4.6 Geology and Soils

This section analyzes the potential physical environmental effects related to seismic hazards, underlying soil characteristics, slope stability, erosion, and paleontological resources within the City of Solvang that could result from implementation of the proposed project.

4.6.1 Setting

a. Geologic Setting

Santa Barbara County is located in the Transverse Ranges geologic province. The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges. As a result, the ground elevation in the Transverse Ranges rises at a faster rate in comparison to other regions on earth. (California Geological Survey [CGS] 2002).

b. Geologic and Seismic Hazards

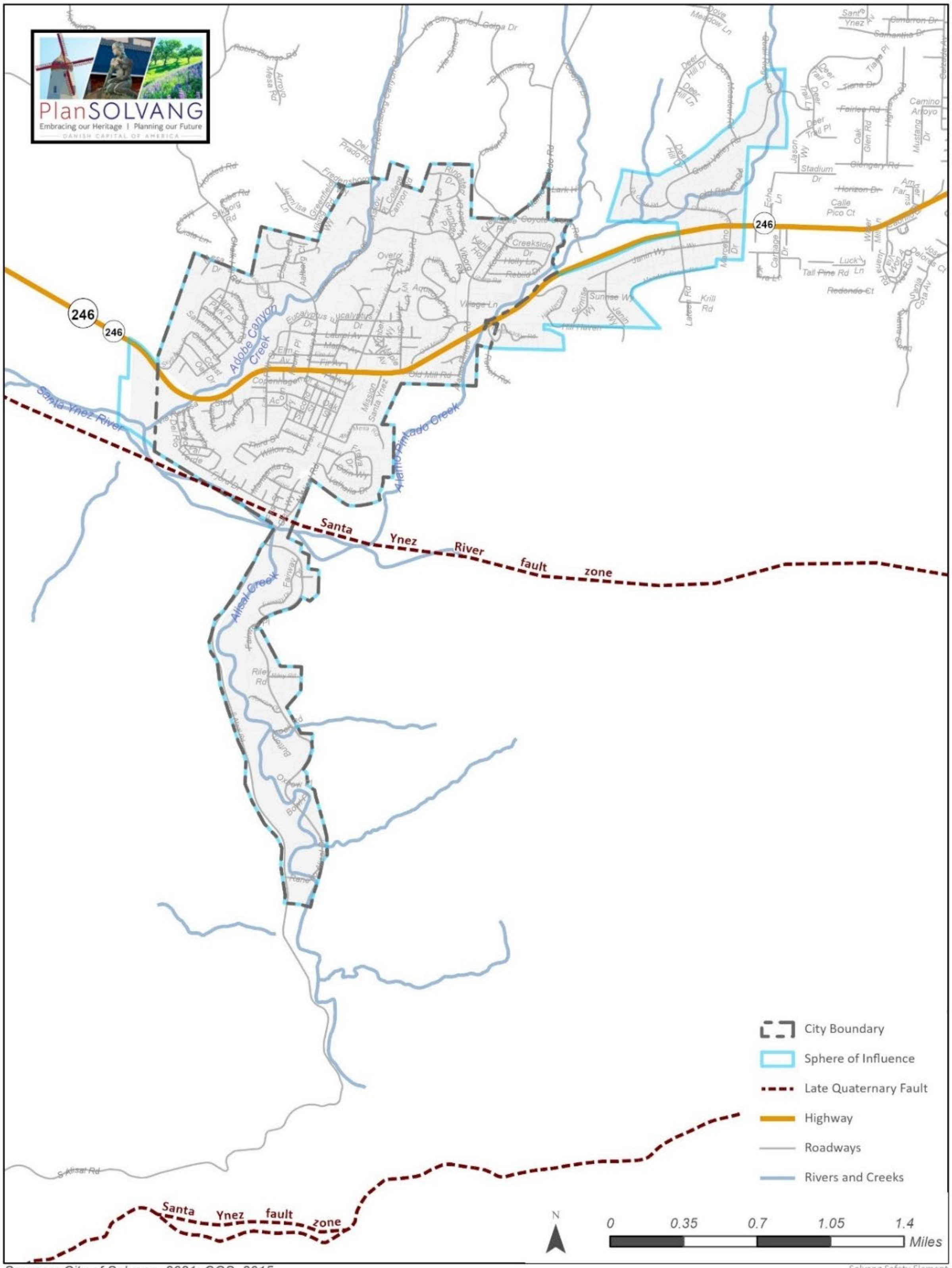
Geologic and seismic hazards are caused by the movement of the earth's surface. The most common geologic or seismic hazards are associated with earthquakes, which cause the earth's surface to move rapidly and the ground to shake. Solvang, much like all of Santa Barbara County, is located in a high seismic activity zone where fault movement primarily occurs along the San Andreas Fault system located approximately seven miles northeast of Santa Barbara County (City of Solvang 2021). The San Andreas Fault system marks the boundary between the Pacific tectonic plate, to the west of the fault zone, and the North American tectonic plate, to the east of the fault zone (United States Geological Survey 2017). The San Andreas Fault system has historically and continues to be capable of producing magnitude 7 earthquakes or higher (United States Geological Survey 2016).

