3.11 GEOLOGY AND SOILS

Introduction

This section describes the geologic and seismic setting of the Project site (the East Campus and West Campus), including regional and local geology, soils and groundwater, and the regulatory framework relevant to the Project. The potential environmental effects of the Project related to geology and soils are described. The impacts examined include risks related to geologic hazards, such as earthquakes, landslides, liquefaction, expansive soils, and impacts on the environment related to soil erosion and sedimentation. This section identifies Project-level and cumulative environmental impacts and explains how compliance with the applicable regulations would reduce or avoid the identified impacts.

A preliminary geotechnical investigation was prepared for the West Campus. The information and conclusions from this document are incorporated into this section. Geotechnical documentation has also been prepared for the East Campus, but is not relevant for the purposes of this section since no ground-disturbing activities would occur. Data from technical studies addressing soil and groundwater contamination at the West Campus were also used to supplement the geotechnical investigation data. Additional information was obtained from environmental documents for projects in the vicinity and from government agency websites.

Issues identified in response to the Notice of Preparation (NOP) (Appendix 1) were considered in preparing this analysis. One comment letter requested that liquefaction hazard be addressed. This issue is addressed in the section.

The change in the Conditional Development Permit (CDP) for the East Campus could result in impacts related to the exposure of additional people to groundshaking as the change from an employee to a trip cap would allow more people on-site. However, this change would not result in any impacts at the East Campus associated with geology or soils. Therefore, Project impacts at the East Campus is not discussed further in this section.

Applicable Plans and Regulations

Federal

Earthquake Hazard Reduction Act of 1977. Federal laws codified in the U.S. Code Title 42, Chapter 86 were enacted to reduce the risks to life and property from earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. Implementation of these requirements are regulated, monitored, and enforced at the state and local level. Key regulations and standards are summarized below.

State

California Building Code. California Code of Regulations (CCR), Title 24, Part 2, the California Building Code (CBC), provides minimum standards for building design in the State. The 2010 CBC, effective January 1, 2011, is the current code and is based on the current (2009) International Building Code (IBC).

Each jurisdiction in California may adopt its own building code based on the 2010 CBC. Local codes are permitted to be more stringent than the 2010 CBC, but, at a minimum, are required to meet all state standards and enforce the regulations of the 2010 CBC beginning January 1, 2011. The City has adopted the 2010 CBC.

Chapter 16 of the CBC deals with structural design requirements governing seismically resistant construction (Section 1604), including, but not limited to, factors and coefficients used to establish seismic site class and seismic occupancy category for the soil/rock at the building location and the proposed building design (Sections 1613.5 through 1613.7). Chapter 18 includes, but is not limited to, the requirements for foundation and soil investigations (Section 1803); excavation, grading, and fill (Section 1804); allowable load-bearing values of soils (Section 1806); and the design of footings, foundations, and slope clearances (Sections 1808 and 1809), retaining walls (Section 1807), and pier, pile, driven, and cast-in-place foundation support systems (Section 1810). Chapter 33 includes, but is not limited to, requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes (Section 3304). Appendix J of the CBC includes, but is not limited to, grading requirements for the design of excavations and fills (Sections J106 and J107) and for erosion control (Sections J109 & J110). Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in Cal-OSHA regulations (CCR, Title 8).

Seismic Hazards Mapping Act. The Seismic Hazards Mapping Act became effective in 1991 to identify and map seismic hazard zones for the purpose of assisting cities and counties in preparing the safety elements of their general plans and to encourage land use management policies and regulations that reduce seismic hazards. The intent of this Act is to protect the public from the effects of strong groundshaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. In addition, the California Geologic Survey's (CGS) Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation of earthquake-related hazards for projects in designated zones of required investigations, and for recommending mitigation measures as required by Public Resources Code Section 2695(a). Liquefaction hazards mapping has been prepared for the west side of San Francisco Bay (Bay), including the Menlo Park area. As noted above, the Project site is within a mapped liquefaction hazard zone requiring special study.

NPDES Construction General Permit. Under the authority of the federal Clean Water Action Section 402 (National Pollutant Discharge Elimination Program [NPDES]), the State Water Resources Control Board (SWRCB) permits all regulated construction activities under Order No. 2009-0009-DWQ (adopted September 2, 2009), which requires that, prior to beginning any construction activities, the permit applicant must obtain coverage under the Construction General Permit by preparing and submitting a Notice of Intent (NOI) to the SWRCB, and preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP), in accordance with the Construction General Permit requirements, for all construction activities disturbing one or more acre of land surface. Construction activities subject to the Construction General Permit include clearing, grading, and disturbances to the ground, such as stockpiling or excavation, that result in soil disturbances of at least one acre of total land area. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges; and (2) to describe and ensure the implementation of best management practices (BMPs) to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges.

Implementation of the permit requirements are necessary (and required) to control erosion during construction activities at the West Campus. Compliance with the State permit is enforced and monitored by the City under Municipal Code Section 7.42 (see below).

Local

City of Menlo Park General Plan. The following policy from the Land Use Element of the General Plan pertains to the Project.

> *Policy I-H-9:* Urban development in areas with geological and earthquake hazards, flood hazards, and fire hazards shall be regulated in an attempt to prevent loss of life, injury, and property damage.

The following policy of the Open Space and Conservation Element of the General Plan pertains to the Project.

> *Policy 9:* Discourage, and in some instances prohibit, urban development in hazardous areas. These hazards include geologic and earthquake hazards, flood hazards, and fire hazards.

The following policies of the Seismic Safety and Safety Element of the General Plan are relevant to the Project.

> *Policy 11:* Require submission of geologic, seismic, and/or soils reports prior to taking action on development proposals for locations identified as potential problem areas in this element.
>
> *Policy 12:* Prohibit structural development in areas where hazards cannot be mitigated by accepted methods to a level of acceptable risk.
>
> *Policy 13:* Require that all new development incorporate adequate hazard mitigation measures to reduce risks from natural hazards.
>
> *Policy 15:* Require that potential geologic, seismic, soils, and/or hydrologic problems confronting public or private development be thoroughly investigated at the earliest stages of the design process, and that these topics be comprehensively evaluated in the Environmental Impact Report (EIR) for each project, by persons of competent geological expertise.

