4.6 Geology, Soils, Seismicity, and Paleontological Resources

This section of the environmental impact report (EIR) evaluates the potential changes to the existing geologic and soils resources of the project site and vicinity that could result from implementation of the proposed 123 Independence Drive Residential Project (project or proposed project). The analysis focuses on potential impacts to the project's exposure to fault zones, risk of seismic ground shaking, risk of seismic-related ground failure (liquefaction), soil profile, risk of potential risk of soil erosion, expansive soils, and the project soil profile capability to support of septic tank and/or wastewater.

As discussed in Chapter 2, Introduction, and Section 4.0, Environmental Analysis, two Notices of Preparation (NOPs) were circulated for this EIR, one in January and February 2021, and one in September and October 2021. None of the written or verbal comments received in response to the NOPs address geology and soils. Both NOPs and the comments received in response to them are provided in Appendix A of this EIR.

The primary sources reviewed to prepare this section include the Geotechnical Investigation prepared for the project by Rockridge Geotechnical (Appendix F1), the Phase I Environmental Site Assessment prepared for the project by PES Environmental Inc. (Appendix F2), the ConnectMenlo General Plan Update (City of Menlo Park 2016a), the ConnectMenlo General Plan Update EIR (City of Menlo Park 2016b), and the City of Menlo Park (City) Municipal Code (City of Menlo Park 2021).

4.6.1 Environmental Setting

Regional Geology

The San Francisco Peninsula is a relatively narrow band of rock at the north end of the Santa Cruz Mountains separating the Pacific Ocean from San Francisco Bay. It represents one mountain range in a series of discontinuous northwesterly-aligned mountains, valleys, and ridges that form the Coast Ranges geomorphic province of California that stretches from the Oregon border on the north nearly to Point Conception on the south. The project site is located in the southeastern portion of the peninsula, in the Santa Clara Valley. The Santa Clara Valley is a broad, sediment-filled basin bounded on the west by the Santa Cruz Mountains and on the northeast by the Diablo Range.

The ConnectMenlo EIR identifies that the natural geology of the study area is comprised of Pleistocene-age (10,000 to 2.6 million years ago) alluvial fan deposits and Holocene-age (less than 10,000 years ago) levee deposits. As discussed under the Project Site Soils and Groundwater Conditions heading below, the project site is underlain by artificial fill, which is an engineered mixture of sand, silt, and gravel used to prepare areas for urban development, with Holocene-age deposits present below the artificial fill (Appendix F1).

Regional Seismicity

The San Francisco Bay area is one of the most active seismic regions in the United States. There are no Alquist-Priolo Earthquake Fault Zones mapped within the City and the potential for ground rupture is therefore considered low (City of Menlo Park 2016a). The project site is located within the Coast Range's geomorphic province, which is characterized by northwest-trending valleys and ridges that formed due to historic seismic activity in the region. The closest and most prominent active fault near the project site is the San Andreas Fault System, specifically the North San Andreas fault, which is located approximately 6.2 miles to the southwest. There have been four major

earthquakes on this fault since 1800; one centered east of Monterey Bay in 1836 with an estimated moment magnitude of 6.25, one in 1838 with an estimated moment magnitude of 7.5, the 1906 San Francisco Earthquake with an estimated moment magnitude of 7.9, and the 1989 Loma Prieta Earthquake with a moment magnitude of 6.9 (Appendix F1).

Other active earthquake faults in the region include the Monte Vista Fault, which lies approximately 4.8 miles southwest of the project site, the Hayward Fault Zone, approximately 12.4 miles to the east, the Calaveras Fault approximately 18 miles east, and the San Gregorio Fault, whose trace passes approximately 14.9 miles west of the project site. The most recent significant earthquake on the Calaveras fault was the 1984 Morgan Hill Earthquake, with a moment magnitude of 6.2 In addition, the Pulgas Fault crosses the southwest part of the Bayfront Area. However, this fault has not been classified as "active" because it has not ruptured in the past 11,000 years. Thus, there are no known active faults in the Bayfront Area (City of Menlo Park 2016a); thus, there is a very low potential for surface fault rupture in the project vicinity.

Ground Shaking

Although the severity of ground shaking at a particular site depends on several variables including the magnitude of the earthquake, the distance between a particular site and the fault source, the directivity of the earthquake energy, and the site-specific soil conditions, it is expected that all areas within the region have a potential to be exposed to substantial ground shaking. This could result in major damage to structures and foundations that have not been designed to resist such forces. The ConnectMenlo EIR identified that "the [U.S. Geological Survey] estimated that the probability of a magnitude (M) 6.7 or greater earthquake prior to year 2032 is 62%, or roughly a two-thirds probability over this timeframe. Individually, the forecasted probability for each individual fault to produce an M 6.7 or greater seismic event by the year 2032 is as follows: 27% for the Hayward Fault, 21% for the San Andreas Fault, 11% for the Calaveras Fault, and ten percent for the San Gregorio Fault" (City of Menlo Park 2016b). The Geotechnical Investigation for the project provides probabilities for a major earthquake (magnitude 6.7 or greater) occurring in the San Francisco Bay Area region through the year 2044 of 72 percent, with probabilities for individual faults of 25 percent for the Hayward (south) fault, 21 percent for the Calaveras (central) fault, and 17 percent for the North San Andreas (Santa Cruz mountains) fault. The Geotechnical Investigation concludes that the site would be exposed to strong to very strong ground shaking during a major earthquake on a segment of one of the nearby faults, particularly the North San Andreas and Hayward faults (Appendix F1).

Liquefaction

Liquefaction occurs when partially saturated soil enters a liquid state, resulting in the soil's inability to support overlying structures. Liquefaction typically occurs in areas where the groundwater is less than 30 feet from the surface and where the soils are composed of poorly consolidated fine to medium sand and/or fill material. Liquefaction most often when soils are subject to strong seismically induced ground shaking but can also occur due to improper grading and landslides. Lateral spreading consists of lateral movement of gently to steeply sloping saturated soil deposits that is caused by earthquake-induced liquefaction. Liquefaction is a serious hazard because land in areas that experience liquefaction may experience cyclic densification (when non-saturated, cohesionless soil is compacted by earthquake vibrations, causing ground-surface settlement) which can cause major structural damage to buildings and other improvements. The ConnectMenlo EIR states that liquefaction potential in the Bayfront Area is very high, particularly where the soil type known as "Bay Mud" is present. The project site is within a designated liquefaction hazard zone (Appendix F1 and City of Menlo Park 2016b).