Solvang has experienced several seismic events. The most recent major earthquake in the region occurred on December 22, 2003, when a magnitude 6.5 earthquake struck the central California coast. The event, known as the San Simeon earthquake, occurred approximately seven miles northeast of San Simeon and approximately 95 miles northwest of Solvang. Although the San Simeon earthquake had a more substantial impact on San Luis Obispo County, the event was widely felt throughout Santa Barbara County, including Solvang (City of Solvang 2021).

There are no Alquist-Priolo earthquake fault zones[1] within Solvang (CGS 2023). However, the Santa Ynez River Fault Zone bisects Solvang northeast to southwest. Other active faults within Santa Barbara County with the potential to affect Solvang include the Santa Ynez, Nacimiento, Ozena, Suey, and Little Pine Faults (City of Solvang 2021). Other faults not included in this list, as well as faults located outside of the Solvang region, may be capable of generating earthquakes that could cause damage in Solvang. In addition, there may be unknown faults in the area that could cause substantial ground shaking or fault rupture. Figure 4.6-1 shows the location of earthquake faults

[1] Alquist-Priolo earthquake fault zones are regulatory zones surrounding the surface traces of active faults (ruptured in the last 11,000 years) in California. Wherever an active fault exists, if it has the potential for surface rupture, a structure for human occupancy cannot be placed over the fault and must be a minimum distance from the fault (generally fifty feet).

Figure 4.6-1 Earthquake Faults in Proximity to Solvang



Sources: City of Solvang, 2021; CGS, 2015
Date: April 26, 2022

within one-mile of Solvang. This fault is located approximately 100 feet south of development Site D, identified in the City's adopted 2023-2031 Housing Element.

Fault Rupture

Fault rupture is the movement of the ground surface along a fault line which breaks and displaces rocks along a fault plane during an earthquake. Depending on the type of fault, the movement may be vertical, horizontal, or both. The damage can be severe, as any building or structure that straddles the fault is effectively pulled in two directions at once. However, the damaged area from fault rupture is generally limited to locations on the fault itself. Some earthquakes can occur without causing fault rupture. Such earthquakes are usually small, but some can be much more substantial, such as the 2003 San Simeon earthquake. These events are known as "blind thrust earthquakes." As shown in Figure 4.6-1, the Santa Ynez River Fault Zone, which bisects the city parallel to the Santa Ynez River, has the potential to result in fault rupture within Solvang.

Ground Shaking

Ground shaking occurs when seismic waves cause the ground to shake, resulting in damage to structures. Ground shaking is triggered by seismic activity on faults and is most likely to occur near regional fault lines, as shown on Figure 4.6-1. Both the Santa Ynez River Fault Zone and the Santa Ynez Fault Zone are considered potentially active and are capable of producing sizable, damaging earthquakes characterized by strong seismic ground shaking. Additionally, most of the developed areas in Solvang are located on or within close proximity to alluvial deposits and are at a greater risk for enhanced ground shaking during seismic events. Consequently, these properties have an increased risk of damage caused by ground shaking. Figure 4.6-2 shows the shaking potential of areas within Solvang.