Earthquake Emergency Response. The City is a participant in the Association of Bay Area Governments (ABAG) multi-jurisdictional planning process for natural disaster emergencies. The City has adopted an Emergency Operation Plan that assesses the potential losses associated with earthquakes (among other disasters) and identifies responsibilities for city departments and coordination with San Mateo County and regional emergency response providers.[1] The City has also prepared a Disaster

[1] City of Menlo Park, Emergency Operation Plan, Version 2, January 2011.

Preparedness Manual that is available to the public, which describes actions that residents and businesses can take in the event of an earthquake.

Municipal Code. The following chapters of the Municipal Code pertain to the Project.

Building Code. Chapter 12.06 of the City's Municipal Code implements the 2010 CBC and local amendments thereto.

Grading and Drainage Control Guidelines. The City Engineering Division requires a grading and drainage (G&D) plan whenever more than 500 square feet of the surface of a lot is to be affected by a building project. The basis for the grading and drainage plan requirement is City development policy, Stormwater Ordinance 859 (Chapter 7.42) and the California Regional Water Quality Control Board Municipal Regional Stormwater Permit issued on October 14, 2009 (Order R2-2009-0074, NPDES Permit No. CAS 612008). The focus of these guidelines are to control eroded sediment from construction sites entering waterways.

The City also requires the G&D plan include "Construction Erosion and Sedimentation Control" notes and plans, which must address timing of grading activities during the dry months, if feasible, and minimization of land disturbance, among other items.

Existing Conditions

Regional Setting

Geology and Soils. The Project site is situated along the San Francisco Peninsula, which separates the Bay from the Pacific Ocean. The San Francisco Peninsula is a ridge of rock and sediments in the Santa Cruz Mountains portion of the Coast Ranges geomorphic province, which forms a rugged barrier between the Pacific Coast and inland California. (Geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform.) The Coast Ranges province, which extends approximately 600 miles north from the Santa Ynez River in Santa Barbara County to the Oregon border, owes much of its physiographic character to the San Andreas fault system (in the San Francisco Bay Area (Bay Area), a 44-mile-wide zone of fracturing and folding rock), where two adjoining tectonic plates that form the Earth's surface (the Pacific plate on the west and the North American plate on the east) are moving past each other in opposite directions. One result of this tectonic plate movement is the regional rock deformation and the general northwest trend of valleys and ridges throughout the Coast Ranges. The sedimentary rocks that form most of the plate boundary area were deposited during successive geologic intervals as layers of marine and terrestrial sediments between 70 million (Cretaceous Period) and 200 million years ago (Jurassic Period).

Quaternary alluvial sediment derived from the Santa Cruz Mountains overlies the older Cretaceous and Jurassic sedimentary rocks. The youngest of this alluvial material consists of Holocene-age (11,000 years or younger) unconsolidated clay interbedded with sand and fine gravel. This unit is generally less than 15 feet thick and forms in poorly drained interfluvial basins, usually at margins of tidal marshlands, where it interfingers with Bay Mud. Overlying this material is artificial fill, which consists of a combination of gravel, sand, and silt, and rock fragments.[2]

Faults. Faults are geologic zones of weakness. Earthquakes are caused by the violent and abrupt release of strain built up along faults. Surface rupture occurs when movement on a fault deep in the earth breaks through to the ground surface. Fault rupture almost always follows preexisting faults. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking.

Figure 3.11-1 shows the locations of regional faults. The closest active and potentially active faults are the Monte Vista-Shannon fault (5.8 miles southwest), the San Andreas fault (7.3 miles southwest), and the Hayward fault (11.6 miles northeast). Other nearby active Bay Area faults include the San Gregorio fault, about 15 miles southwest, and the Calaveras fault, about 16 miles northeast of the Project site.[3] Potentially active, concealed faults of the Quaternary Palo Alto and Stanford faults are a few miles southwest of the Project site. The trace of the San Jose fault is northeast of the site, in the vicinity of East Palo Alto.[4] These Quaternary faults do not show evidence for recent surface displacements (i.e., during the last 10,000 years) that would cause the state of California to categorize them as active.

Earthquake Magnitude. Earthquakes are classified based on the amount of energy released, using logarithmic scales known as the Richter scale and the Moment Magnitude scale (MW). Each whole number of Richter magnitude represents a tenfold increase in the wave amplitude (earthquake size) generated by an earthquake, as well as a 3.16-fold increase in energy released. Thus, a magnitude 6.3 earthquake is ten times larger than a magnitude 5.3 earthquake and releases 31.6 times more energy. In contrast, a magnitude 7.3 event is 100 times larger than magnitude 5.3, and releases 1,000 times more energy. One limitation of the Richter magnitude scale is that it has an upper limit at which large earthquakes appear to have about the same magnitude. As a result, the MW scale, which does not have an upper limit magnitude, was introduced in 1979, and is used to characterize earthquakes greater than magnitude 3.5. Earthquakes of MW 6.0 to 6.9 are classified as "moderate," MW 7.0 to 7.9 as "major," and MW 8.0 and larger as "great."

Earthquake Intensity. The Modified Mercalli Intensity Scale is a scale used for measuring the intensity of an earthquake. The scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII one that causes almost complete destruction. Table 3.11-1 (Modified Mercalli Intensity Scale) provides abbreviated definitions of the scale ratings. Although this scale is useful in describing earthquake effects for the general public, it is not employed by engineers when designing seismic-resistant structures. The safety standards to which structures must be designed are set forth in the CBC and take into account numerous factors and criteria.

