

3.5 - Geology, Soils, and Seismicity

3.5.1 - Introduction

This section describes the existing geology, soils, and seismicity setting and potential effects from project implementation on the site and its surrounding area. Descriptions and analysis in this section are based on information provided by the Geotechnical Engineering Report prepared by Wallace Kuhl & Associates and the Geological Fault Investigation prepared by Cornerstone Earth Group. Both reports are provided in Appendix E.

3.5.2 - Environmental Setting

Regional Geology

The site is located in the southern portion of the Napa Valley, which is characterized as a relatively large northwest-trending alluvial valley within the Northern California Coast Range geomorphic province. The valley is at the southernmost end of the Mayacmas Mountains. South of the City of Napa, the hills on the western side of the valley terminate at the marshes bordering the northern end of San Pablo Bay; the hills on the northeast continue to near Sulphur Springs Mountain near the City of Vallejo. The bedrock ridges on each side of the Napa Valley trend northwest, parallel to the general north-northwest structural trend of the North Coast Ranges. Pre-Quaternary bedrock is generally restricted to the foothills, but locally there are low knolls or hills of Tertiary-age bedrock in the central and western parts of the valley. Quaternary alluvial fan deposits shed from the hills on the east, and fluvial deposits associated with the Napa River and its tributary valleys comprise the youngest deposits within the Napa Valley. Late Pleistocene estuarine deposits formed during the last interglacial stage are postulated to underlie a broad geomorphic surface in the southern end of the valley where the subject site is situated.

Within the region, the San Andreas Fault system distributes shearing across a complex assemblage of primarily right-lateral, strike-slip, parallel, and sub-parallel faults that include the Hayward and Calaveras Faults and others (see the “Faulting” section of this report). The mountainous topography west of Napa Valley resulted from latest Pliocene and Quaternary uplift associated with the younger structures.

Local Geology

The site is in an area adjacent to the San Francisco Bay where Quaternary alluvial deposits dominate the local geology. The majority of the site and adjacent areas is underlain by Late Pleistocene to Holocene alluvial fan deposits (“Qf”), which are bound to the north and on the west by older geologic units, including Late Pleistocene fan deposits (“Qpf”) and Early to Middle Pleistocene alluvial fan or terrace deposits (“Qoa”). Specifically, the Qf unit is relatively younger than and was deposited over the Qpf and the Qoa units. The Qf unit is described as gently sloping, fan-shaped, relatively undissected alluvial surfaces where Late Pleistocene or Holocene age was uncertain or where the deposits of different age interfinger such that they could not be delineated at the map scale. Sediments include sand, gravel, silt, and clay, moderately to poorly sorted and moderately to poorly bedded. The Qpf unit is described as Late Pleistocene fan deposits. Gently sloping, fan-shaped

alluvial surfaces where Late Pleistocene age is indicated by slight dissection and/or the development of alfisols. The Qoa unit is described as moderately to deeply dissected alluvial deposits capped by alfisols, ultisols, or soils containing a silica or calcic hardpan.

The Huichica Formation (Pliocene) is mapped on the western edge of the site. The formation is described as fluvial gravel, sand, silt, and clay. Holocene alluvium is mapped within the meandering, channelized path of the unnamed creek that extends into the site.

Seismicity

The term *seismicity* describes the effects of seismic waves that are radiated from an earthquake as it ruptures. While most of the energy released during an earthquake results in the permanent displacement of the ground, as much as 10 percent of the energy may dissipate immediately in the form of seismic waves. The probability of one or more earthquakes of magnitude 6.7 (Richter scale) or higher occurring in the project area has been evaluated by the United States Geological Survey (USGS). Based on the results of the USGS evaluation, there is a 63 percent likelihood that such an earthquake event will occur in the Bay Area between 2007 and 2036. The faults with the greater probability of movement with a magnitude of 6.7 or higher earthquake are the Hayward Fault at 27 percent, the San Andreas Fault at 21 percent, and the Calaveras Fault at 11 percent. To understand the implications of seismic events, a discussion of faulting and seismic hazards follows.

Faulting

Faults form in rocks when stresses overcome the internal strength of the rock, resulting in a fracture. Large faults develop in response to large, regional stresses operating over a long time, such as those stresses caused by the relative displacement between tectonic plates. According to the elastic rebound theory, these stresses cause strain to build up in the earth's crust until enough strain has built up to exceed the strength along a fault and cause a brittle failure. The slip between the two stuck plates or coherent blocks generates an earthquake. Following an earthquake, strain will build once again until the occurrence of another earthquake. The magnitude of slip is related to the maximum allowable strain that can be built up along a particular fault segment. The greatest build up in strain that is due to the largest relative motion between tectonic plates or fault blocks over the longest period of time will generally produce the largest earthquakes. The distribution of these earthquakes is a study of much interest for both hazard prediction and analysis of active deformation of the earth's crust. Deformation is a complex process, and strain caused by tectonic forces is not only accommodated through faulting but also by folding, uplift, and subsidence, which can be gradual or in direct response to earthquakes.

Faults are mapped to determine earthquake hazards since they occur where earthquakes tend to recur. A historic plane of weakness is more likely to fail under stress and strain than a previously unbroken block of crust. Faults are, therefore, a prime indicator of past seismic activity, and faults with recent activity are presumed to be the best candidates for future earthquakes. However, since slip is not always accommodated by faults that intersect the surface along traces, and since the orientation of stresses and strain in the crust can shift, predicting the location of future earthquakes is complicated. Earthquakes sometimes occur in areas with previously undetected faults or along faults previously thought inactive.

The West Napa, Green Valley, and Rogers Creek are the three faults closest to American Canyon. These faults and their characteristics are summarized in Table 3.5-1 and shown on Exhibit 3.5-1.