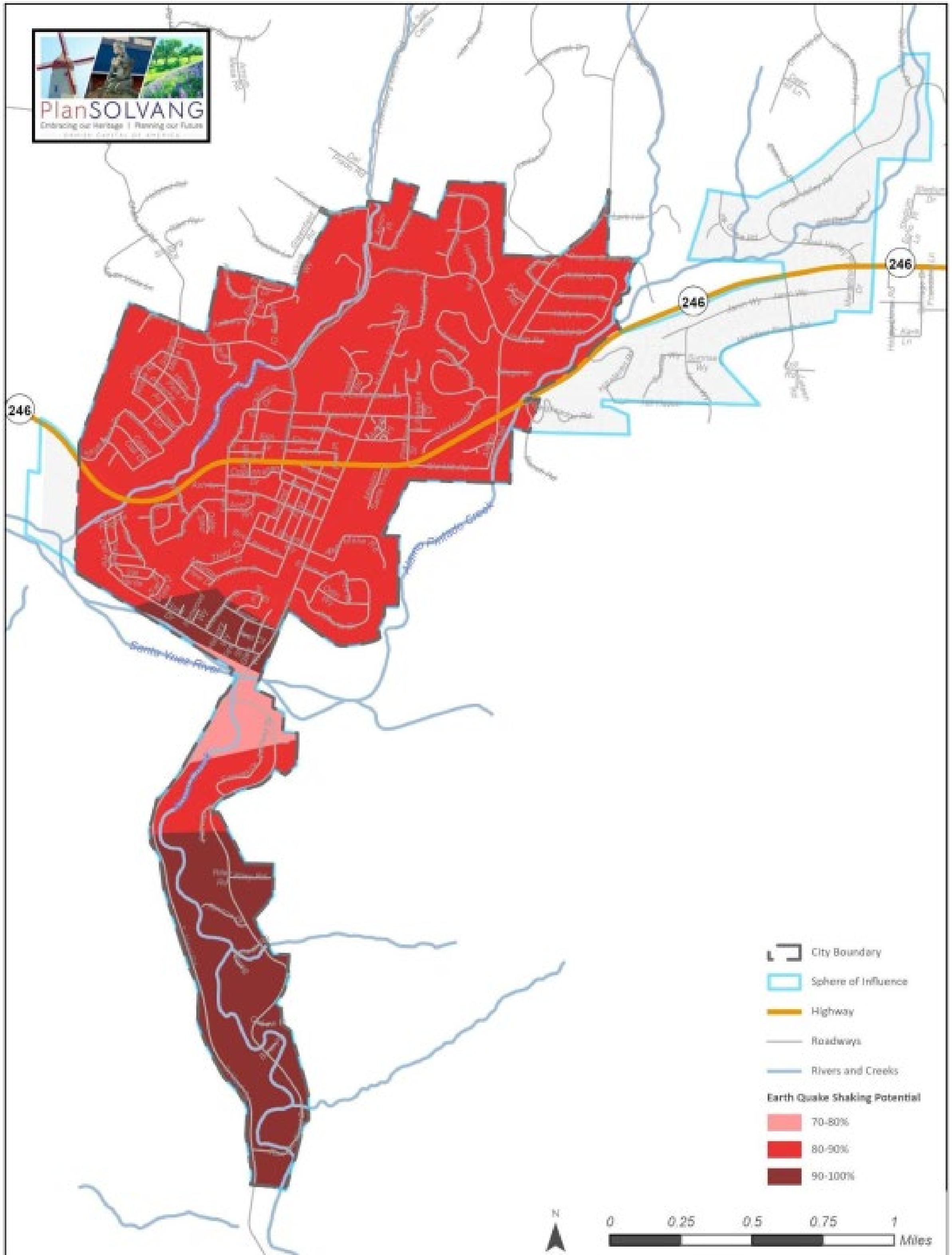
Liquefaction

Liquefaction occurs when loose soil loses strength and behaves like a liquid during an earthquake, creating the potential for structural damage to buildings in the vicinity. The alluvial deposits typically found along the Santa Ynez River and Alamo Pintado Creek also have a high susceptibility for liquefaction (City of Solvang 2021). Properties near the Santa Ynez River are located on alluvium deposits, which have a high susceptibility for liquefaction. However, most of the developed areas in Solvang are located on or within close proximity to alluvial deposits. The potential for liquefaction can exacerbate the overall effects from local and regional seismic events.

Landslides

Landslides can be caused by earthquake shaking resulting in loose material to slide down a slope. Landslide risk is highest adjacent to Adobe Canyon Creek, as shown in Figure 4.6-3. This area, as well as others concentrated throughout the eastern and southern portions of Solvang, are classified as a very high landslide risk. These areas are primarily comprised of open space and adjacent to residential uses. The northern portion of development Site C, identified in the City's adopted 2023-2031 Housing Element, is within a landslide risk area identified by the City.