Landslides and Subsidence

Landslides occur when rock, soil, unconsolidated sediment, or combinations of such materials shift towards lower elevations due to gravity. Landslide movement can be rapid, as in a soil or rock avalanche, or can creep slowly for extended periods of time. Several factors influence the potential for a given location to be subject to landslide, including slope steepness, slope material, water content, and vegetative cover. The project site and surrounding areas are generally flat and there is no risk of landslide within or adjacent to the site.

The ConnectMenlo EIR identifies that the Bayfront Area has been subject to historical subsidence due to the highly compressible nature of the fill and sediments that underlie the area and historical groundwater overdraft conditions between the 1920s and mid-1960s. The construction of the Hetch Hetchy aqueduct allowed for imported water to largely replace groundwater as a source of drinking water, which in turn led to increased groundwater levels and effectively stopped the land settlement trends (City of Menlo Park 2016b).

Soil Erosion

Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil material, structure, and placement, as well as human activity. Soil containing high amounts of silt is often easily eroded while sandy soils are less susceptible. Excessive soil erosion can lead to damage of building foundations, roadways and stream embankments. The erosion potential for soils in the project area is variable, however the majority of the project site is covered with impervious surfaces and landscaping. There are very few areas where soil is exposed to wind and water, and thus the potential for erosion to occur is very low.

Project Site Soils and Groundwater Conditions

A Geotechnical Investigation was prepared to identify the geologic, soil, and seismic conditions at the project site (Appendix F1). This evaluation of subsurface conditions at the site included performing 20 cone penetration tests, drilling six test borings, performing laboratory testing on selected soil samples, and performing engineering analyses to develop conclusions and recommendations regarding subsurface conditions, seismicity and seismic hazards, including potential liquefaction hazards, settlement, soil corrosivity and construction methods including grading, excavation, dewatering, fill placement and compaction, foundation types and design, and pavement design,

The Geotechnical Investigation identifies that the site is mapped as being underlain by Holocene-age alluvial deposits. Specifically, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, maps a single soil type as occurring within the project site: Urban-land-Orthents, reclaimed complex, 0 to 2 percent slopes (USDA 2022). The Urban Land-Orthents designation indicates that 65 percent of the original soils have been disturbed or covered by paved surfaces, buildings or other structures, 30 percent consist of orthents and similar soils, and four percent consists of minor components. The Urban-land-Orthents soil unit consists of very deep and poorly drained soils that have been filled, and are composed of gravel, broken cement and asphalt, Bay Mud, and solid waste material.

A 1991 USDA soil survey of San Mateo County provides an overview of the soil types present within and surrounding the project site as well as their physical and engineering properties (USDA 2019). The project site, adjacent properties, and much of the land within the northern portion of the Bayfront Area is underlain by the Urban land-Orthents, reclaimed complex soil classification. This map unit identifies areas that were once part of San Francisco Bay and adjacent tidal flats but have been covered with artificial fill. The “Urban land” component of this

classification identifies areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, and other structures. The Orthents soils component of this classification identifies soils that are very deep, poorly drained, and texturally heterogeneous, and were placed in the area as fill to facilitate development of the former tidal flats. Because these soils were imported to their present locations and can include varying amounts of soil, rock fragments, broken concrete and asphalt, Bay Mud, and solid waste material, the soil properties can be highly variable. Soils north of the site, along the Bay, are of the Botella complex. These soils are generally composed of deep or very deep, well drained clay loams. Areas to the south are characterized as Urban land.

The cone penetration tests performed as part of the Geotechnical Investigation were advanced to between 50 and 100 feet below ground surface (bgs) while the borings were advanced to depths between 30.5 and 45 feet bgs. The results of these explorations "indicate the alluvium primarily consists of stiff to very stiff clay with occasional medium stiff layers up to about two feet thick. The clay is interbedded with layers of medium dense to very dense sand and gravel to the maximum depth explored of about 100 feet bgs. The granular layers encountered at this site varied in thickness from 1 to 9 feet. Below depths of about 32 feet bgs (northwest corner of the site) and 52 feet bgs (southeast corner of the site), the clays become very stiff to hard, and the sand and gravels become dense to very dense" (Appendix F1).

Expansive Soil

Expansive soils are soils that experience swelling (expansion) when moisture content increases and shrinking (contracting) when moisture content decrease. Expansive soils are typically very fine-grained with a high to very high percentage of clay, which can retain a lot of moisture. Soils on the northeastern Baylands edge are known to be clay-rich, poorly drained, and likely to possess high shrink-swell potential (City of Menlo Park 2016b). The Geotechnical Investigation included testing of near-surface soils samples. The results of this testing indicate that much of the near-surface soil consists of clay that is very highly expansive (Appendix F1).

Sources of moisture that can influence the shrink-swell potential include seasonal rainfall, landscape irrigation, utility leakage, and/or perched groundwater. When the soil shrinks, wide cracks in the ground surface can appear. The shrink/swell properties can result in structural hazards such as damage to concrete slabs, foundations, and pavement. Specific building and structure design measures and soil treatment are often needed in areas with expansive soils.

Groundwater

Groundwater measurements taken from the cone penetration tests and borings indicate the depth to groundwater ranged from about 4.5 and 7 feet bgs at the time of the field work completed for the Geotechnical Investigation. Similarly, the Phase I Environmental Site Assessment prepared for the project found that groundwater ranges from between 4 and 9 feet bgs. This was determined based on data from two groundwater monitoring wells that were installed at the 119 Independence Drive property and which had an average depth to groundwater of 4.5 feet bgs in 2009; data from borings taken in 2015 at the 130 Constitution Drive where groundwater was encountered at depths of 8 to 10 feet bgs; and quarterly groundwater monitoring data from the adjacent property at 120 Constitution Drive where static depth to groundwater was measured at between 4 and 5 feet bgs (Appendix F2).