Table 3.5-1: Fault Summary

Fault	Type	Relationship to Project Site		Maximum Credible Earthquake (magnitude)
		Direction	Distance (miles)	
West Napa	Normal-Oblique	—	<0.1	6.50
Green Valley	Right-Lateral Strike-Slip	East	7.4	6.50
Rogers Creek	Right-Lateral Strike-Slip	Southwest	8.1	7.00
Source: Cornerstone Earth Group 2017.				

West Napa Fault

The West Napa Fault begins under San Pablo Bay and travels north through American Canyon and up the west side of the Napa Valley to the vicinity of Saint Helena. The West Napa Fault is designated an Alquist-Priolo Special Study Area. On August 24, 2014, a magnitude 6.0 earthquake (known as the South Napa Earthquake) occurred on the West Napa Fault, the epicenter of which was approximately 1 mile from the project site. Prior to the 2014 South Napa Earthquake, the last major seismic event on the West Napa Fault was a magnitude 5.2 temblor whose epicenter was near Yountville in September 2000.

Exhibit 3.5-2 depicts the location of the West Napa Fault in relation to the project site. As shown in the exhibit, the fault and Special Study Area overlap with the western portion (Phase 2) of the project site.

Seismic Hazards

Seismicity describes the effects of seismic waves that are radiated from an earthquake as it ruptures. While most of the energy released during an earthquake results in the permanent displacement of the ground, as much as 10 percent of the energy may dissipate immediately in the form of seismic waves. To understand the implications of seismic events, a discussion of faulting and seismic hazards is provided below.

Seismic hazards pose a substantial danger to property and human safety and are present because of the risk of naturally occurring geologic events and processes impacting human development. Therefore, the hazard is influenced as much by the conditions of human development as by the frequency and distribution of major geologic events. Seismic hazards present in California include ground rupture along faults, strong seismic shaking, liquefaction, ground failure, landsliding, and slope failure.

Fault Rupture

Fault rupture is a seismic hazard that affects structures sited above an active fault. The hazard from fault rupture is the movement of the ground surface along a fault during an earthquake. Typically,

this movement takes place during the short time of an earthquake, but it also can occur slowly over many years in a process known as creep. Most structures and underground utilities cannot accommodate the surface displacements of several inches to several feet commonly associated with fault rupture or creep.

Following the August 24, 2014, seismic event on the West Napa Fault, fault rupture was observed on two Napa County Airport taxiways and various roadways in Napa County, including State Route 121 and Old Sonoma Road.

Ground Shaking

The severity of ground shaking depends on several variables, such as earthquake magnitude, epicenter distance, local geology, thickness, seismic wave-propagation properties of unconsolidated materials, groundwater conditions, and topographic setting. Ground shaking hazards are most pronounced in areas near faults or with unconsolidated alluvium.

Based on observations of damage from recent earthquakes in California (e.g., San Fernando 1971, Whittier-Narrows 1987, Landers 1992, Northridge 1994), ground shaking is responsible for 70 to 100 percent of all earthquake damage. The most common type of damage from ground shaking is structural damage to buildings, which can range from cosmetic stucco cracks to total collapse. The overall level of structural damage from a nearby large earthquake would likely be moderate to heavy, depending on the characteristics of the earthquake, the type of ground, and the condition of the building. Besides damage to buildings, strong ground shaking can cause severe damage from falling objects or broken utility lines. Fire and explosions are also hazards associated with strong ground shaking.

During the 2014 South Napa Earthquake, the USGS instrument readings at monitoring sites in Napa and Vallejo reported peak ground acceleration values ranging from 19.8 to 40.7 percent of gravity, which corresponds to “strong” and “very strong” ground shaking. Following the earthquake, more than 200 persons sought treatment at local hospitals, more than 150 buildings were “red tagged,”¹ and numerous utility lines experienced ruptures or leaks that disrupted service.

Ground Failure

Ground failure includes liquefaction, the liquefaction-induced phenomena of lateral spreading, and lurching.

Liquefaction is a process by which sediments below the water table temporarily lose strength during an earthquake and behave as a viscous liquid rather than a solid. Liquefaction is restricted to certain geologic and hydrologic environments, primarily recently deposited sand and silt in areas with high groundwater levels. The process of liquefaction involves seismic waves passing through saturated granular layers, distorting the granular structure, and causing the particles to collapse. This causes the granular layer to behave temporarily as a viscous liquid, resulting in liquefaction.

¹ A red-tagged building is considered uninhabitable without further assessment or repair under the California Building Standards Code.

Liquefaction can cause the soil beneath a structure to lose strength, which may result in the loss of foundation-bearing capacity. This loss of strength commonly causes the structure to settle or tip. Loss of bearing strength can also cause light buildings with basements, buried tanks, and foundation piles to rise buoyantly through the liquefied soil.

Lateral spreading is lateral ground movement, with some vertical component, caused by liquefaction. In effect, the soil rides on top of the liquefied layer. Lateral spreading can occur on relatively flat sites with slopes less than 2 percent, under certain circumstances, and can cause ground cracking and settlement.

Lurching is the movement of the ground surface toward an open face when the soil liquefies. An open face could be a graded slope, stream bank, canal face, gully, or other similar feature.

Landslides and Slope Failure

Landslides and other forms of slope failure form in response to the long-term geologic cycle of uplift, mass wasting, and disturbance of slopes. Mass wasting refers to a variety of erosional processes from gradual downhill soil creep to mudslides, debris flows, landslides, and rock fall—processes that are commonly triggered by intense precipitation, which varies according to climactic shifts.

Often, various forms of mass wasting are grouped together as landslides, which are generally used to describe the downhill movement of rock and soil.