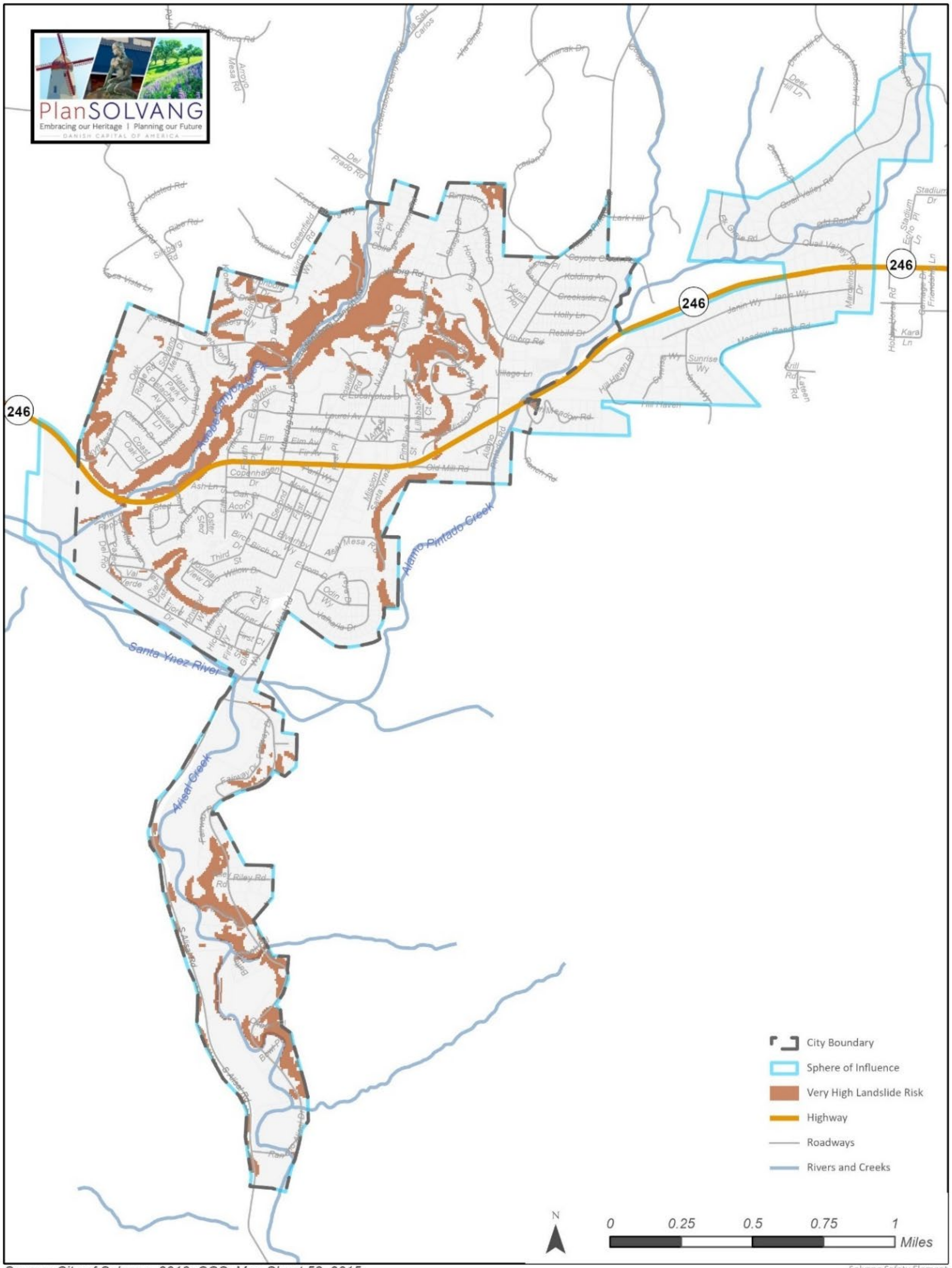
Figure 4.6-2 Ground Shaking Potential



Source: City of Solvang, 2016; USGS, 2021
Date: May 12, 2022

Solvang Safety Element
Fig X Shake Scenario Map

Figure 4.6-3 Landslide Risk in Solvang



Source: City of Solvang, 2016; CGS, Map Sheet 58, 2015
Date: April 26, 2022

Solvang Safety Element
Fig X Landslide Risk

Expansive Soils

Certain soils which include clay materials tend to swell when their moisture content increases and shrink when moisture decreases. As moisture content varies, the resultant shrinking and swelling of expansive soils can cause extensive damage to structures built over such material. Soils underlying Solvang have clay contents ranging from approximately two percent clay to approximately 50 percent clay (United States Department of Agriculture – Natural Resources Conservation Service 2023). In particular, soils in the Planning Area associated with the Positas, Santa Ynez, Tierra, Cropley and Diablo formations typically have a moderate to high shrink-swell potential and are considered expansive. These areas are generally north of Highway 246 in the area east and west of Alamo Pintado Road (City of Solvang 2016). Soils in Solvang are shown in Figure 4.6-4. Descriptions of the soils in Solvang are provided in Table 4.6-1.

Collapsible Soils

Collapsible soils are low density, fine-grained, dominantly granular soils. When these soils become saturated with water, they undergo a rearrangement of their grains, resulting in substantial and rapid settlement under relatively low loads. Therefore, such soils are extremely sensitive to an increase in moisture content caused either by a rise in the groundwater table or by increased surface water infiltration. According to the County of Santa Barbara Comprehensive Plan Safety Element, the only notable case of soil collapse in the County is in the town of New Cuyama (County of Santa Barbara 2015).