The Geotechnical Investigation reports that groundwater levels at the site are expected to fluctuate seasonally due to rainfall and may be subject to tidal fluctuations due to the site's location approximately 600 feet south of the Bay margin, thus a groundwater level of between 1.8 to 3.8 feet below existing grades is used for the project design and construction recommendations presented in the Geotechnical Investigation. The Phase I Environmental Site

Assessment reports that groundwater flows fluctuate from north to southeast depending on tidal influences. The Phase I Environmental Site Assessment also reports that there is regional groundwater contamination in the project area. This is discussed in Section 4.8, Hazards and Hazardous Materials.

Paleontological Resources

Paleontological resources, or fossils, are, by definition, objects that are more than 10,000 years old and provide evidence of and information about past life on earth. They can include remains, traces, and imprints of once-living organisms preserved in rocks and sediments. An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved. Marine invertebrates are generally common, well developed, and well documented and would generally not be considered a unique paleontological resource whereas identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare. Surveys previously completed in northern California have found two major divisions of Pleistocene-age fossils: the Irvingtonian (older Pleistocene fauna) and the Rancholabrean (younger Pleistocene and Holocene fauna). The potential of a particular area to produce a valuable paleontological resource is largely dependent on the geologic age and origin of the underlying rocks.

The ConnectMenlo EIR reports that vertebrate fossils have been identified at eight locations within San Mateo County, including locations along the Pacific coast, along Skyline Drive in South San Francisco, and along Middlefield Road in unincorporated San Mateo County (City of Menlo Park 2016b). The project site is underlain by artificial fill material that was imported to the site during development of the existing buildings. Artificial fill does not typically contain any significant fossil records that could contribute to science or natural history, and thus typically does not contain unique or significant paleontological resources. However, as noted above, there may be Pleistocene-age alluvium and Holocene-age deposits below the artificial soil. Holocene-age deposits are less than 10,000 years old and therefore are considered too young support paleontological resources because the remains of organisms would not have fossilized yet because fossilization processes take place over millions of years. In contrast, the Pleistocene alluvium are old enough to have stiffened and preserved the remains of Pleistocene organisms; therefore, could have high potential for producing paleontologically significant resources (City of Menlo Park 2016b).

4.6.2 Regulatory Framework

Federal Regulations

National Earthquake Hazards Reduction Act

The National Earthquake Hazards Reduction Act was passed to reduce the risks to life and property resulting from earthquakes. The act established the National Earthquake Hazards Reduction Program (NEHRP). The mission of NEHRP includes improving the understanding, characterization, and prediction of hazards and vulnerabilities; improving building codes and land use practices; reducing risk through post-earthquake investigations and education; developing and improving design and construction techniques; improving mitigation capacity; and accelerating application of research results. NEHRP designates the Federal Emergency Management Agency as the lead agency of the program and assigns several planning, coordinating, and reporting responsibilities. Other NEHRP agencies include the National Institute of Standards and Technology, National Science Foundation, and the U.S. Geological Survey.

Paleontological Resources Preservation Act

The federal Paleontological Resources Preservation Act of 2002 limits the collection of vertebrate fossils and other rare and scientifically significant fossils to qualified researchers who have obtained a permit from the appropriate state or federal agency. Additionally, it specifies these researchers must agree to donate any materials recovered to recognized public institutions, where they will remain accessible to the public and to other researchers. This Act incorporates key findings of a report, *Fossils on Federal Land and Indian Lands*, issued by the Secretary of Interior in 2000, which establishes that most vertebrate fossils and some invertebrate and plant fossils are considered rare resources.

State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Act (Public Resources Code [PRC] Sections 2621 through 2630) was passed in 1972 to mitigate the hazard of surface faulting for structures designed for human occupancy. The main purpose of the law is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. A structure for human occupancy is defined as any structure 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. The law addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Alquist-Priolo Act requires the State Geologist to establish regulatory zones known as Earthquake Fault Zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning efforts. Before a structure for human occupancy can be permitted in a designated Alquist-Priolo Earthquake Fault Zone, the local agency must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (PRC Sections 2690 through 2699.6), passed by the California legislature in 1990, addresses earthquake hazards from non-surface fault rupture, including liquefaction and seismically induced landslides. The act established a mapping program for areas that have the potential for liquefaction, strong ground shaking, or other earthquake and geologic hazards.

California Building Code

The state regulations protecting structures from geo-seismic hazards are contained in the California Code of Regulations, Title 24, Part 2 (the California Building Code), which is updated every three years. These regulations apply to public and private buildings in the state. The current code is the 2019 California Building Code; however, the 2022 California Building Code was adopted in December 2021 and will be effective January 1, 2023. The California Building Code is based on the current (2018) International Building Code and includes enhancements to the sections dealing with existing structures. Seismic-resistant construction design is required to meet more stringent technical standards than those set by previous versions of the California Building Code.

Construction activities are subject to occupational safety standards for excavation and trenching, as specified in the California Safety and Health Administration regulations (Title 8 of the California Code of Regulations) and in Chapter 33 of the California Building Code. These regulations specify the measures to be used for excavation and trench work where workers could be exposed to unstable soil conditions. The project would be required to employ these safety measures during excavation and trenching.

State Earthquake Protection Law

The State Earthquake Protection Law (California Health and Safety Code Section 19100 et seq.) requires that structures be designed and constructed to resist stresses produced by lateral forces caused by wind and earthquakes, as provided in the California Building Code. Chapter 16 of the California Building Code sets forth specific minimum seismic safety and structural design requirements, requires a site-specific geotechnical study to address seismic issues, and identifies seismic factors that must be considered in structural design. Because the program and programmatic infrastructure component sites are not located within an Alquist-Priolo Earthquake Fault Zone, as noted above, no special provisions would be required for development of the Proposed Project related to fault rupture.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines require that all private and public activities not specifically exempted be evaluated against the potential for environmental damage, including effects to paleontological resources. Paleontological resources, which are limited, nonrenewable resources of scientific, cultural, and educational value, are recognized as part of the environment under these state guidelines. This analysis satisfies project requirements in accordance with CEQA (13 PRC Section 21000 et seq.) and PRC Section 5097.5 (Stats 1965, c. 1136, p. 2792). This analysis also complies with guidelines and significance criteria specified by the SVP (2010).