Geologists classify landslides into several different types that reflect differences in the type of material and type of movement. The four most common types of landslides are translational, rotational, earth flow, and rock fall. Debris flows are another common type of landslide similar to earth flows, except that the soil and rock particles are coarser. Mudslide is a term that appears in non-technical literature to describe a variety of shallow, rapidly moving earth flows.

Surface Profile/Geomorphology

The project site contains flat topography and ground cover vegetation. There are few exposures of natural earth materials at the subject site except for local erosion scars on sloping ground within the central trough and stream banks of the unnamed creek near the northern edge of the site. At the time of the reconnaissance the site was undeveloped and being used for livestock pasture. Grasses and weeds exist across the ground surface. The central portion of the site is crossed north to south by a seasonal creek that has resulted in subtle depressions accented by wetland vegetation. A topographic rise on the southwest corner of the site corresponds to area where the published maps show the Huichita Formation forming an oblong outcrop at the ground surface.

Site reconnaissance revealed geomorphic features suggesting the presence of fault surface traces, including subtle linear topographic depressions along the northerly trending creek adjacent to the north property line, a dextrally offset drainage, and linear edge along the west edge of wetlands.

Subsurface Profile

Geologic Units

The project site, the property to the south through which the utility lines would be extended, and the pump station site are underlain by Late Pleistocene fan deposits bordered by two younger geologic units: Holocene alluvium and Holocene alluvial fan sentiments.

Native Soils

Soil mapping by the United States Department of Agriculture Natural Resources Conservation Service indicates that the project site consists mostly of Haire loam, 2-9 percent slopes; smaller areas of Clear Lake clay drained, 0-2 percent slopes; and Haire clay loam, 2-9 percent slopes. The characteristics of the three native soils are summarized in Table 3.5-2. Note that fill has been placed on-site and is not reflected in Table 3.5-2.

Table 3.5-2: Native Soils Summary

Soil	Parent Material	Landform	Constituents	Drainage Class
Haire loam, 2-9 percent slopes	Alluvium derived from sedimentary rock	Alluvial fans	Loam; sandy clay loam; clay; sandy clay	Moderately well
Clear Lake clay, drained, 0-2 percent slopes	Basin alluvium derived from igneous, metamorphic, and sedimentary rock	Basin floors	Clay	Poor
Haire clay loam, 2-9 percent slopes	Alluvium derived from sedimentary rock	Alluvial fans	Loam; sandy clay loam; clay; sandy clay	Moderately well
Source: Natural Resources Conservation Service 2021.				

Soil Borings

Wallace Kuhl conducted 52 soil borings in 2020 to evaluate the subsurface profile. The borings indicated that the project site is underlain by moderate-to-high plasticity, stiff-to-hard lean clay to depths of 5 to 10 feet below ground surface. Groundwater was encountered in six borings at depths ranging from 12 to 20 feet below ground surface. Wallace Kuhl's 2020 findings were consistent with Cornerstone Earth Group's 2017 investigation.

Paleontological Resources

The surface of the project site consists of Holocene fan deposits (Qf), Holocene–Pleistocene fan deposits (Qpf), early to middle Pleistocene fan or terrace deposits (Qoa), and the Pliocene Huichica Formation (Th). Also in the surrounding 0.5-mile radius (dashed outline) are modern artificial fill (af, afbm), Holocene–Pleistocene landslide deposits (Qls), the Plio-Pleistocene Petaluma Formation (Tsp), the Pliocene Sonoma Volcanics andesite (Tsv), and the Cretaceous Great Valley Sequence (Kgv). Modern and Holocene deposits are too young to be fossiliferous, whereas andesite is a nonfossiliferous volcanic rock. All of the other units have the potential to yield significant paleontological resources.

3.5.3 - Regulatory Framework

Federal

National Earthquake Hazards Reduction Program

The National Earthquake Hazards Reduction Program (NEHRP) was established by the United States Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law 95–124. In establishing the NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early warning systems, coordinated emergency preparedness plans, and public education and involvement programs. The four basic goals remain unchanged:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods and their use.
- Improve the understanding of earthquakes and their effects.

Several key federal agencies contribute to earthquake mitigation efforts. There are four primary NEHRP agencies:

- National Institute of Standards and Technology of the Department of Commerce
- National Science Foundation
- USGS of the Department of the Interior
- Federal Emergency Management Agency (FEMA) of the Department of Homeland Security

Implementation of NEHRP priorities is accomplished primarily through original research, publications, and recommendations to assist and guide state, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) permit program, authorized by Section 402(p) of the federal Clean Water Act, controls water pollution by regulating point sources, such as construction sites and industrial operations that discharge pollutants into waters of the United States. A Storm Water Pollution Prevention Plan (SWPPP) is required to control discharges from a project site, including soil erosion, to protect waterways. A SWPPP describes the measures or practices to control discharges during both the construction and operational phases of the project. A SWPPP identifies project design features and structural and nonstructural Best Management Practices (BMPs) that will be used to control, prevent, remove, or reduce stormwater pollution from the site, including sediment from erosion.

State Regulations

California Building Standards Code

The 2019 California Building Code is another name for the body of regulations known as the California Code of Regulations, Title 24, Part 2, which is a portion of the California Building Standards Code. The California Building Code incorporates by reference the International Building Code requirements with necessary California amendments. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards.

Compliance with the California Building Code requires (with very limited exceptions) that structures for human occupancy be designed and constructed to resist the effects of earthquake motions. The Seismic Design Category for a structure is determined in accordance with either California Building Code Section 1613—Earthquake Loads or the American Society of Civil Engineers Standard No. 7-05, Minimum Design Loads for Buildings and Other Structures. In brief, based on the engineering properties and soil-type of soils at a proposed site, the site is assigned a Site Class ranging from A to F. The Site Class is then combined with Spectral Response (ground acceleration induced by earthquake) information for the location to arrive at a Seismic Design Category ranging from A to D, of which D represents the most severe conditions. The classification of a specific site and related calculations must be determined by a qualified Geotechnical Engineer and are site-specific.