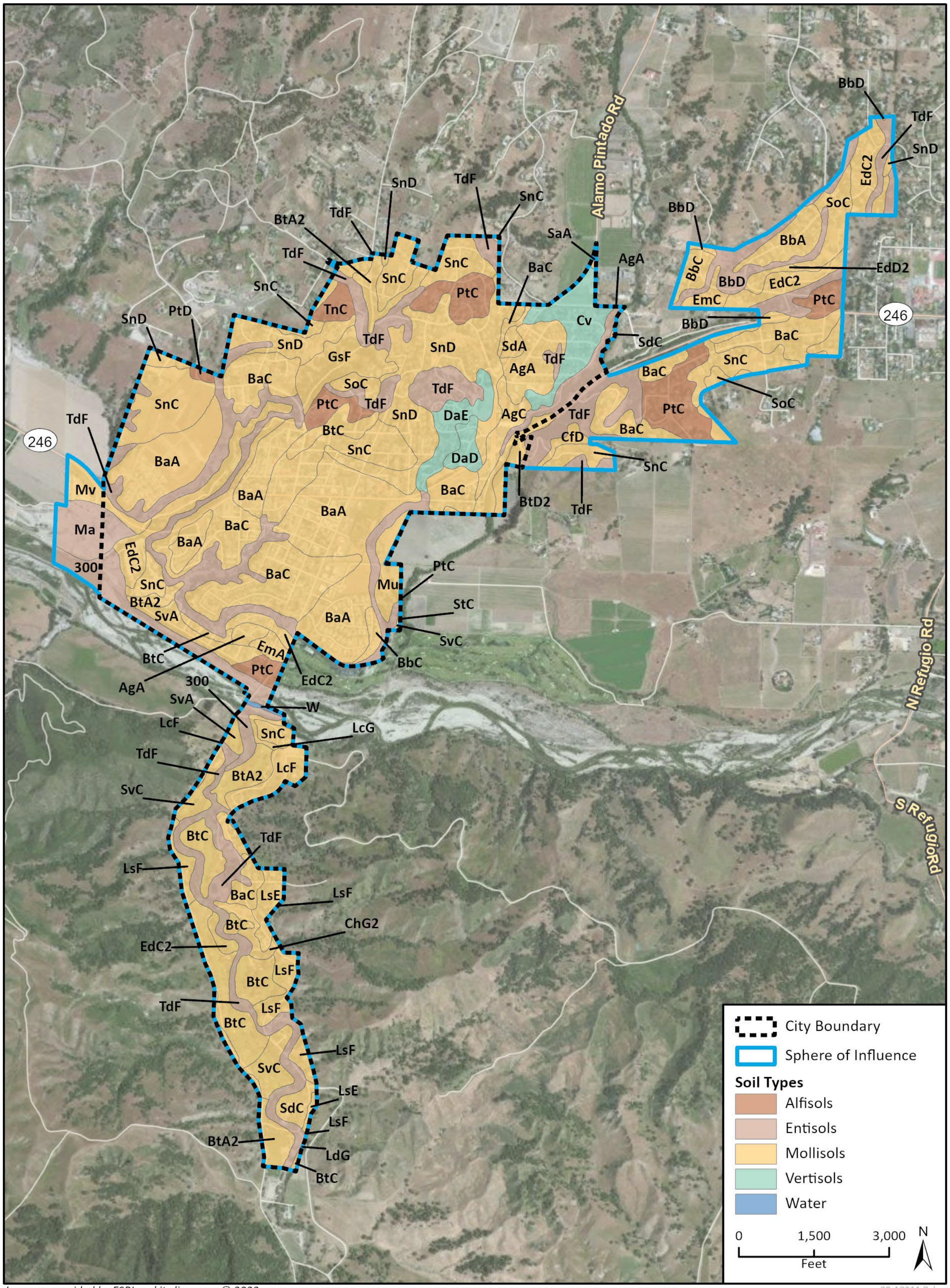
Soil Erosion

Erosion refers to the removal of soil from exposed bedrock surfaces by water or wind. Erosion occurs naturally but is often accelerated by human activities that disturb soil and vegetation. The rate at which erosion occurs is largely a function of climate, soil cover, slope conditions, and inherent soil properties such as texture and structure. Soil units found within the Planning Area generally have a slight to moderate potential for erosion, with erosion potential being generally higher in the hillside areas. Small areas with a severe potential for erosion occur along Adobe Canyon Creek and in the area north of Highway 246 and west of Alamo Pintado Road (City of Solvang 2016).

Lateral Spreading

Lateral spreading is the horizontal movement or spreading of soil toward an open face such as a stream bank, the open side of fill embankments, or the sides of levees. Artificial fill areas which are improperly engineered or which have steep, unstable banks are most likely to be affected by lateral spreading. The potential for lateral spreading is highest in areas where there is a high groundwater table, relatively soft and recent alluvium deposits, and where creekbanks are relatively high. In the Planning Area, these areas are located along the Santa Ynez River, Adobe Canyon Creek, Alisal Creek, and Alamo Pintado Creek (City of Solvang 2016).

Figure 4.6-4 Soils Within Solvang



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Soils data provided by SSURGO Soils Downloader, 2023.

20-10211 Paleo
Fig X Soils Within Solvang

Table 4.6-1 Soil Descriptions in Solvang

Map Unit	Map Unit Name	Geomorphic Description	Soil Order
AgA	Agueda silty clay loam, 0 to 2 percent slopes	alluvial fans, valleys	Mollisols
AgA	Agueda silty clay loam, 0 to 2 percent slopes	alluvial fans, valleys	Mollisols
AgA	Agueda silty clay loam, 0 to 2 percent slopes	alluvial fans, valleys	Mollisols
AgC	Agueda silty clay loam, 2 to 9 percent slopes	alluvial fans, terraces, valleys	Mollisols
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	terraces	Mollisols
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	terraces	Mollisols
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	terraces	Mollisols
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BbA	Ballard gravelly fine sandy loam, 0 to 2 percent slopes	terraces	Mollisols
BbC	Ballard gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BbC	Ballard gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
BbD	Ballard gravelly fine sandy loam, 9 to 15 percent slopes	terraces	Mollisols
BbD	Ballard gravelly fine sandy loam, 9 to 15 percent slopes	terraces	Mollisols
BbD	Ballard gravelly fine sandy loam, 9 to 15 percent slopes	terraces	Mollisols
BbD	Ballard gravelly fine sandy loam, 9 to 15 percent slopes	terraces	Mollisols
BtA2	Botella clay loam, 0 to 2 percent slopes, eroded	alluvial fans, valleys	Mollisols
BtA2	Botella clay loam, 0 to 2 percent slopes, eroded	alluvial fans, valleys	Mollisols
BtA2	Botella clay loam, 0 to 2 percent slopes, eroded	alluvial fans, valleys	Mollisols
BtA2	Botella clay loam, 0 to 2 percent slopes, eroded	alluvial fans, valleys	Mollisols
BtD2	Botella clay loam, 2 to 15 percent slopes, eroded	valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols

Map Unit	Map Unit Name	Geomorphic Description	Soil Order
BtC	Botella clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, benches, terraces, valleys	Mollisols
ChG2	Chamise shaly loam, 30 to 75 percent slopes, eroded	terraces	Mollisols
CfD	Chamise shaly sandy loam, 9 to 15 percent slopes	terraces	Mollisols
300	Corducci and Typic Xerofluvents, 0 to 5 percent slopes, occasionally flooded, MLRA 14	alluvial fans, flood plains, stream terraces, valleys	Entisols
300	Corducci and Typic Xerofluvents, 0 to 5 percent slopes, occasionally flooded, MLRA 14	alluvial fans, flood plains, stream terraces, valleys	Entisols
Cv	Cropley silty clay	flood plains	Vertisols
DaE	Diablo silty clay, 15 to 30 percent slopes	hills, ridges	Vertisols
DaD	Diablo silty clay, 9 to 15 percent slopes	hills, ridges	Vertisols
EmA	Elder loam, 0 to 2 percent slopes, MLRA 14	alluvial fans, alluvial plains, inset fans	Mollisols
EmC	Elder loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains	Mollisols
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	alluvial fans	Mollisols
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	alluvial fans	Mollisols
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	alluvial fans	Mollisols
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	alluvial fans	Mollisols
EdD2	Elder sandy loam, 9 to 15 percent slopes, eroded	alluvial fans	Mollisols
GsF	Gazos clay loam, 30 to 45 percent slopes	hills	Mollisols
LcF	Linne clay loam, 30 to 45 percent slopes	hills	Mollisols
LcF	Linne clay loam, 30 to 45 percent slopes	hills	Mollisols
LcG	Linne clay loam, 45 to 75 percent slopes	hills	Mollisols
LdG	Lodo loam, 30 to 75 percent slopes	hills, mountains	Mollisols
LsE	Los Osos-San Benito clay loams, 15 to 30 percent slopes	hills	Mollisols
LsE	Los Osos-San Benito clay loams, 15 to 30 percent slopes	hills	Mollisols
LsF	Los Osos-San Benito clay loams, 30 to 45 percent slopes	hills	Mollisols
LsF	Los Osos-San Benito clay loams, 30 to 45 percent slopes	hills	Mollisols
LsF	Los Osos-San Benito clay loams, 30 to 45 percent slopes	hills	Mollisols
LsF	Los Osos-San Benito clay loams, 30 to 45 percent slopes	hills	Mollisols
Ma	Made Land		Entisols
Mu	Mocho fine sandy loam, 0 to 2 percent slopes, MLRA 14	alluvial fans, alluvial flats, alluvial plains	Mollisols
Mv	Mocho loam, 0 to 2 percent slopes, MLRA 14	alluvial fans, alluvial plains, flood plains, terraces	Mollisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtC	Positas fine sandy loam, 2 to 9 percent slopes	terraces	Alfisols
PtD	Positas fine sandy loam, 9 to 15 percent slopes	terraces	Alfisols

Map Unit	Map Unit Name	Geomorphic Description	Soil Order
SaA	Salinas loam, 0 to 2 percent slopes, MLRA 14	alluvial fans, alluvial flats, alluvial plains, flood plains, terraces	Mollisols
SdA	Salinas silty clay loam, 0 to 2 percent slopes, MLRA 14	alluvial fans, alluvial flats, alluvial plains, flood plains	Mollisols
SdC	Salinas silty clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, flood plains, terraces	Mollisols
SdC	Salinas silty clay loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, flood plains, terraces	Mollisols
SoC	Santa Ynez clay loam, 2 to 9 percent slopes	terraces	Mollisols
SoC	Santa Ynez clay loam, 2 to 9 percent slopes	terraces	Mollisols
SoC	Santa Ynez clay loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	terraces	Mollisols
SnD	Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	scarp slopes	Mollisols
SnD	Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	scarp slopes	Mollisols
SnD	Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	scarp slopes	Mollisols
SnD	Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	scarp slopes	Mollisols
SvA	Sorrento loam, 0 to 2 percent slopes, MLRA 14	alluvial plains, flood plains	Mollisols
SvA	Sorrento loam, 0 to 2 percent slopes, MLRA 14	alluvial plains, flood plains	Mollisols
SvC	Sorrento loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, scarp slopes, terraces	Mollisols
SvC	Sorrento loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, scarp slopes, terraces	Mollisols