Paleontological resources are explicitly afforded protection by CEQA, specifically in Section VII(f) of CEQA Guidelines Appendix G, the "Environmental Checklist Form," which addresses the potential for adverse impacts to "unique paleontological resource[s] or site[s] or … unique geological feature[s]." This provision covers fossils of significant importance – remains of species or genera new to science, for example, or fossils exhibiting features not previously recognized for a given animal group – as well as localities that yield fossils significant in their abundance, diversity, and degree of preservation. Other state requirements for paleontological resource management are found in PRC Chapter 1.7, Section 5097.5, Archaeological, Paleontological, and Historical Sites. This statute specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. This statute does not apply to the proposed project because none of the property includes public lands.

Regional and Local Regulations

Menlo Park General Plan

The City of Menlo Park General Plan includes goals, policies, and programs relevant to the aesthetic factors potentially affected by the proposed project. The City's General Plan includes the following policies relevant to geology and soils.

Goal LU-7: Promote the implementation and maintenance of sustainable development, facilities and services to meet the needs of Menlo Park's residents, businesses, workers, and visitors.

Policy LU-7.7: Hazards. Avoid development in areas with seismic, flood, fire, and other hazards to life or property when potential impacts cannot be mitigated.

Goal OSC-3: Protect and enhance historic resources.

Policy OSC3.3: Archaeological or Paleontological Resources Protection. Protect prehistoric or historic cultural resources either on site or through appropriate documentation as a condition of removal.

Require that when a development project has sufficient flexibility, avoidance and preservation of the resource shall be the primary mitigation measure, unless the City identifies superior mitigation. If resources are documented, undertake coordination with descendants and/or stakeholder groups, as warranted.

Policy OSC3.4**:** Prehistoric or Historic Cultural Resources Found During Construction. Require that if cultural resources, including archaeological or paleontological resources, are uncovered during grading or other on-site excavation activities, construction shall stop until appropriate mitigation is implemented.

Goal S-1: Assure a safe community.

Policy S-1.1: Location of Future Development. Permit development only in those areas where potential danger to the health, safety and welfare of the residents of the community can be adequately mitigated.

Policy S-1.3: Hazard Data and Standards. Integrate hazard data (geotechnical, flood, fire, etc.) and risk evaluations into the development review process and maintain, develop and adopt up-to-date standards to reduce the level of risk from natural and human-caused hazards for all land use.

Policy S-1.5: New Habitable Structures. Require that all new habitable structures incorporate adequate hazard mitigation measures to reduce identified risks from natural and human-caused hazards.

Policy S-1.7: Hazard Reduction. Continue to require new development to reduce the seismic vulnerability of buildings and susceptibility to other hazards through enforcement of the California Building Standards Code and other programs.

Policy S-1.13: Geotechnical Studies. Continue to require site-specific geologic and geotechnical studies for land development or construction in areas of potential land instability as shown on the State and/or local geologic hazard maps or identified through other means.

Policy S-1.14**:** Potential Land Instability. Prohibit development in areas of potential land instability identified on State and/or local geologic hazard maps, or identified through other means, unless a geologic investigation demonstrates hazards can be mitigated to an acceptable level as defined by the State of California.

Policy S-1.26**:** Erosion and Sediment Control. Continue to require the use of best management practices for erosion and sediment control measures with proposed development in compliance with applicable regional regulations.

City of Menlo Park Municipal Code

Title 12 of the City of Menlo Park Municipal Code addresses buildings and construction, including specific requirements for addressing potential geologic, soil and seismic impacts. Chapters 12.04, 12.06, and 12.08 identify that the City has adopted applicable portions of the California Building Code as the City's building code, with minor modifications made to identify the specific types of work that the City has exempted from the need to obtain a building permit. In addition, Chapter 12.04 adds a standard for testing of soil samples prior to import of fill to a construction site to verify the material proposed for import meets standards established in the California Environmental Protection Agency, Department of Toxic Substances Control guidelines for clean imported fill material.

Within the California Building Code, Chapter 16 addresses Structural Design and Chapter 18 addresses Soils and Foundations. Both of these chapters include specific requirements for identifying potential hazards associated with geology, soils, and seismic activity. For example, both chapters include design criteria for construction within a range of seismic design categories, while Chapter 18 also includes requirements to evaluate if expansive soil is present and identifies design criteria to ensure that structural damage from expansive soil will be avoided, as well as similar requirements to ensure structural stability when constructing on engineered fill.

Land Development Guidelines

The City of Menlo Park Community Development Department, Building Division, is responsible for ensuring that new construction and redevelopment projects comply with the city's building code and related policies. The Building Division will complete a plan check and inspection process to verify compliance. This includes ensuring compliance with the City's requirements for grading and drainage (City of Menlo Park n.d.), such as the following:

- Use of post-construction best management practices
- When fill is imported to a site, ensuring a transition to existing grades on neighboring properties to avoid adverse effects and ensure drainage on adjacent properties is not impeded
- Design the drainage for sheet flow to lawn or pervious landscaped areas of the site without creating ponding and erosion
- Minimum and maximum drainage gradients to prevent excessive erosion and subsequent instability
- Maximum cut and fill slopes of 2:1

City of Menlo Park Emergency Operations Plan

The City of Menlo Park 2014 Emergency Operations Plan describes how the City will manage and coordinate resources and personnel responding to a range of "extraordinary" emergency situations including natural disasters and technological incidents. The operational concepts reflected in the Emergency Operations Plan focus on potential large-scale disasters which can generate unique situations requiring expanded emergency responses. It uses principles from the Federal National Incident Management System, the California Standardized Emergency Management System and the Incident Command System to ensure a comprehensive and effective strategy for providing a coordinated and efficient response to major emergencies. The Emergency Operations Plan defines emergency response phases and emergency levels; specifies policies and general procedures, including protocols for communication between emergency service providers and for communication with the public; defines and delegates tasks for emergency staff; and provides for coordination of planning efforts. (City of Menlo Park 2014).

4.6.3 Thresholds of Significance

The significance criteria used to evaluate project impacts to geology and soils are based on Appendix G of the CEQA Guidelines. Potential project-related impacts analyzed in this section account for geology and soils that occur or have the potential to occur on the project site. According to Appendix G of the CEQA Guidelines, a significant impact related to geology and soils would occur if the project would:

A. Directly or indirectly cause 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 Geologist for the area or based on other substantial evidence of a known fault;

b. strong seismic ground shaking;
c. seismic-related ground failure, including liquefaction; or
d. landslides.