Finally, the California Building Code requires that a geotechnical investigation be prepared for all new buildings that are 4,000 square feet or larger, as well as for smaller buildings if they meet certain criteria. The geotechnical investigation must be prepared by a California registered Geotechnical Engineer and address the classification and investigation of the soil, including requirements for geotechnical designs necessary to meet standards for reducing exposure to geological hazards.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code [PRC] Sections 2621 to 2630) was passed in 1972 to provide a statewide mechanism for reducing the hazard of surface fault rupture to structures used for human occupancy. The main purpose of the Act is to prevent the siting of buildings used for human occupancy across the traces of active faults. It should be noted that the Act addresses the potential hazard of surface fault rupture and is not directed toward other earthquake hazards, such as seismically induced ground shaking or landslides.

The law requires the State Geologist to identify regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and to depict these zones on topographic base maps, typically at a scale of 1 inch to 2,000 feet. Earthquake Fault Zones vary in width, although they are often 0.75-mile wide. Once published, the maps are distributed to the affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. With the exception of single-family wood-frame and steel-frame dwellings that are not part of a larger development (i.e., four units or more), local agencies are required to regulate development within the mapped zones. In general, construction within 50 feet of an active fault zone is prohibited.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (PRC §§ 2690–2699.6), which was passed in 1990, addresses earthquake hazards other than surface fault rupture. These hazards include strong ground shaking, earthquake-induced landslides, liquefaction, or other ground failures. Much like the Alquist-Priolo Earthquake Fault Zoning Act discussed above, these seismic hazard zones are mapped by the State Geologist to assist local government in the land use planning process. The Act states, “It is necessary to identify and map seismic hazard zones in order for cities and counties to adequately prepare the safety element of their general plans and to encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety.” The Act also states, “Cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard.”

City of American Canyon

General Plan

The City of American Canyon General Plan sets forth the following guiding and implementing policies relevant to geology, soils, and seismicity:

- Goal 9** Reduce the potential level of death, injury, property damage, economic and social dislocation (i.e., business closures and homelessness due to structural damage) and disruption of vital services that could result from earthquake damage.
- Goal 9C** Ensure that seismic, geologic, and soils hazards that might affect areas designated for human use or habitation are properly mitigated or avoided entirely prior to development.
- Objective 9.1** Protect life, ensure public safety, substantially reduce the damage to and ensure the orderly evacuation of building occupants following a seismic event.
- Policy 9.1.1** Promote the collection of relevant data on fault location and the history of fault displacement as a basis for future refinement of fault zone policies and development standards. Particular attention should be paid to the West Napa Fault that is generally depicted in Figure 9-1 and should be evaluated in conjunction with proposed development. Based on predevelopment studies, limitations on new development shall be imposed if necessary in the identified fault areas.
- Policy 9.1.2** Implement mandatory development restrictions and investigation requirements (by the state, under the Alquist-Priolo Act, or by the City) on that portion of the West Napa Fault zone located within American Canyon and its Planning Area.
- Policy 9.1.3** Require that any building intended to have occupancy be located at least 50 feet from either side of an active or potentially active fault.
- Objective 9.2** Protect health and life safety, and reduce the level of potential property damage from the adverse effects of strong seismic ground shaking by implementing effective, state-of-the-art standards for seismic design of structures in the City.

- Policy 9.2.1** Require that development be designed in accordance with seismic requirements of the Uniform Building Code.
- Objective 9.3** Protect life and essential lifelines (e.g., gas, electricity, water), reduce the risk of property damage due to liquefaction, and promote the collection of more complete information on liquefaction susceptibility throughout the Planning Area.
- Policy 9.3.1** A void development in areas with known liquefaction risk. If these areas cannot be avoided, require a qualified geologist, hydrologist, or civil engineer to determine the liquefaction potential at proposed development sites.
- Policy 9.3.2** Require the submittal of liquefaction mitigation plans for proposed developments located in areas determined to have a high level of liquefaction risk.
- Objective 9.4** Protect life, ensure safety, and substantially reduce the potential level of property damage from landslides, mudflows, slope failures and soil hazards. Promote the collection and utilization of more complete information on slope instability potential throughout the City and Planning Area.
- Policy 9.4.5** Review proposals for new development and' expansion of existing development in areas that are susceptible to collapsible or expansive soils and require adequate mitigation of these hazards.

Municipal Code

American Canyon Municipal Code, Chapter 16.02 adopts the California Building Code; as such, all new construction within the city limits is required to adhere to its seismic safety standards. The City of American Canyon Community Development Department is responsible for the administration and enforcement of the Building Code.

3.5.4 - Methodology

This analysis in this section is based on the Geotechnical Engineering Report prepared by Wallace Kuhl & Associates in November 2020 and the Geological Fault Investigation prepared by Cornerstone Earth Group in November 2017. Both reports are provided in Appendix E.

Wallace Kuhl drilled 52 borings on the project site in September and October 2020. The soil attributes of the borings were recorded, including moisture, density, and unconfined compressive strength. Wallace Kuhl subsequently laboratory tested five of the boring samples to determine additional attributes, including plasticity index and R-value. The Geotechnical Engineering Report provided recommendations for grading, soil engineering, and construction practices.

Cornerstone Earth Group prepared a fault investigation for proposed utility pipelines that would cross the western portion of project site where the West Napa Fault is present. Cornerstone excavated three trenches ranging from 215 to 394 feet in length to depths of 7.5 to 9.5 feet below ground surface. Exhibit 3.5-3 depicts the locations of the trenches. A certified engineering geologist assessed each trench documented the geologic conditions of each trench to identify the location of

the West Napa Fault. The Geological Fault Investigation provided recommendations for pipeline construction practices.