Map Unit	Map Unit Name	Geomorphic Description	Soil Order
SvC	Sorrento loam, 2 to 9 percent slopes, MLRA 14	alluvial fans, alluvial plains, scarp slopes, terraces	Mollisols
StC	Sorrento sandy loam, 2 to 9 percent slopes	alluvial fans	Mollisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TdF	Terrace escarpments, loamy	escarpments	Entisols
TnC	Tierra sandy loam, 2 to 9 percent slopes, MLRA 14	hills, marine terraces, terraces	Alfisols
W	Water	--	Water

Source: SSURGO Soils Downloader 2023

Subsidence

Subsidence refers to the sinking of a large area of ground surface in which material is displaced vertically with little or no horizontal movement. Subsidence originates at great depths below the surface when subsurface pressure is reduced by the natural loss or human withdrawal of fluids (e.g. groundwater, natural gas, or oil), or can occur due to soil compression. Historical evidence of land subsidence in the Santa Ynez Valley is limited, and the Santa Ynez Groundwater Basin is at low risk for subsidence (Dudek 2020).

Paleontological Resources

Paleontological resources, or fossils, are the remains and/or traces of prehistoric life. Significant paleontological resources are fossils or assemblages of fossils that are unique, rare, diagnostically important, or are common but have the potential to provide valuable scientific information for evaluating evolutionary patterns and geologic processes. New or unique specimens can provide new insights into evolutionary history; however, additional specimens of well represented lineages can be equally important for studying evolutionary pattern and process, and evolutionary rates. As such, common fossils, especially vertebrates, may be scientifically important, and therefore are considered highly significant.

Fossils are typically preserved in layered sedimentary rocks and the distribution of fossils is a result of the sedimentary history of the geologic units within which they occur. Fossils occur in a non-continuous and often unpredictable distribution within some sedimentary units, and the potential for fossils to occur within sedimentary units depends on several factors. Although it is not possible to determine whether a fossil will occur in any specific location, it is possible to evaluate the potential for geologic units to contain scientifically significant paleontological resources.

The geology of the region surrounding Solvang was mapped by Sweetkind et al. (2021), who identified 11 geologic units underlying the 2045 General Plan area. The paleontological sensitivity of each of these geologic units has been evaluated according to the following Society of Vertebrate Paleontology (SVP; 2010) paleontological sensitivity scale. The age, lithology, and paleontological sensitivity, of these geologic units are summarized in Table 4.6-2, and their geographic distribution shown in Figure 4.6-5.

Low Sensitivity

In general, the Holocene-aged geologic units (active alluvium, coded as Qac, and alluvial fan and fluvial deposits, coded as Qay) that underlie the topographically lower areas of the 2045 General Plan area (e.g., near and within the Santa Ynez River, Alisal Creek, and Alamo Pintado Creek) have low paleontological sensitivity. These geologic units are generally considered too young (i.e., less than 5,000 years old) to preserve paleontological resources (SVP 2010). Site D is completely underlain by alluvial fan and fluvial deposits, and Sites B and C are partially underlain by alluvial fan and fluvial deposits.

These Holocene-aged geologic units are likely underlain by older geologic units that may have high paleontological sensitivity (see Table 4.6-2). The depth at which these units occur depends on local conditions and development history of the site, so it is likely highly variable throughout the Planning Area.

The Tranquilon Volcanics (coded as Ttv) are an igneous geologic unit that has low paleontological sensitivity that is found in a small area near the mouth of Alisal Creek. Igneous rocks generally do not preserve paleontological resources, but the Tranquilon Volcanics consist of tuff (i.e., ashfall deposits), which are a type of igneous rock known to produce paleontological resources (SVP 2010). However, no fossils are yet known from the Tranquilon Volcanics.