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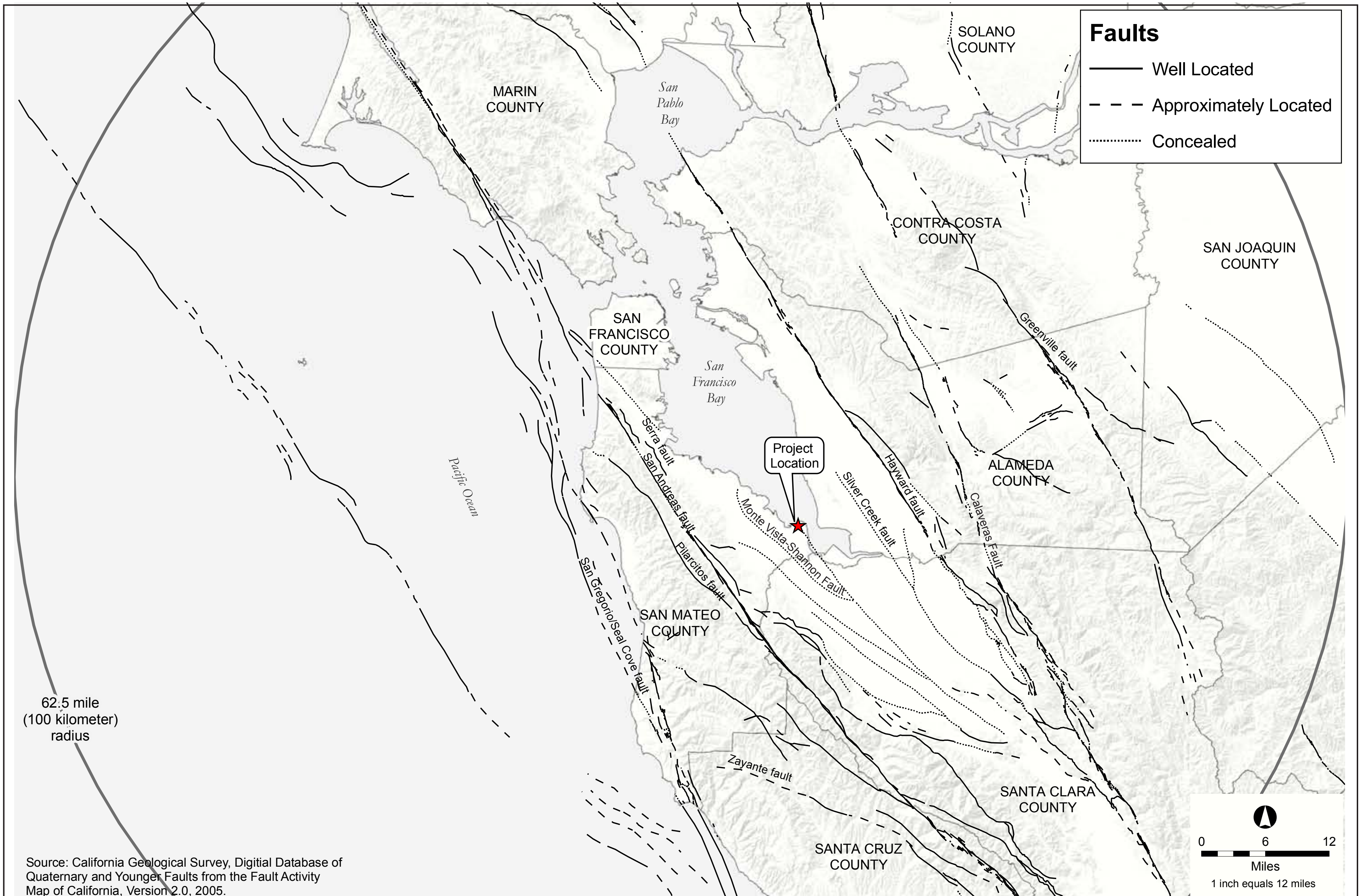
2 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

3 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

4 California Geological Survey, 2010 Fault Activity Map of California.



Source: California Geological Survey, Digitial Database of Quaternary and Younger Faults from the Fault Activity Map of California, Version 2.0, 2005.

Source: California Geological Survey, 2008.

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FIGURE 3.11-1
Regional Faults

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Menlo Park Facebook Campus Project

Table 3.11-1
Modified Mercalli Intensity Scale

Scale Rating	Description
I	Not felt.
II	Felt by persons at rest, on upper floors, or favorably placed.
III	Felt indoors; hanging objects swing; vibration like passing of light trucks; duration estimated; may not be recognized as an earthquake.
IV	Hanging objects swing; vibration like passing of heavy truck or sensation of a jolt like a heavy ball striking the walls; standing automobiles rock; windows, dishes, doors rattle; wooden walls and frame may creak.
V	Felt outdoors; direction estimated; sleepers wakened; liquids disturbed, some spilled; small unstable objects displaced or upset; doors swing; shutters, pictures move; pendulum clocks stop, start, change rate.
VI	Felt by all; many frightened and run outdoors; persons walk unsteadily; windows, dishes, glassware broken; knickknacks, books, etc., off shelves; pictures off walls; furniture moved or overturned; weak plaster and masonry D cracked.
VII	Difficult to stand; noticed by drivers of automobiles; hanging objects quiver; furniture broken; weak chimneys broken at roof line; damage to masonry D, including cracks, fall of plaster, loose bricks, stones, tiles, and embraced parapets; small slides and caving in along sand or gravel banks; large bells ring.
VIII	Steering of automobiles affected; damage to masonry C, partial collapse; some damage to masonry B; none to masonry A; fall of stucco and some masonry walls; twisting, fall or chimneys, factory stacks, monuments, towers, elevated tanks; frame houses moved on foundations if not bolted down; loose panel walls thrown out; decayed piling broken off. Branches broken from trees; changes in flow or temperature of sprigs and wells; cracks in wet ground and on steep slopes.
IX	General panic; masonry D destroys; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged; general damage to foundations; frame structures, if not bolted, shifted off foundations; frames racked; serious damage to reservoirs; underground pipes broken; conspicuous cracks in ground and liquefaction.
X	Most masonry and frame structures destroyed with their foundations; some well built wooden structures and bridges destroyed; serious damage to dams, dikes, embankments; large landslides; water thrown out of banks of canals, rivers, lakes, etc.; sand and mud shifted horizontally on beaches and flat land; rails bent slightly.
XI	Rails bent greatly; underground pipelines completely out of service.
XII	Damage nearly total; large rock masses displaced; lines of sight and level distorted; objects thrown in the air.

Source: Pre-Earthquake Planning for Post- Earthquake Rebuilding," Spangle, William E., 1987.

Notes:

Masonry A = Good workmanship and mortar, reinforced designed to resist lateral force.

Masonry B = Good workmanship and mortar, reinforced.

Masonry C = Good workmanship and mortar, unreinforced.

Masonry D = Poor workmanship and mortar and weak materials, like adobe.

Seismicity. The Bay Area is in one of the most seismically active regions. The U.S. Geological Survey's 2007 Working Group on California Earthquake Probabilities estimated that there is a 63 percent probability that one or more MW 6.7 or greater earthquakes will occur in the Bay Area in the next 30 years. The probability of a MW 6.7 or greater earthquake occurring along individual faults was estimated to be 31 percent on the Hayward fault and 21 percent along the San Andreas fault.[5]

Groundshaking. The intensity of the seismic shaking (groundshaking), or strong ground motion, during an earthquake depends on the distance and direction between a particular area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding that area. Earthquakes occurring on faults closest to the Project site probably would generate the largest ground motions.