FirstCarbon Solutions (FCS) also obtained information about faults and seismic hazards from sources including the USGS, the United States Department of Agriculture, and the City of American Canyon General Plan.

At the request of FCS, Dr. Kenneth Finger, Consulting Paleontologist, conducted a records search of the University of California Museum of Paleontology database in January 2021. The query yielded no records of vertebrate or plant localities in Napa County.

3.5.5 - Thresholds of Significance

Appendix G to the California Environmental Quality Act (CEQA) Guidelines is a sample Initial Study Checklist that includes questions for determining whether impacts related to geology, soils, and seismicity are significant. These questions reflect the input of planning and environmental professionals at the Governor's Office of Planning and Research (OPR) and the California Natural Resources Agency, based on input from stakeholder groups and experts in various other governmental agencies, nonprofits, and leading environmental consulting firms. As a result, many lead agencies derive their significance criteria from the questions posed in Appendix G. The City has chosen to do so for this project. Thus, the proposed project would have a significant effect if it would:

- a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving:
 - i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42);
 - ii. Strong seismic ground shaking;
 - iii. Seismic-related ground failure, including liquefaction;
 - iv. Landslides;
- b) Result in substantial soil erosion or the loss of topsoil;
- c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;
- 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 (refer to Section 7, Effects Found not to be Significant); or
- f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

3.5.6 - Project Impacts and Mitigation Measures

This section discusses potential impacts associated with the proposed project and provides mitigation measures where necessary. The analysis below has been written against the backdrop of CEQA case law addressing the scope of analysis required in Environmental Impact Reports (EIRs) for potential impacts resulting from existing environmental hazards found at the site or in the vicinity of a site for a proposed project. In *California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal.4th 369, 377, the California Supreme Court held that “agencies subject to CEQA generally are *not* required to analyze the impact of existing environmental conditions on a project’s future users or residents.” (Italics added.) The court reasoned that “ordinary CEQA analysis is concerned with a project’s impact on the environment, rather than with the environment’s impact on a project and its users or residents.” (*Id.* at p. 378.)

The court did not hold, however, that CEQA never requires consideration of the effects of existing environmental conditions on the future occupants or users of a proposed project. The circumstances in which such conditions may be considered are narrow: “when a proposed project *risks exacerbating* those environmental hazards or conditions that already exist, an agency must analyze the potential impact of such hazards on future residents or users. In those specific instances, it is the project’s impact on the environment—and not the environment’s impact on the project—that compels an evaluation of how future residents or users could be affected by exacerbated conditions.” (*Id.* at pp. 377-378, italics added.)

To help readers understand how to conduct impact analysis in light of these general principles, the court provided an example, which, it said, “may be illuminating. Suppose that an agency wants to locate a project next to the site of a long-abandoned gas station. For years, that station pumped gasoline containing methyl tertiary-butyl ether (MTBE), an additive—now banned by California—that can seep into soil and groundwater. [Citations.] Without any additional development in the area, the MTBE might well remain locked in place, an existing condition whose risks—most notably the contamination of the drinking water supply—are limited to the gas station site and its immediate environs. But by virtue of its proposed location, the project threatens to disperse the settled MTBE and thus exacerbate the existing contamination. The agency would have to evaluate the existing condition—here, the presence of MTBE in the soil—as part of its environmental review. Because this type of inquiry still focuses on the project’s impacts on the environment—how a project might worsen existing conditions—directing an agency to evaluate how such worsened conditions could affect a project’s future users or residents is entirely consistent with this focus and with CEQA as a whole.” (*Id.* at p. 389.)

Seismic Hazards

Impact GEO-1: **The proposed project may expose people or structures to potential substantial adverse effects associated with seismic hazards.**

Impact Analysis

This impact evaluates potential exposure to seismic hazards, including fault rupture, strong ground shaking, ground failure and liquefaction, and landslides, and addresses whether the project could exacerbate any such hazards. Each issue is discussed separately.

Fault Rupture

Phase 1

There are no active earthquake faults within Phase 1. For these reasons, Phase 1 of the proposed project would not be subject to fault rupture during a seismic event nor would it exacerbate exposure to fault rupture hazards. Impacts in this regard would be less than significant.

Phase 2

The West Napa Fault crosses through the western portion of Phase 2. Cornerstone Earth Group conducted a Geological Fault Investigation in 2017 that identified the precise location of the West Napa Fault within Phase 2 of the project site. Pursuant to State law, a 50-foot setback must be established from the fault to the nearest building. Mitigation Measure (MM) GEO-1a requires the applicant to prepare and submit plans for Phase 2, when building permits are sought, demonstrating the required setbacks. The establishment of the setbacks would ensure that the proposed project does not exacerbate exposure to fault rupture hazards. The implementation of this mitigation measure would ensure that the proposed project is not exposed to fault rupture. Impacts would be less than significant.

Strong Ground Shaking

Phases 1 and 2

Phase 1 is located in a seismically active region of California and is susceptible to strong ground shaking during a seismic event.

A design-level geotechnical report for the proposed project would be prepared by the time building permits are sought. Such a report would provide recommendations on the appropriate level of soil engineering and building design necessary to minimize ground shaking hazards. Accordingly, MM GEO-1b is proposed, requiring the applicant to submit such a study to the City of American Canyon for review and approval. Standard soil engineering and building design practices would include standards for foundations and structural support of buildings to ensure that they withstand strong ground shaking during a seismic event and avoid the exacerbation of exposure to such hazards. The implementation of this mitigation measure would ensure that the proposed project is not exposed to strong ground shaking hazards. Impacts would be less than significant.

