resources would be less than significant with mitigation.

Mitigation Measure GEO-6a: Retain a qualified professional paleontologist to monitor significant ground-disturbing activities

Please refer to discussion of Mitigation Measure GEO-6a under Initial Repower Impact GEO-6.

Mitigation Measure GEO-6b: Educate construction personnel in recognizing fossil material

Please refer to discussion of Mitigation Measure GEO-6b under Initial Repower Impact GEO-6.

Mitigation Measure GEO-6c: Stop work if substantial fossil remains are encountered during construction

Please refer to discussion of Mitigation Measure GEO-6c under Initial Repower Impact GEO-6.

Impact GEO-7[F]: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater (less than significant)

The Full Repower would include installation of a septic system for the onsite bathrooms. Improperly designed or operated septic systems may cause surface water or groundwater contamination or other health hazards. Site factors considered in the design of a septic system include ground slope (not to exceed 25%), absorptive quality of the soil, and soil percolation rate. The topography of much of the project area is steep and many soils of the soils may be too clayey to be suitable for septic systems. These factors and other will be addressed in the design of the septic system by a registered professional. The final design may include grading, importation of appropriate soils, and advanced septic system technologies. No septic system will be approved and built unless it meets the requirements of the county septic and water system ordinance, and no building permit will be issued until the permit for the septic system is approved. Therefore this impact would be less than significant.

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