An earthquake along the entire San Andreas fault is considered capable of generating a MW 7.9 earthquake (similar to the 1906 San Francisco earthquake). An earthquake of this magnitude would generate very strong to violent seismic shaking (Modified Mercalli Intensity VIII and IX) at the site.[6] Groundshaking of this intensity could result in damage to buildings, and can trigger ground failures such as liquefaction, potentially resulting in foundation damage, disruption of utility service and roadway damage.

Hydrogeology. The Project site is near the boundary between major units of two alluvial deposits, as defined by the California Department of Water Resources: San Francisquito Cone and Niles Cone. The San Francisquito deposits are derived from the Santa Cruz Mountains to the southwest, and the Niles Cone deposits are derived from the Diablo Range along the northeastern boundary of the Bay.

The unconsolidated materials in both units consist of four hydrogeologic zones: shallow aquifer, aquitard, deep aquifer, and sediments below the deep aquifer. The shallow aquifer zone ranges in depth from 5 to approximately 100 feet below ground surface (bgs). The zone consists of silt and clay with low permeability interbedded with high-permeability coarse-grained channel deposits.[7]

Local Setting

Site Topography. The Project site ranges from 5 to 9 feet above mean sea level (msl), is relatively level, and slopes gently to the north. There are no immediately adjacent hillsides. The current topography of the East Campus and West Campus reflects filling of the tidal marshland associated with the Bay, as described below.

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[5] U.S. Geological Survey 2007 Working Group on Earthquake Probabilities, *The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2*), U.S. USGS Open File Report 2007-1437, 2008, website: http://earthquake.usgs.gov/regional/nca/ucerf/.

[6] Association of Bay Area Governments (ABAG), Earthquake Hazard Map for Menlo Park/Atherton/East Palo Alto, Scenario: Entire San Andreas Fault System, 2003, website: http://www.abag.ca.gov.

[7] GRA Associates, *RFI Report – Soil Investigation (Final) Raychem/Tyco Facility –Expanded Area 6 (Eastern Portion of Site) 300 Constitution Drive Menlo Park California*. March 2002. Section 1.7 (Regional Geology and Hydrogeology).

East Campus. Levees were constructed around the East Campus, beginning in the 1940s when the first salt evaporation pond was constructed. The levees were raised in 1965 to an elevation of approximately five feet msl. In 1968, the sloughs and ditches in the East Campus were filled with recompacted Bay Mud and varying amounts of compacted fill, estimated to be approximately 4 to 8 feet thick. Following a combination of heavy rains, winds, and high tides that caused flooding when water from the Bay breached the levees in 1983, the perimeter levees were raised to an elevation of 10 feet msl, but subsequent settlement lowered the levee elevations to approximately 8.5 feet. The first building pads were constructed on the East Campus in 1975, but the site was not fully developed until the early 1990s.[8]

West Campus. The West Campus was undeveloped marshland and was filled prior to development of the Raychem facilities. The fill source for the West Campus was reported to be from a road cut for Interstate 280 (I-280) construction, just north of Woodside Road (south of Farm Hill Boulevard exit).[9]

Geology. The Project site is near the historic shoreline of the Bay. Similar to other Bay margin sites between San Mateo and San Jose, the Project site is covered with a layer of artificial fill. At the East Campus, the fill is approximately 8.5 to 13 feet thick, and at the West Campus it ranges from 0 to 6 feet thick. Below the fill are younger sediments, possibly Bay Mud, to a depth of approximately 11 feet at the West Campus and 20 feet at the East Campus. The Bay Mud is underlain by interbedded silty clay and silt/sand channel deposits.[10]

Fault Rupture. There are several faults within approximately 15 miles of the site, as noted above. No known surface expression of fault traces are believed to cross the site, and the site is not in an Alquist-Priolo Earthquake Fault Zone[11] nor adjacent to any known active fault. Therefore, fault rupture hazard is not a significant geologic hazard at the Project site.[12]

Groundshaking. The Project site would be expected to be subject to strong groundshaking.[13] Existing buildings at the East Campus were designed and constructed in accordance with then-current building codes for seismic hazards, such as groundshaking. This is an existing condition that would remain

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8 Cornerstone Earth Group, *Phase I Environmental Site Assessment, 10 Network Circle, Menlo Park, California*, November 3, 2010.

9 Cornerstone Earth Group, *Phase I Environmental Site Assessment, 312-314 Constitution Drive, Menlo Park, California*, November 19, 2010.

10 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*. November 18, 2010.; Cornerstone Earth Group, *Geotechnical Investigation, Facebook Courtyard Improvements, Willow Road/Bayfront Expressway, Menlo Park, California,* July 14, 2011.

11 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. Buildings for human occupancy are not permitted to be constructed across the surface trace of active faults.

12 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

13 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

unchanged as a result of the Project. The existing buildings at the West Campus are vacant, would be demolished, and would not be re-used. New construction would be required to comply with current seismic safety standards (see Applicable Laws and Regulations, above).

Liquefaction. Liquefaction is a phenomenon in which uniformly sized, loosely deposited, saturated, granular soils (usually fine sand) with low clay content lose strength during strong earthquake-induced groundshaking, which causes the soil to behave as a fluid for a short time. Liquefaction generally occurs at depths shallower than 50 feet below the ground surface (bgs). Soils may lose their ability to support structures, and this loss of bearing strength may cause structures founded on the liquefied materials to tilt or possibly topple over. Light structures such as pipelines, sewers, and empty fuel tanks that are buried in the ground can float to the surface when they are surrounded by liquefied soil. The susceptibility of a site to liquefaction is a function of the uniformity, depth, density, and water content of the granular sediments beneath the site and the magnitude of earthquakes likely to affect the site.