Ground Failure and Liquefaction

Phases 1 and 2

The Geotechnical Engineering Report determined that the project site is underlain by high plasticity soils, which are considered too stiff and dense to be susceptible to liquefaction. Thus, the proposed project would not be susceptible to ground failure, liquefaction, or liquefaction-related phenomena. Thus, the proposed project would not exacerbate exposure to such hazards. Impacts would be less than significant.

Landslides

Phases 1 and 2

The project site contains relatively flat relief, with an approximately 15-foot difference in elevation across the site. There are no slopes near the project site that may be susceptible to landsliding during a seismic event. This precludes the possibility of the proposed project being susceptible to

landsliding. Thus, the proposed project would not exacerbate exposure to such hazards. Impacts would be less than significant.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

- MM GEO-1a** Prior to the issuance of building permits for each Phase 2 structure, the project applicant shall submit plans to the City of American Canyon for review and approval that demonstrate a minimum 50-foot setback between the West Napa Fault and each building. The approved plans shall be incorporated into the proposed project.
- MM GEO-1b** Prior to the issuance of building permits for each Phase 1 and 2 structure, the project applicant shall submit a design-level Geotechnical Investigation to the City of American Canyon for review and approval. The investigation shall be prepared by a qualified engineer and identify grading and building practices necessary to achieve compliance with the latest adopted edition of the California Building Standards Code (CBC) geologic, soils, and seismic requirements, including abatement of expansive soil conditions. The report shall also determine the final design parameters for walls, foundations, foundation slabs, and surrounding related improvements (e.g., utilities roadways, parking lots, and sidewalks). The measures identified in the approved report shall be incorporated into the project plans and all applicable construction-related permits.

Level of Significance After Mitigation

Less than significant impact.

Erosion

Impact GEO-2: The proposed project may result in substantial soil erosion or the loss of topsoil.

Impact Analysis

Phases 1 and 2

The proposed project would involve grading, building construction, paving, and utility installation activities that may cause erosion and sedimentation. This includes construction activities associated with the proposed project. Left unabated, the accumulation of sediment in downstream waterways could result in the blockage of flows, potentially causing increased localized ponding or flooding. As such, MM HYD-1a in Section 3.8, Hydrology and Water Quality, would require the implementation of stormwater quality control measures during construction activities to prevent pollutants from entering downstream waterways. Standard stormwater pollution prevention measures would include implementing structural and nonstructural control measures within and around disturbed areas to prevent soil and pollutants from leaving the project site. Impacts would be less than significant.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

MM HYD-1a Prior to issuance of grading permits for the proposed project, the applicant shall submit to the City of American Canyon for review and approval a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the requirements of the statewide Construction General Permit. The SWPPP shall be designed to address the following objectives: (1) all pollutants and their sources (e.g., runoff), including sources of sediment associated with construction, construction site erosion, and all other activities associated with construction activity, are controlled; (2) where not otherwise required to be under a Regional Water Quality Control Board (RWQCB) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated; (3) site Best Management Practices (BMPs) (e.g., silt fencing, street sweeping, routine inspection, etc.) are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity; and (4) stabilization BMPs are installed to reduce or eliminate pollutants after construction are completed. The SWPPP shall be prepared by a qualified SWPPP developer. The SWPPP shall include the minimum BMPs required for the identified Risk Level. BMP implementation shall be consistent with the BMP requirements in the most recent version of the California Stormwater Quality Association (CASQA) Stormwater Best Management Handbook—Construction or the California Department of Transportation (Caltrans) Stormwater Quality Handbook Construction Site BMPs Manual. The SWPPP shall be implemented during construction.

Level of Significance After Mitigation

Less than significant impact.

Unstable Geologic Location

Impact GEO-3: The proposed project would not be located on an unstable geologic unit or soil.

Impact Analysis

Phases 1 and 2

The stability of the underlying geologic units and soils are functions of their constituents. For example, soils with high organic or fill content would generally be considered unsuitable to support urban development. Likewise, soils that are composed of well-compacted alluvium would generally be considered suitable to support urban development.

The project site is underlain by high plasticity soils. The Geotechnical Engineering Report determined that these soils are too stiff and dense to be susceptible to liquefaction. As such, the proposed project would not be susceptible to or cause landslides, lateral spreading, collapse, ground failure, liquefaction, or liquefaction-related phenomena nor would it exacerbate these existing conditions to the extent they exist in the project vicinity. Impacts would be less than significant.

Level of Significance Before Mitigation

Less than significant impact.

Mitigation Measures

No mitigation is necessary.

Level of Significance After Mitigation

Less than significant impact.

Expansive Soil

Impact GEO-4:	The proposed project may create substantial risks to life or property as a result of expansive soil conditions on the project site.
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Impact Analysis*Phases 1 and 2*

The Geotechnical Engineering Report found that the project site is underlain by soils with high clay content and are therefore capable of being expansive. The design-level Geotechnical Investigation required by MM GEO-1b would outline standard grading and soil engineering practices would abate these potential hazards. Standard grading and soil engineering practices would include replacing native soils with engineered fill that would not possess expansive characteristics. These grading and soil engineering practices would ensure that the proposed project does not exacerbate the existing expansive soil conditions. Thus, the implementation of this mitigation measure would reduce impacts to a level of less than significant.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Implement Mitigation Measure GEO-1b.

Level of Significance After Mitigation

Less than significant impact.