B. Result in substantial soil erosion or the loss of topsoil.
C. Be located on a geologic unit or soil that is made unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
D. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.
E. 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.
F. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
G. Result in a cumulatively considerable contribution to adverse effects related to geology, soils, seismicity, and paleontological resources.

Methodology

The project setting and impact analysis was developed by reviewing available information relating to geology, soils, seismicity, and paleontological resources in the project vicinity, including the City's General Plan, San Mateo County Soil Survey, and Natural Resources Conservation Service Web Soil Survey as well as the site-specific Geotechnical Investigation (Appendix F1) and the site-specific Phase I Environmental Site Assessment (Appendix F2).

It is important to note impacts of the environment on a project (as opposed to impacts of a project on the environment) are beyond the scope of required CEQA review. "[T]he purpose of an EIR is to identify the significant effects of a project on the environment, not the significant effects of the environment on the project" (Ballona Wetlands Land Trust v. City of Los Angeles [2011] 201 Cal.App.4th 455, 473) and "CEQA generally does not require an analysis of how existing environmental conditions will affect a project's future users or residents" (California Building Industry Association v. Bay Area Air Quality Management District [2015] Cal.App 4th.).

With these rulings, the effect of the environment on a project (such as the impact of existing seismic hazards on new project occupants) is no longer required to be considered as an environmental impact under CEQA, unless the project could exacerbate an existing environmental hazard. However, information pertaining to potential impacts associated with the environment on the project are included for informational purposes.

4.6.4 Impacts and Mitigation Measures

Impact 4.6-1 Would the project expose people or structures to potentially substantial adverse events, 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?

Fault rupture occurs when ground surface is broken due to fault movement during an earthquake. These ruptures generally occur along active fault traces. As described above in Section 4.6.1, the closest and most prominent active fault near the project site is the San Andreas Fault System, specifically the North San Andreas fault, which is located approximately 6.2 miles to the southwest. Other active earthquake faults in the region include the Monte Vista Fault, which lies approximately 4.8 miles southwest of the project site, the Hayward Fault Zone, approximately

12.4 miles to the east, the Calaveras Fault approximately 18 miles east, and the San Gregorio Fault, whose trace passes approximately 14.9 miles west of the project site.

The project site is not located on a known active or potentially active earthquake fault trace and the risk of surface rupture is very low (Appendix F1); therefore, people within the project site would not be exposed to substantial risks related to surface rupture. Further, the proposed project would not change the risk of surface rupture and, therefore, would not exacerbate existing hazards related to surface fault rupture and seismic ground shaking. Thus, **no impact** would occur with regard to rupture of a known earthquake fault.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-2 Would the project directly or indirectly expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

Seismic ground shaking generally occurs when the earth's surface is in motion due to an earthquake. Seismic shaking is typically the primary cause of structural damage during seismic events. The proposed project could experience substantial ground shaking during moderate and large magnitude earthquakes that may occur along the San Andreas Fault or other active fault zones in the Bay Area. However, construction and operation of the proposed project does not have the potential to exacerbate seismic risks and thus this discussion is provided for informational purposes. Given the proximity of the project site to active earthquake faults, in the event of an earthquake, the project site would have a high potential to experience strong seismic ground shaking (Appendix F1) which could have adverse effects to people or structures within the project site. The proposed project would not change existing seismic hazards and, therefore, would not exacerbate the potential for seismic ground shaking to occur. However, the project would increase human presence within the project site by replacing existing office and light industrial uses with residential and public open space uses, which would increase the number of people that could be exposed to hazards associated with seismic ground shaking,

However, risks related to building failure from ground shaking would be reduced through adherence to requirements set in the current California Building Standards Code to ensure that buildings can withstand the anticipated level of seismic activity. Specifically, the project design and construction methods would be required to comply the California Building Code standards for projects in areas of high seismic risk addressing excavation, grading, construction earthwork, fill embankments, foundations, liquefaction potential, and soil strength loss. In conjunction with the City's General Plan Policy S-1.7, a site-specific geotechnical report has been prepared (Appendix F1). Seismic hazards and risks to buildings cannot be completely eliminated even with site-specific geotechnical design and compliance with the California Building Code., but such risks are substantially reduced and safety for occupants increased with such compliance. However, the Geotechnical Investigation concludes that the proposed development can be constructed as planned and will not pose a safety risk to future occupants, provided the recommendations presented in the Geotechnical Investigation are incorporated into the project plans and specifications and implemented during construction. The Geotechnical Investigation recommendations include seismic design parameters to be used in accordance with the California Building Code to account for earthquake ground motion. The project would neither exacerbate the potential for seismic shaking to occur nor increase seismic-related risks for the existing population in the project area. Because risks associated with seismic hazards represent an effect of the environment on the proposed project, the potential for the proposed buildings to be exposed to seismic hazards is not considered an adverse environmental effect under CEQA. Thus, this impact is

considered **less than significant.** To ensure the safety of people and structures within the project site, compliance with the Geotechnical Investigation recommendations and California Building Code would be addressed through the City's Conditions of Approval for the proposed project.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-3 Would the project directly or indirectly expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

Soil liquefaction occurs typically when saturated soil layers are located close to the ground surface. During ground shaking, these soils can lose strength and result in horizontal and vertical movements. As described above, the ConnectMenlo EIR states that liquefaction potential in the Bayfront Area is very high, particularly where the soil type known as "Bay Mud" is present. The project site, along with much of the land adjacent to the south bay, is within a designated liquefaction seismic hazard zone by the California Geological Survey (CGS) (CGS 2022). The proposed project, however, would not exacerbate the potential for either seismic-related ground failure or liquefaction to occur, thus this discussion is provided for informational purposes.

The Geotechnical Investigation prepared for the project evaluated potential liquefaction hazards at the site assuming a high groundwater depth of three feet below existing grades for the "during earthquake" groundwater level, the 2019 California Building Code peak ground acceleration of 0.69 times gravity, and a moment magnitude 8.04 earthquake based on the characteristic moment magnitude for the San Andreas fault. The Geotechnical Investigation found that "most of the soils at the site are sufficiently cohesive and/or dense to resist liquefaction" and that because the potentially liquefiable layers are not continuous, there is no risk of lateral spreading (Appendix F1).