The potential for liquefaction at the Project site is high, based on the soils and depth to groundwater. In addition, the Project site is mapped by the State within a seismic hazard zone for liquefaction.[14]

Lateral Spreading. Lateral spreading (or lurching) occurs as a form of horizontal displacement of relatively flat-lying material toward an open face, such as an excavation, channel, or body of water. Generally, in soils, this movement is due to failure along a weak plane and may often be associated with liquefaction. Although liquefaction potential at the Project site is high, there are no significant steep open faces within 200 feet of the site where lateral spreading could occur. Therefore, the potential for lateral spreading to affect the site appears to be low.[15]

Ground Rupture. Ground rupture can occur when the pore water pressure within liquefiable soil layers are great enough to break through the overlying non-liquefiable layer. Because the potential for liquefaction at the Project site is high, there is a potential for ground rupture.[16]

Differential Compaction. If near-surface materials vary in composition either vertically or laterally, strong groundshaking can cause non-uniform compaction, resulting in movement of the materials and overlying structures. This can also occur gradually over time. Surficial materials underlying the Project site generally consist of undocumented fill materials and younger sediments. Therefore, the potential for differential compaction is high.[17]

Soils. Soils at the Project site from the ground surface to a depth of 90 feet generally consist of artificial fill, organic silty clay, interbedded clay, and coarse-grained channel deposits that are

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14 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

15 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

16 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

17 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

discontinuous across the site. At the East Campus, the artificial fill ranges in thickness from 2 to 9 feet. Approximately 3 to 11 feet of native, soft compressible clay (Bay Mud) underlies the fill.[18] At the West Campus, the fill (sandy clay and serpentine-rich clayey gravel) ranges in thickness from 0 feet in the southwestern corner to approximately 6 feet near the northeastern corner. Most of the sediment below the fill is a silty clay of high plasticity, ranging in thickness from 1.5 to 11 feet.[19]

Soils at the Project site have been mapped by the Natural Resources Conservation Service (NRCS) as primarily Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes, with lesser amounts of Novato clay, 0 to 1 percent slopes. These units are both generally associated with tidal flats and marshes. The Urban land category is a description for man-made soils and land, usually already developed and covered by paving and structures, consisting of heterogeneous fills of unknown origin. Neither of these soil types are sources of topsoil.[20]

Expansive Soils. Expansive soils can undergo significant volume change with changes in moisture content. They shrink and harden when dried, and expand and soften when wetted. Soil "plasticity" is an indicator of the shrink-swell potential of soil. The composition of the artificial fill is unknown, but the underlying alluvial sediments are assumed to have moderate to high plasticity because of their clay composition. Therefore, the expansive soil potential at the Project site is considered moderate to high.[21]

Compressible Surface Soils and Fills. Compressible soils can settle or subside as a result of groundshaking or as a result of the loads placed on top of them. Most of the previous improvements at the West Campus have been demolished and removed. It is unknown how excavations created during demolition were backfilled, and if fill materials were compacted. Near-surface, compressible saturated clays are present in some areas of the West Campus and East Campus. Therefore, there is the potential for compressible soils to be present.[22]

Groundwater. The State has mapped historic high groundwater at depths less than 10 feet. Previous investigations indicate first groundwater encountered at 8 feet.[23] Seasonal fluctuations occur in the shallow zone.[24]

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18 Cornerstone Earth Group, *Phase I Environmental Site Assessment, 10 Network Circle, Menlo Park, California*, November 3, 2010.

19 GRA Associates, *RFI Report – Soil Investigation (Final) Raychem/Tyco Facility –Expanded Area 6 (Eastern Portion of Site) 300 Constitution Drive Menlo Park California*, March 2002, Section 1.8 (Site Geology and Hydrogeology).

20 Natural Resources Conservation Service. San Mateo County, Eastern Part, and San Francisco County, California Survey Area Data: Version 7, Jul 27, 2010. Web Soil Survey website: http://websoilsurvey.nrcs.usda.gov.

21 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

22 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

23 Cornerstone Earth Group, *Geotechnical Feasibility Evaluation 22-Acre Property at Highway 84 and Willow Road Menlo Park, California*, November 18, 2010.

24 GRA Associates, *RFI Report – Soil Investigation (Final) Raychem/Tyco Facility –Expanded Area 6 (Eastern Portion of Site) 300 Constitution Drive Menlo Park California*, March 2002, Section 1.8 (Site Geology and Hydrogeology).

Impacts and Mitigation Measures

Standards of Significance

The Project would result in a significant impact if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  a. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State of Geologist for the area or based on other substantial evidence of a known fault
  b. Strong seismic groundshaking
  c. Seismic-related ground failure, including liquefaction
  d. Landslides
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.
- Be located on expansive soil, as defined in Section 1802.3.2 of the 2010 CBC, creating substantial risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

For the purpose of this Draft EIR, significant geologic hazards would pertain to soil and/or seismic conditions so unfavorable that they could not be overcome by reasonable design, construction, and maintenance practices.

Methodology

A preliminary geotechnical assessment of the West Campus has been completed, and was used for the analysis of West Campus impacts. The preliminary geotechnical assessment provides a summary and compilation of available geotechnical information that was used as part of the analysis of geologic, seismic, and geotechnical issues for this Draft EIR. This preliminary geotechnical assessment describes and evaluates geologic and geotechnical conditions at the Project site to support preliminary planning and conceptual-level design during initial phases of Project planning. Design-level geotechnical studies would be completed during development of construction plans, in accordance with the 2010 CBC and City building permit requirements.

As explained in the Project Description, no new structures would be built at the East Campus, so the geologic and soils hazards that could affect the East Campus (e.g., strong seismic groundshaking and liquefaction) exist regardless of whether the Project is implemented. Therefore, this analysis assumes there would be no substantial physical change from existing conditions.

Impacts Not Evaluated In Detail

The following impacts are not evaluated in detail because there would be no impact as a result of implementing the Project.

As shown in Figure 3.11-1, there are no faults that cross the East Campus or West Campus, nor are these sites within an Alquist-Priolo Earthquake Fault Zone. There would be no impact related to fault rupture, and this impact is not further evaluated.

The East Campus and West Campus are primarily flat and are not adjacent to any hillsides where seismically induced landslides or other downslope movement of rock or soil material that could pose a hazard to the Project site, nor would the Project cause or exacerbate landslide hazard. Exposure of people to landslide hazards is not considered an impact associated with the Project; therefore, this impact is not evaluated.

The West Campus consists of developed land underlain by artificial fill, and there is no topsoil. Because the Project would not result in the loss of topsoil, this impact is not evaluated.

The Project would not include any septic tanks or leach field systems. Wastewater generated at the Project site would be disposed through the existing sanitary sewer system. Consequently, the existence of soils incapable of supporting septic systems is not considered an impact associated with the Project; therefore, this impact is not evaluated.