Paleontological Resources or Unique Geologic Features

Impact GEO-5:	The proposed project may directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
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Impact Analysis*Phases 1 and 2*

The surface of the project site consists of Holocene fan deposits (Qf), Holocene–Pleistocene fan deposits (Qpf), early to middle Pleistocene fan or terrace deposits (Qoa), and the Pliocene Huichica Formation (Th). Also in the surrounding 0.5-mile radius (dashed outline) are modern artificial fill (af, afbm), Holocene–Pleistocene landslide deposits (Qls), the Plio-Pleistocene Petaluma Formation (Tsp), the Pliocene Sonoma Volcanics andesite (Tsv), and the Cretaceous Great Valley Sequence (Kgv).

Modern and Holocene deposits are too young to be fossiliferous, whereas andesite is a nonfossiliferous volcanic rock. Additionally, there are no recorded vertebrate or plant localities within Napa County.

For these reasons, the project site is not located in an area that is considered likely to have paleontological resources present. The type of depositional environment at the project site typically does not present favorable conditions for the discovery of paleontological resources. In this context, the project would not result in impacts to paleontological resources. However, if significant paleontological resources are discovered, implementation of MM GEO-5 will reduce this potential impact to a less than significant level. The mitigation measure requires treatment and salvage of resources in accordance Society of Vertebrate Paleontology guidelines. The Society of Vertebrate Paleontology is widely recognized as an authoritative information source for paleontological resources. There are no unique geologic features present on the project site or off-site development areas. Therefore, the proposed project would have less than significant impacts on a unique geologic feature.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

MM GEO-5 If potential fossils are discovered during project implementation, all earthwork or other types of ground disturbance within 100 feet of the find shall stop immediately until a qualified professional Paleontologist can assess the nature and importance of the find. Based on the scientific value or uniqueness of the find, the Paleontologist shall either record the find and recommend that the City of American Canyon allow work to continue or recommend salvage and recovery of the fossil. The Paleontologist shall, if required, propose modifications to the stop-work radius based on the nature of the find, site geology, and the activities occurring on the site. If treatment and salvage is required, recommendations will be consistent with Society of Vertebrate Paleontology guidelines and currently accepted scientific practice. If required, treatment for fossil remains shall include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and, if required, shall also include preparation of a report for publication describing the finds.

Level of Significance After Mitigation

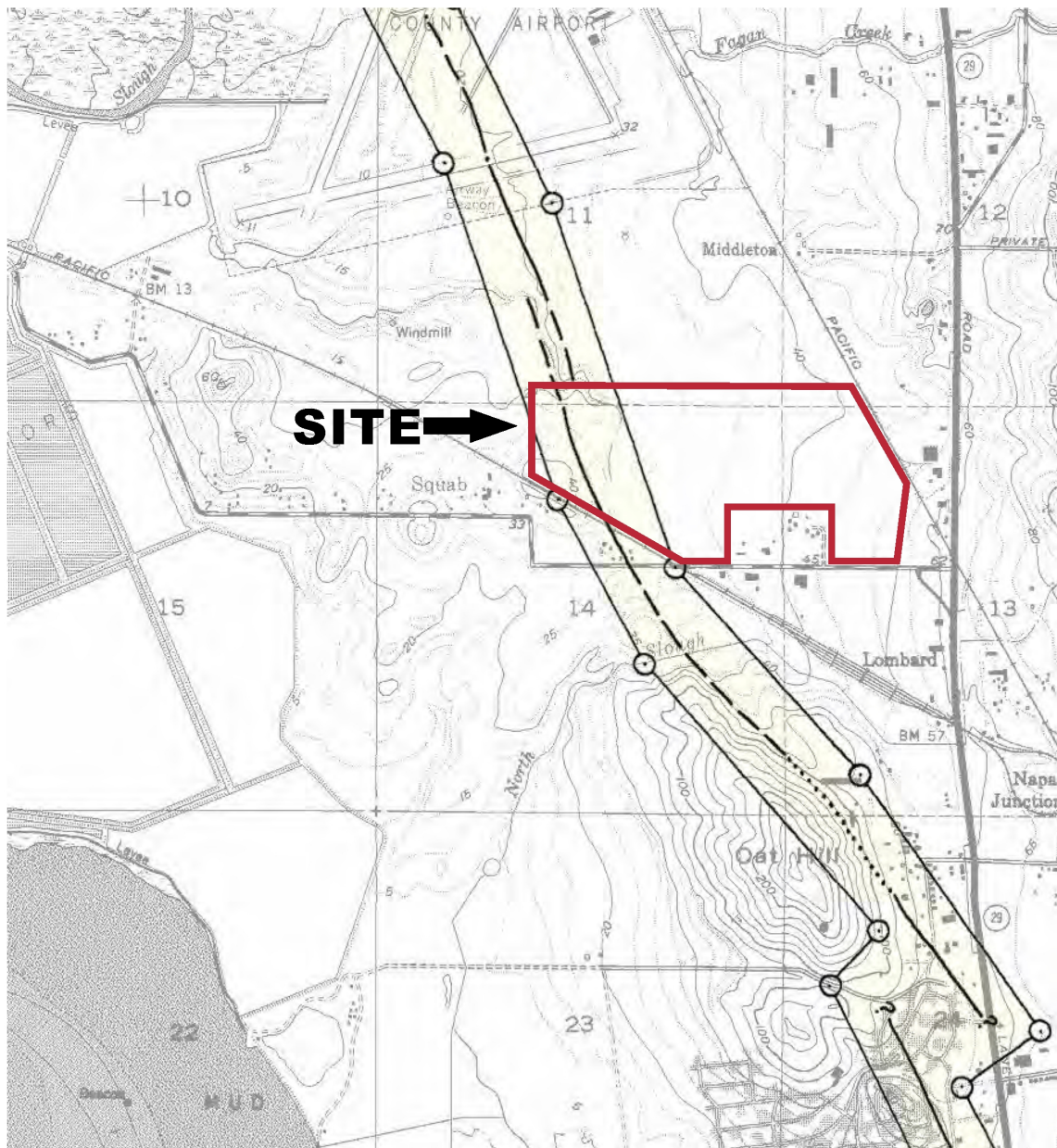
Less than significant impact.