However, the several layers of potentially liquefiable material encountered in the cone penetration tests below a depth of 9 feet bgs indicate that there is a potential for ground surface settlement associated with liquefaction following a major earthquake on a nearby fault. The Geotechnical Investigation concludes that there could be up to 1 inch of total ground surface settlement associated with reconsolidation of soils after liquefaction, with a differential settlement of up to 0.5 inches over a horizontal distance of 30 feet. Further, the Geotechnical Investigation concludes that "the non-liquefiable soil overlying the potentially liquefiable soil layers is sufficiently thick such that the potential for liquefaction-induced ground failure at the ground surface is low" but that the "lenses of potentially liquefiable soil slightly below proposed basement subgrade that may result in a reduction in bearing capacity during a major seismic event in localized areas." Based on these findings, the Geotechnical Investigation recommends use of mat foundations rather than spread footings because spread footings could experience bearing failures during a major seismic event. However, post-tension slabs are also suggested as a viable alternative to mat foundations for the proposed townhomes. Section 7.3 of the Geotechnical Investigation provides design criteria for the foundation to accommodate 1 inch of total liquefaction-induced settlement and 0.5 inches of differential settlement over 30 feet (Appendix F1).

The project would not exacerbate the potential for liquefaction to occur. Because risks associated with liquefaction represent an effect of the environment on the proposed project, the potential for the proposed buildings to be exposed to differential settlement is not considered an adverse environmental effect under CEQA. Thus, this impact is considered **less than significant.** To ensure the safety of people and structures within the project site, compliance with the Geotechnical Investigation recommendations would be ensured through the City's Conditions of Approval for the proposed project.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-4 Would the project directly or indirectly expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Landslides occur as a result of rapid movement of soil masses on unstable slopes. The project site is relatively level, with no free face or sloping ground in the vicinity. Therefore, there is no risk of landslides in the project area. The Seismic Hazard Zones mapped by CGS delineate areas susceptible to landslides; these areas require additional investigation to determine the extent and magnitude of potential ground failure. According the CGS, the project site is not located within a zone for seismically induced landslides (CGS 2006). The project would involve importing fill material sufficient to ensure that the final floor elevation of all proposed ground-level residential units would be at least 2 feet above the 5-foot FEMA floodplain, per the requirements of Menlo Park Municipal Code Section 16.45.130(4). The current site grade varies from approximately 7.8 feet to 9.8 feet and the finished grade for the proposed development would be at approximately 13 feet, which is approximately 2.6 feet above the 5-foot FEMA floodplain. Therefore, between approximately 3.2 and 5.2 feet of engineered fill would be placed to reach proposed finished grades. The proposed grading would ensure that the transition between the finished grade level of the project site, which would be increased relative to adjacent properties due to this import of fill material, and the grade level of adjacent properties is smooth, and slopes are stabilized consistent with current Building Code requirements such that no new risk of landslide is created. For these reasons, impacts would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-5 Would the project result in substantial soil erosion or the loss of topsoil?

The project site is currently developed with pavement and existing structures and has minimal areas of exposed soil. Redevelopment of the project site would involve demolition and construction activities, including excavation, grading, and trenching. Temporary soil erosion could occur if the site is exposed to wind or rain when soils are exposed. These impacts would be temporary and limited to the project's excavation and grading phases. Upon completion of construction, the project site would be covered with structures, pavement, and landscaping and would not include areas of exposed soil. The proposed project would also be required to comply the City's Engineering Division's Grading and Drainage Control Guidelines which address potential impacts form erosion and the loss of topsoil during construction. Furthermore, because the project would disturb more than 1 acre of soil during construction, it would be subject to the National Pollutant Discharge Elimination System Constructing General Permit, requiring preparation of a Storm Water Pollution Prevention Plan including erosion control best management practices. For these reasons, the proposed project would result in **less-than-significant** soil erosion impacts.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-6 Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

Unstable geologic units or soils are characterized by materials lacking sufficient integrity to support urban development. As discussed under Impact 4.6-2 and 4.6-3, the project would not exacerbate seismic hazards, including the potential for liquefaction, and thus impacts related to seismic hazards would be less than significant. As discussed in Impact 4.6-4, the project site is not subject to landslides and the project would not create the potential for landslides.

Subsidence or collapse can result from the removal of subsurface water, resulting in either catastrophic or gradual depression of the surface elevation of the project site. The project would connect to Menlo Park Municipal Water infrastructure and therefore would not require groundwater extraction during project operation. As discussed in Section 4.6.1, groundwater is present at between 4.5 feet and 9 feet bgs within the project site. During excavation to construct the below-grade parking facility for the proposed apartment building, dewatering would be required. The Geotechnical Investigation includes recommendations for a temporary active dewatering system consisting of a series of extraction wells installed outside the excavation. However, the Geotechnical Investigation notes that dewatering can result in settlement of improvements on adjacent properties, including ground subsidence and differential settlement. Thus, the project could result in adverse effects due to subsidence because it could exacerbate the potential for adjacent properties to be exposed to ground subsidence and differential settlement, which could cause associated risks to structures and people in the vicinity.

Additionally, the Geotechnical Investigation notes that placement of new fill to raise site elevation would result in static settlement at the project site due to consolidation of the underlying soil. To limit adverse effects, the Geotechnical Investigation recommends that fill placement occur a minimum of 3 months prior to construction of the foundations for proposed buildings, since most settlement is expected to occur within a few months of fill placement. This represents a potential adverse effect of the project on soil stability within the project site.

The area surrounding the project site supports development, which indicates that geologic conditions in the area are capable of supporting future development of the site and would not be unstable. Further, the Geotechnical Investigation found that the site is capable of supporting the proposed development and provides recommendations for project design and construction methods to ensure that the project minimizes existing potential adverse effects associated with geologic and seismic conditions, including soil stability. The Geotechnical Investigation concludes that the proposed development can be supported at the project site and would not be adversely affected by geological and soil instability provided that the recommendations presented in the Geotechnical Investigation are incorporated into the project plans. Specifically, this requires fill placement to occur a minimum of 3 months prior to construction of foundation, that the apartment building be supported on a mat foundation, and that the townhome buildings be supported on either mat foundations or post-tensioned slabs-on-grade (Appendix F1). The project would not affect the soil stability at adjacent sites except for potential subsidence resulting from dewatering as described in the preceding paragraph.