Environmental Analysis

GS-1 ***Strong Seismic Groundshaking and Seismic-Related Ground Failure.*** *The Project, at both the East Campus and West Campus, would have a less-than-significant potential to expose persons and structures to strong seismic groundshaking and seismic-related ground failure. (LTS)*

<u>East Campus</u>

No new structures are proposed on the East Campus, but the Project would increase the number of people who could be exposed to strong groundshaking and related hazards. The following describes why this would not result in a significant impact.

The existing buildings at the East Campus were developed originally for Sun Microsystems in 1991 as office buildings with hardware-intensive laboratories, with the exception of Building 11, which featured a cafeteria and meeting rooms; Building 18, which also featured a cafeteria; and Building 19, which was used as a sports facility. The buildings at the East Campus were designed for a higher level of earthquake safety than required by the 1991 CBC. Sun Microsystems voluntarily used the higher earthquake engineering design factors with the goal of having only cosmetic damage in a minor earthquake, and of having a maximum shut-down of two days following a major earthquake. This resulted in the buildings' earthquake-resistant frames to withstand earthquake loads eight times greater than would have been required by the 1991 CBC.[25]

The existing buildings were also constructed to conform to the 1991 CBC occupant load factor. As explained in more detail below, the occupant load factor has not changed and, therefore, does not require the buildings to meet the 2010 CBC structural requirements for a new building.

The designed occupant load for a building is the number of people that are intended to occupy a building at any one time. The CBC provides an Occupant Load Factor that establishes the maximum floor area allowed per occupant based on the building's use. These Occupant Load Factors are derived from studies and counts of the number of occupants in typical buildings. The designed occupant load is used to establish the design for the emergency exiting system.

Different building uses have different Occupant Load Factors. As an example, a business or office use has an Occupant Load Factor of one person per 100 square feet of floor area, whereas a warehouse has an Occupant Load Factor of 500 square feet per person. The Occupant Load Factor is divided into the floor area being occupied to arrive at the maximum number of occupants. If a 10,000 square foot building is being used as an office, the maximum number of occupants would be 100 people. However, if the same building is being used as a warehouse, the maximum number of occupants would be 20 people.

Table 3.11-2, below, shows the Occupant Load Factors from the 1991 CBC for the types of uses the buildings were initially designed for and compares these with the current 2010 CBC.

Table 3.11-2
Occupant Load Factors for the East Campus

Building Use	**1991 Occupant Load Factor**	**2010 Occupant Load Factor**
Assembly Area Less Concentrated Use – Dining Room	15 Sq Ft/person	15 Sq Ft/person
Assembly Area Less Concentrated Use – Conference Room	15 Sq Ft/person	15 Sq Ft/person
Office	100 Sq Ft/person	100 Sq Ft/person

Source: California Building Code 1991, 2010.

The employee cap of 3,600 people for the Sun Microsystems campus was established during the entitlement process in the early 1990s and was not based on the maximum number of occupants allowed by the CBC. Assuming a conservative scenario of all-office space at the East

25 RMJ Structural Engineers, Facebook Campus, Menlo Park, Floor and Lateral System Capacity. Letter from Peter Robinson, President, to Lisa Bieringer, Gensler. August 25, 2011. [RMJ developed the original structural design of the buildings on the East Campus.]

Campus, the buildings would have an occupant load of approximately 10,360 people.[26] The Occupant Load Factors have not changed since the campus was originally developed and had there not been a limitation placed on the number of occupants during the entitlement process, the buildings could have accommodated a significantly higher occupant load.

Section 3408 of the 2010 CBC states, "No change shall be made in the use or occupancy of any building that would place the building in a different division of the same group of occupancies or in a different group of occupancies, unless such building is made to comply with the requirements of this code for such division or group of occupancies." Additionally, Section 3408.4 states, "When a change of occupancy results in a structure being reclassified to a higher occupancy category, the structure shall conform to the seismic requirements for a new structure of the higher occupancy category."

A higher occupancy group is an occupancy group that would require a higher level of life safety measures as established by the CBC. Since the occupancy for the buildings is not changing and the original occupant load of the campus was restricted by the entitlements for the campus, the 2010 CBC does not require the buildings to meet the 2010 CBC structural requirements for a new building. In addition, even if the Occupant Load Factor would apply to the Project, the proposed number of employees (approximately 6,600 people) is significantly lower than the permitted conservative occupant load of approximately 10,360 occupants. Therefore, the East Campus would have a ***less-than-significant*** impact to expose persons and structures to strong seismic groundshaking and seismic-related ground failure.

West Campus

Development of the West Campus would involve the construction and occupancy of new buildings in a location where strong seismic groundshaking can be expected to occur over the life of the Project. In addition, based on previous investigations at the site, mapped soil conditions, and the existence of high groundwater, the potential for liquefiable sediments is high. CGS Seismic Hazard Zone mapping also identifies the Project location in an area where special study to address liquefaction hazard is required.

Liquefaction-related phenomena can include lateral spreading, loss of bearing strength, vertical settlement from densification (subsidence), buoyancy effects, and flow failures, all of which could cause damage to the proposed structures in the West Campus. Damage from liquefaction and lateral spreading is generally most severe when liquefaction occurs within 15 to 20 feet below the ground surface. Foundations for structures and pipelines would be the components most vulnerable to damage from liquefaction-related phenomena. Seismically induced settlement can occur in areas underlain by compressible or poorly consolidated sediments.

[26] Square footage of all buildings at the East Campus is 1,035,840 sf. Occupant Load Factor for office is 100 sf. 1,035,840 sf/100 sf = ~10,360 occupants. This scenario is a conservative estimate considering that some of the space at the East Campus is devoted to assembly areas, such as dining rooms, conference rooms, and fitness areas. Since more people can occupy these uses, the actual occupant load would be greater than 10,360 occupants. However, for the purposes of this analysis, this estimate represents the conservative scenario.

Some artificial fills are susceptible to mobilization and densification, resulting in earthquake-induced subsidence.

Although there are seismic hazards, the Geotechnical Feasibility Evaluation for the West Campus concluded that development of the Project is feasible provided the potential hazards are mitigated through design and construction.