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Source: Cornerstone Earth Group, October 2017.

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MAP EXPLANATION

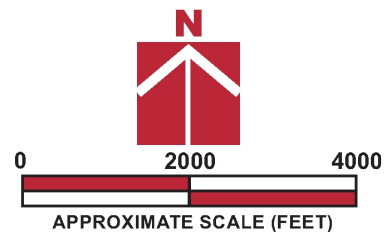
Potentially Active Faults

1906 C
 Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Special Studies Zone Boundaries

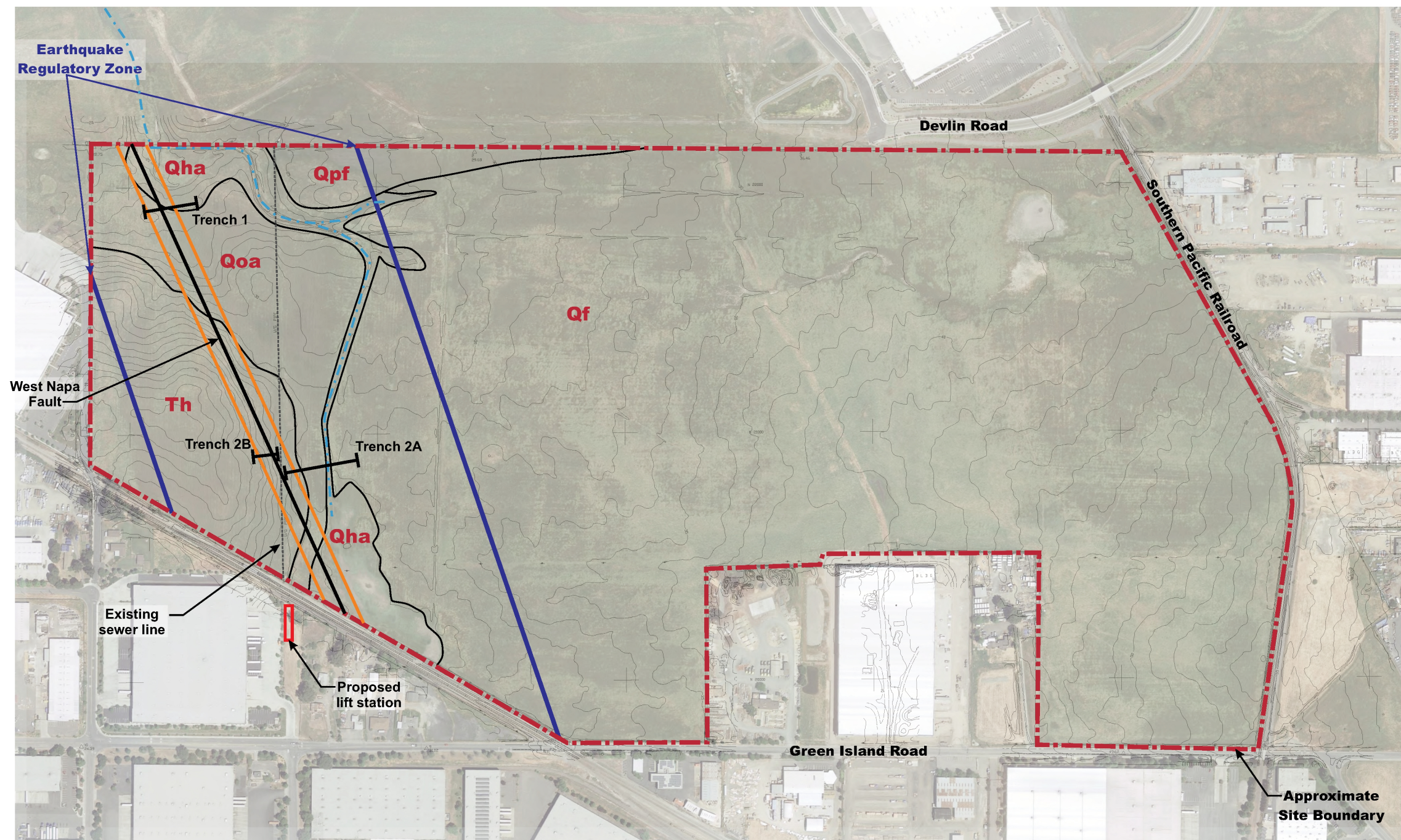
- These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.
- Seaward projection of zone boundary.

Base: State of California, Special Studies Zones. Cutting Wharf Quadrangle



Source: Cornerstone Earth Group, October 2017.

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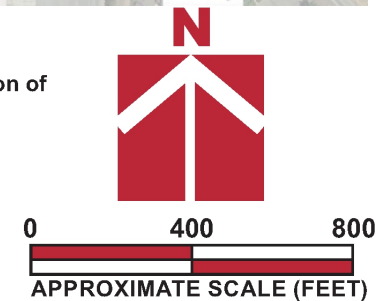


Geologic Units

- Qha** Holocene alluvium, undifferentiated
- Qf** Late Pleistocene to Holocene fan deposits
- Qpf** Late Pleistocene fan deposits
- Qoa** Early to middle Pleistocene fan or terrace deposits
- Th** Huichica Formation (Pliocene)
Fluvial gravel, sand, silt, and clay

Legend

- Approximate location of trench
- Approximate Earthquake Regulatory Zone
- Approximate location of seasonal unnamed creek
- Approximate location of West Napa Fault (this investigation)
- 50 ft setback



Base by Google Earth, dated 5/20/2017
Overlay: Topographical Map, undated

Source: Cornerstone Earth Group, October 2017.

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