Finally, the Geotechnical Investigation notes that the analysis and recommendations in that report are based on limited subsurface exploration and laboratory testing, and that a qualified geotechnical consultant should be retained to monitor excavation, grading, and foundation installation to observe conditions and modify design and construction method recommendations if warranted based on the actual conditions encountered during construction.

Although impacts associated with geologic and soil stability are expected to remain less than significant, there is a potential for a significant impact if dewatering would cause substantial subsidence or differential settlement on adjacent properties, and/or if placement of new fill would cause substantial static settlement within the project site that could adversely affect the proposed buildings. Thus, this impact is considered **potentially significant.**

Mitigation Measures

Mitigation Measures (MM) 4.6a and 4.6b would lessen this potential impact to a **less-than-significant** level by ensuring that implementation of the dewatering system during construction does not result in adverse effects to adjacent properties, and that excavation, grading, and foundation installation methods ensure geologic and soil stability for the project site.

MM 4.6a Prior to issuance of a grading permit, the project developer shall submit to the City an analysis prepared by a qualified geotechnical consultant regarding the effects of dewatering on nearby buildings and the proposed design of the shoring and dewatering systems and confirming that the geotechnical aspects of the proposed shoring system meets the Geotechnical Investigation requirements. The analysis shall demonstrate that the shoring and dewatering systems minimize the amount of dewatering required and that dewatering will not result in structural damage to improvements on adjacent properties. If the estimated settlements are not acceptable, the dewatering and shoring system shall include measures to reduce settlement, such as installing a secant pile or continuous soil-cement mix wall to shore the excavation as well as cut off lateral groundwater flow, thus reducing the amount of dewatering required from within the excavation.

MM 4.6b Prior to issuance of a grading permit, the City shall ensure that the proposed grading and construction schedule provides for fill placement to occur a minimum of 3 months prior to foundation installation, consistent with the recommendations provided in the Geotechnical Investigation prepared for the project by Rockridge Geotechnical.

Impact 4.6-7 Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial direct or indirect risks to life or property?

The ConnectMenlo EIR notes that expansive soils are most prevalent in areas in proximity to the Bay, especially within the northeastern portion of the City where the project is located. Expansive soils can shrink and swell as a result of moisture change. These volume changes can result in damage over time to building foundations, underground utilities, and other subsurface facilities, such as cause movement and cracking of foundations, pavements, slabs, and below-grade walls. Shrink-swell potential is influenced by the amount and type of clay minerals present in the soil and can be measured by the percent change of the soil volume. However, appropriate design and construction methods can reduce the potential for damage by ensuring that site improvements can accommodate changing soil conditions.

As discussed in Section 4.6.1, the Geotechnical Investigation found that the existing near-surface soil contains clay that has a very high expansion potential. However, because between 3.2 to 5.2 feet of engineered fill would be placed to raise the site grade to an elevation of 13 feet, which is approximately 2.6 feet above the 5-foot FEMA floodplain, the building foundations and other site improvements would be placed on non-expansive engineered fill, which would avoid the potential hazards associated with placing site improvements on or within expansive soil (Appendix F1). Additionally, the project would not exacerbate the potential for expansive soils to affect other properties within the project area. The project would have **no impact** associated with risks to life or property due to expansive soil.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-8 Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No septic tanks or alternative wastewater disposal systems are proposed. The West Bay Sanitary District provides wastewater collection and conveyance service to the City. Wastewater generated at the project site would be conveyed to the Silicon Valley Clean Water wastewater treatment plant for treatment and discharge to the San Francisco Bay. The proposed project would connect to existing 8-inch sanitary sewer lines located in Constitution Drive and Independence Drive and an existing 10-inch sanitary sewer line in Chrysler Drive. Provision of wastewater collection, conveyance, and treatment services to the project is discussed further in Section 4.16, Utilities and Service Systems. The project would have **no impact** related to septic tanks or alternative wastewater disposal systems.

Mitigation Measures

No mitigation measures are required.

Impact 4.6-9 Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

According to the ConnectMenlo EIR, no known fossils or unique paleontological resources or unique geologic features are present in the project area. However, geological formations underlying Menlo Park have the potential for containing paleontological resources (i.e., fossils). There could also be fossils of potential scientific significance in other geological formations that have not been recorded (City of Menlo Park 2016b). Ground-disturbing construction associated with the project would include excavation to a depth of approximately 10 feet below the existing grade for construction of the below-grade parking garage for the apartment building and trenching to a depth of up to 8 feet below the existing grade for installation of utility infrastructure. If paleontological resources are encountered during excavation or trenching, damage to, or destruction of, paleontological resources could result. Thus, the project would result in a **potentially significant impact** to paleontological resources.

Mitigation Measures

MM 4.6c, which is the same as MM CULT-3 in the ConnectMenlo EIR, would lessen this potential impact to a **less-than-significant** level by ensuring that any potential paleontological resources encountered during construction are appropriately evaluated and recovered when necessary to avoid significant impacts.

MM 4.6c In the event that fossils or fossil bearing deposits are discovered during ground-disturbing activities, excavations within a 50-foot radius of the find shall be temporarily halted or diverted. Ground disturbance work shall cease until a City-approved qualified paleontologist determines whether the resource requires further study. The paleontologist shall document the discovery as needed (in accordance with Society of Vertebrate Paleontology standards [Society of Vertebrate Paleontology 1995]), evaluate the potential resource, and assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5. The paleontologist shall notify the appropriate agencies to determine procedures that would be followed before construction activities are allowed to resume at the location of the find. If avoidance is not feasible, the paleontologist shall prepare an excavation plan for mitigating the effect of construction activities on the discovery. The excavation plan shall be submitted to the City of Menlo Park for review and approval prior to implementation, and all construction activity shall adhere to the recommendations in the excavation plan (ConnectMenlo EIR MM CULT-3).

Cumulative Impacts

The geographic context considered for cumulative geology and soils impacts is the project site and immediate surroundings. The project site is within the Bayfront Area of the City, where development and redevelopment pursuant to the recent update to the City's General Plan is ongoing, as summarized in Section 4.0 Environmental Analysis. The cumulative development scenario for this analysis is buildout of the City's General Plan.

The proposed project would develop residential uses on an 8.15-acre site. Projects of this scale and nature typically do not have the ability to alter geologic, seismic, and soil conditions in areas not proximate to the project site. As described above, the project would result in potentially significant impacts associated with geologic and soil stability and paleontological resources, but all of these impacts would be reduced to less-than-significant levels with implementation of the mitigation measures identified in this section. The project would not increase seismic or geologic hazards on the project site or within the surrounding area.