All structures, roads, and utility lines must meet or exceed design criteria of the 2010 CBC for Seismic Zone E. Design and construction of the structures and facilities at the West Campus would incorporate appropriate engineering practices to ensure seismic stability, as required by Chapter 16, Structural Design, and Chapter 18, Soils and Foundations, of the CBC. Sections 1607 through 1614 contain the formulae, tables, and graphs by which the Project Sponsor's engineer would develop the structural specifications for building design and which would be reviewed by the City when it issues building permits, to verify the applicability of the specifications. Sections 1804 through 1812 of the CBC contain similar information for the design and verification of adequate soils and foundation support for individual elements of the Project. Section 1802 of the CBC requires the use of this information in the seismic analyses prepared for the site-specific investigations that must be prepared in connection with the permits for individual elements of the Project.

In addition, because the Project site is in a liquefaction Seismic Hazard Zone, the Project Sponsor would be required to comply with the guidelines set by CGS Special Publication 117, which outline the protocol for analysis and treatment of liquefaction-related hazards, including estimates of vertical settlement and lateral spreading. Prediction of liquefaction-related settlement is necessarily approximate, and related hazard assessment and development of recommendations for treatment of such hazards must be performed conservatively, as recommended by CGS Special Publication 117A. A similarly conservative approach is recommended by CGS Special Publication 117A when estimating the amount of localized differential settlement likely to occur as part of the overall predicted settlement: localized differential settlements up to two-thirds of the total settlements anticipated must be assumed until more precise predictions of differential settlements can be made.

The 2010 CBC requires that geotechnical investigations provide design criteria that would minimize impacts associated with strong groundshaking during an earthquake. The 2010 CBC also requires that all foundations and other improvements (i.e., roads, driveways, utilities) be designed by a licensed professional engineer based on site-specific soil investigations performed by a California Certified Engineering Geologist or Geotechnical Engineer to ensure the suitability (especially considering the existence of potentially liquefiable soils at the site) of the subsurface materials for adequately supporting the proposed structures. This would include designing foundations so they are able to tolerate or resist the anticipated total and differential settlement that can be caused by liquefaction. The City and the Project Sponsor would be responsible for ensuring that all recommendations from the investigations are incorporated in the Project, pursuant to State law.

As evidenced by the level of development throughout the Bay Area, successful building construction is possible in a seismically active zone and can be readily accomplished even where seismic hazards are known to exist. The risks to public safety from seismic hazards can be mitigated to the extent required by law with implementation of the proper design and construction methods, which would be within the responsibility of the City and the Project Sponsor to monitor and enforce through its building permit process. In addition, the City, along with other Bay Area jurisdictions, participates in a coordinated planning and emergency response program, and has its own Emergency Operation Plan to respond to natural disasters.

Consequently, the Project would not have a significant adverse impact with regard to exposure of people or structures to damage resulting from seismic groundshaking or liquefaction-related hazards. Therefore, impacts are considered ***less than significant***.

GS-2 ***Soil Hazards.*** *The Project at the West Campus would result in less-than-significant soil hazards. (LTS)*

The artificial, undocumented fill and alluvial deposits that underlie the West Campus are regarded as potentially weak soils that may be compressible or exhibit other characteristics that would make them unstable (e.g., differential compaction). For example, as noted in the Geotechnical Feasibility Evaluation, the highly compressible soils would not be expected to support the types of multi-storied structures envisioned for the West Campus. In addition, the West Campus is located within the floodplain, and the elevation would need to be increased above the base flood elevation to comply with the City's floodplain ordinance, thereby involving the import of soil. Using existing potentially unsuitable soils (and the placement of additional fill to raise the West Campus elevation) would have the potential to create future collapse or subsidence problems, leading to building settlement and/or utility line disruption.

The Geotechnical Feasibility Evaluation for the Project site indicates that site soils are expected to have a moderate to high shrink-swell potential. Structural damage, warping, and cracking of roads, driveways, parking areas and sidewalks, and rupture of utility lines may occur if the potential expansive soils and the nature of the imported fill are not considered during design and construction of improvements.

The presence of shallow groundwater could affect grading and underground construction by causing wet pavement subgrade, difficulty achieving compactions, and difficult utility installation. Dewatering and shoring of utility trenches may be required for deeper gravity utilities.

However, standard engineering practices could be used to reduce potential hazards associated with soils at the West Campus, and the Geotechnical Feasibility Evaluation concluded that development of the West Campus is feasible from a geotechnical perspective. Some examples of geotechnical recommendations could include: 1) over-excavation of artificial fill and replacement with engineered fill, and 2) incorporation of soil treatment programs (grouting, compaction, drainage control, etc.). Specific treatments to eliminate expansion of soils include, but are not limited to, grouting (cementing the soil particles together), recompaction (watering and compressing the soils), and replacement with a non-expansive material (excavation of unsuitable soil followed by filling with suitable material). The Geotechnical Feasibility Evaluation recommended that deep foundations consisting of pre-cast, pre-stressed concrete driven piles, or augercast piles (cast-in-place), should be used to mitigate compressible soil hazards. Because residual chemical contaminants are present in site soils that could be excavated, moved, or otherwise disturbed to ensure geotechnical specifications are met, this Draft EIR separately evaluates the potential hazards to the public and environmental associated with soil movement on-site. Please refer to Impact HM-2 in Section 3.13, Hazardous Materials, for additional information and analysis.

As part of the construction permitting process, the City would require completed reports of soil conditions to identify potentially unsuitable soil conditions. The evaluations must be conducted by registered soil professionals. The reports must (a) identify potentially unsuitable soil conditions and (b) contain appropriate recommendations for foundation type and design criteria that conform to the analysis and implementation criteria described in the City Building Code, Chapters 16, 18, and A33, to eliminate inappropriate soil conditions.

Adherence to the soil and foundation support parameters of the City Building Code, as required by City and State law, ensures the maximum practicable protection available from soil failures under static or dynamic conditions for structures and their associated trenches and foundations. The Project Sponsor would be required to incorporate these recommendations into Project design. In view of these circumstances, hazards related to unstable geologic or soil units at the West Campus are considered ***less than significant***.

GS-3 ***Soil Erosion.*** *The Project at the West Campus would have a less-than-significant impact to soil erosion. (LTS)*

The West Campus is mostly flat and would not involve development on hillsides that would involve cut-and-fill; thus, there would be no topographic changes that could alter erosion potential. Deep excavations are not anticipated due to the presence of residual contaminants in shallow soils and land use restrictions (see Impact HM-2 in Section 3.13, Hazardous Materials, for additional evaluation of soil contamination).

However, development of the West Campus would involve grading to construct building foundations and trenching for utility installations. Some minor modifications to allow additional roadway access points would also be implemented. These construction activities could temporarily expose soils to erosive effects from stormwater runoff. As noted in Impact GS-2, above, fill may be imported to raise the elevation for flood protection. If fill is imported and stockpiled, the stockpiles could be eroded by wind or water unless properly protected. Because the Project site exceeds one acre in size, in accordance with Chapter 7.42 of the Municipal Code, the City would require the Project Sponsor implement a SWPPP to reduce potential erosion and subsequent sedimentation of storm water runoff. This SWPPP would include BMPs to control erosion associated with grading, trenching, and other ground surface-disturbing activities. The Project Sponsor would be required to submit a grading plan to the City before permits would be issued. In addition, the Project Sponsor would be required to prepare and submit a G&D plan, along with an Erosion and Sedimentation Control Plan prior to obtaining a grading permit from the City. The Project Sponsor would also be required to implement the specifications in Chapter A33 of the CBC, which regulates grading activities, including drainage and erosion control. Compliance with City requirements and the CBC, which are within the authority of the City to enforce and monitor, would ensure that erosion impacts resulting from Project construction would be ***less than significant***.

After construction, the West Campus would be developed with buildings, parking areas and roadways, and landscaping and hardscaping, which would substantially and permanently reduce the amount of soil that could be eroded. Therefore, there would be no operational impacts.

Cumulative Analysis

The geographic context for the analysis of impacts resulting from geologic hazards is generally site specific, rather than cumulative in nature. Each project area has unique geologic considerations that would be subject to uniform site development and construction standards. As such, the potential for cumulative impacts to occur is limited. Therefore, the geographic context for issues related to soil composition (i.e., liquefaction, subsidence, lateral spreading, and landslides) includes only those projects in the immediate vicinity of the Project, which would include Menlo Gateway, 297 Terminal Avenue, 1283 Willow Road (Tier 1 projects), and the East Palo Alto Specific Plan (Tier 2 project). For impacts related to exposure to seismic hazards, the geographic context would be the Bay Area, as the entire region is seismically active and subject to risk of injury to persons and property damage as a result of seismic groundshaking.

C-GS-1 ***Cumulative Seismic Hazards.*** *The Project, in combination with other foreseeable development in the vicinity, would not substantially increase the risk of exposure or people or structures to seismic hazards. As such, the cumulative impact would be less than significant. (LTS)*

Tier 1 and Tier 2

Future population growth in the Bay Area, along with the Project and cumulative development, will increase the number of people and structures exposed to seismic hazards. Given the risk from seismic activity associated with all development in seismically active areas, this impact would be significant if it were not mitigated by building code requirements. Construction in California is strictly regulated by the CBC, as adopted and enforced by each jurisdiction, including the City, to reduce risks from seismic events to the maximum extent possible. Because the City uses and enforces the requirements of the CBC as part of its Building Code, new buildings and facilities in the City are required to be sited and designed in accordance with the most current geotechnical and seismic guidelines and recommendations. Development of cumulative projects would implement all necessary design features recommended by site-specific geotechnical studies (required for all development applications) to reduce the risk from seismic activity, unstable slopes, and soil limitations. Therefore, there would be no significant cumulative impact. The Project would implement the design features recommended by the Project geotechnical studies. With adherence to the Building Code and related plans, regulations, and design and engineering guidelines and practices, the cumulative impact of the Project would be ***less than significant.***

C-GS-2 ***Cumulative Soil Hazards.*** *The Project, in combination with other foreseeable development in the vicinity, would not substantially increase soil hazards. As such, the cumulative impact would be less than significant. (LTS)*

Tier 1 and Tier 2

The geographic context for analysis of impacts on development from unstable soil conditions, including compressible soils, expansive soils, or other conditions that could cause structural problems is site-specific and would not be compounded by additional development. Further, development is required to undergo analysis of geological and soil conditions applicable to the specific individual project, and restrictions on development would be applied in the event that geological or soil conditions pose a risk to safety as a result of site-specific geologic or soils instability, subsidence, collapse, and/or expansive soil. Because the City uses and enforces the requirements of the CBC as part of its Building Code, new buildings and facilities in the City are required to be sited and designed in accordance with the most current geotechnical guidelines and recommendations. There would be no significant cumulative impact with respect to soil hazards. The Project would include all necessary design features recommended by the site-specific geotechnical studies to reduce the risk from seismic activity, unstable slopes, and soil limitations. With adherence to the Building Code and related plans, regulations, and design and engineering guidelines and practices, the cumulative impact of the Project with respect to soil hazards would be ***less than significant.***

C-GS-3 ***Cumulative Soil Erosion.*** *The Project, in combination with other foreseeable development in the vicinity, would not substantially increase soil erosion potential. As such, the cumulative impact would be less than significant. (LTS)*

Tier 1 and Tier 2

The geographic context for analysis of impacts on development associated with the geotechnical aspects of erosion (i.e., permanent loss in soil or topographic changes that can cause or exacerbate erosion) is generally site-specific, and impacts would not be compounded by additional development. From a watershed perspective, erosion can affect water quality by contributing sediment, and, thus the geographic context would be broader and would include the Atherton Channel watershed (see Section 3.12, Hydrology and Water Quality). However, the Atherton Channel watershed is considered already 99 percent built out with an estimated 69 percent impervious cover. Consequently, potential growth would likely occur as redevelopment and not extensive new development on vacant land or open space. Development of the cumulative projects could expose soil surfaces and alter soil conditions. To minimize the potential for cumulative impacts that could cause erosion, all cumulative projects in the City are required to conform to the provisions of applicable City ordinances and State regulations pertaining to erosion and sedimentation control. This includes the City's Municipal Code Chapter 7.42 requirements, which implement the federal and state National Pollutant Discharge Elimination System (NPDES) program. Therefore, there is no significant cumulative impact due to soil erosion.

During the construction phase, the West Campus could expose soil to erosion by wind or water because it would involve substantial amounts of soil disturbance, but it would not involve permanent topographic changes that could cause increased erosion. The East Campus would not contribute to the Project impact. Because the City and the Project Sponsor are responsible for ensuring the Project would be in compliance with applicable NPDES permit requirements, and would implement and maintain the BMPs required by the Project SWPPP, the cumulative impact would be ***less than significant.***

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