Impact 4.6-10: Would the project make a cumulatively considerable contribution to a significant cumulative impact related to geology, soils, seismicity, or paleontological resources?

The ConnectMenlo EIR evaluated potential cumulative geological impacts that could arise from future development under the City's General Plan and concluded that impacts would remain less than significant because new development would be subject to California Building Code, Municipal Code, and General Plan polices. The ConnectMenlo EIR found that compliance with these requirements would reduce the cumulative impacts from land development related to seismic shaking, seismically induced landslides and liquefaction, expansive soils, and erosion and loss of topsoil to less than significant levels (City of Menlo Park 2016b). Thus, there are no significant geologic, soils, and seismicity cumulative impacts to which the project could contribute. The project similarly would comply with all applicable California Building Code, Municipal Code, and General Plan policies. Further, as noted above, with implementation of MMs 4.6a and 4.6b, the project would result in less-than-significant impacts to these resources.

Similarly, the ConnectMenlo EIR found that implementation of the City's General Plan would result in less-than-significant cumulative impacts to paleontological resources with implementation of ConnectMenlo EIR MM CULT-3. The same measure is included in this EIR as MM 4.6c. With implementation of MM 4.6c, the project would result in less-than-significant impacts to paleontological resources.

Although the project would construct more residential units than were evaluated under the ConnectMenlo EIR, the project would not expand the development area or footprint of development that was evaluated in that EIR. Thus, the conclusions of the ConnectMenlo EIR regarding the potential for significant cumulative impacts associated with geology, soils, seismicity, and paleontological resources remain applicable to the proposed project.

Mitigation Measures

Implementation of MM 4.6a would ensure that dewatering during construction does not result in adverse effects to adjacent properties; implementation of MM 4.6b would ensure that placement of fill material at the project site does not cause excessive settlement at the project site that could lead to soil instability; implementation of Mitigation Measure 4.6c would ensure that if any potential paleontological resources are encountered during construction, the resources would be appropriately evaluated and recovered when necessary to avoid significant impacts. No additional mitigation measures are necessary.

4.6.5 References Cited

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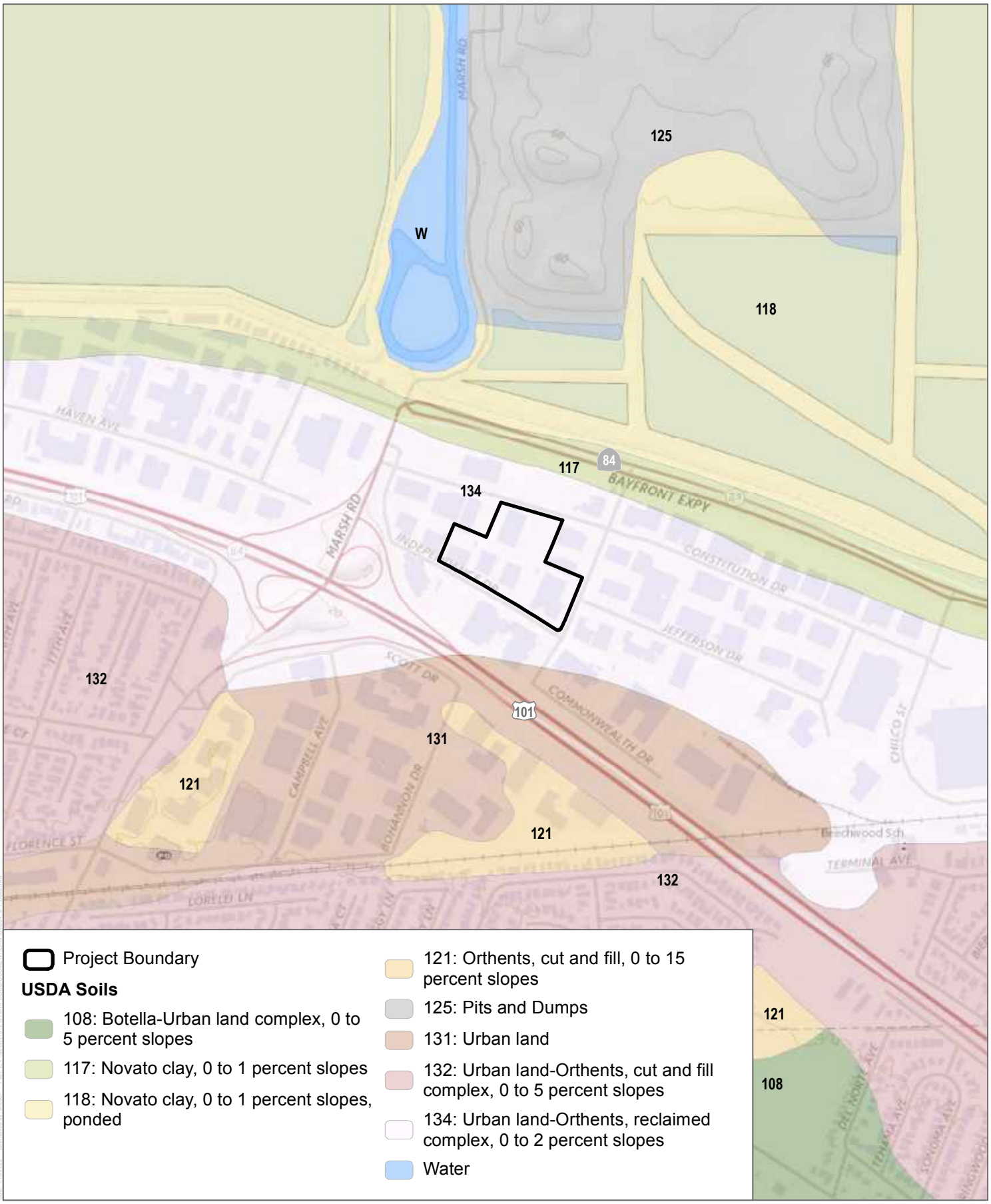

SOURCE: USGS National Map, USDA NRCS 2011

DUDEK

0 400 800 Feet

FIGURE 4.6-1

Site Soils

123 Independence Drive Residential Project

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