High Sensitivity

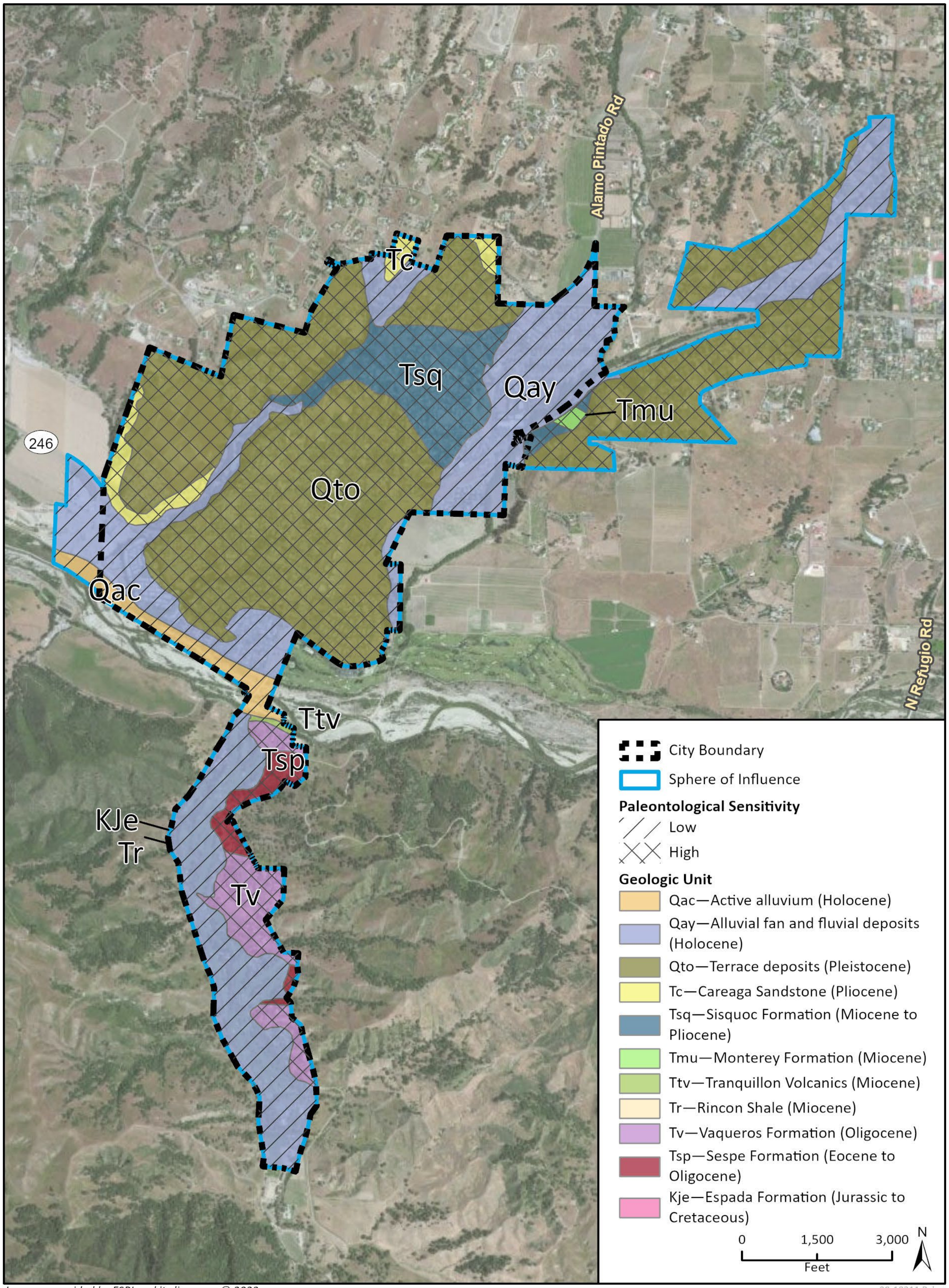
The older Cenozoic-aged sedimentary geologic units (older terrace deposits, Qto; Careaga Sandstone, Tc; Sisquoc Formation, Tsq; Monterey Formation, Tmu; Rincon Shale, Tr; Vaqueros Formation, Tv;; and Sespe Formation, Tsp that underlie the majority of the 2045 General Plan area have high paleontological sensitivity. All of these geologic units are known to have produced scientifically significant paleontological resources in Santa Barbara County and surrounding regions including mammal, bird, reptile, ray-finned fish, shark, and invertebrate fossils (Jefferson 2010; Paleobiology Database 2023; Sweetkind et al. 2021; University of California Museum of Paleontology 2023; Woodring and Bramlette 1950). Sites B and C are partially underlain by the Sisquoc Formation, and the Old Lumberyard site is entirely underlain by older terrace deposits.

The Espada Formation (KJe) is a Mesozoic-aged sedimentary geologic unit with high paleontological sensitivity found along Alisal Creek. The Espada Formation has produced numerous invertebrate-bearing fossil localities in Santa Barbara County (Paleobiology Database 2023; Sweetkind et al. 2021; University of California Museum of Paleontology 2023).

Table 4.6-2 Geologic Units of Solvang

Geologic Unit	Abbreviation	Description	Age	Sensitivity
Active alluvium	Qac	Subrounded to rounded, moderately to well-sorted, sand- to boulder-sized sediments found within active stream and river channels.	Late Holocene	Low
Alluvial fan and alluvial deposits	Qay	Unconsolidated valley, floodplain, fluvial, and alluvial fan deposits. Sediments range in size from clay- to cobble-sized with varying degrees of rounding and sorting.	Holocene	Low
Older terrace deposits	Qto	Moderately well-bedded, sandy conglomerate that represent uplifted stream channel and alluvial deposits.	Pleistocene	High
Careaga Sandstone	Tc	Gray, buff, or white; fine- to coarse-grained sandstone or conglomerate.	Pliocene	High
Sisquoc Formation	Tsq	Brown, laminated or massively bedded, mudstone with occasional diatomite or sandstone beds.	Miocene to Pliocene	High
Monterey Formation	Tmu	Laminated to thin-bedded, chert, shale, and mudstone.	Miocene	High
Tranquilon Volcanics	Ttv	Grayish white or pinkish white rhyolitic tuff that is likely less than 6 feet thick in the 2045 General Plan area.	Miocene	Low
Rincon Shale	Tr	Brown, gray, or buff; poorly to massively bedded, mudstone with orange-weathering dolomite concretions and occasional sandstone beds.	Miocene	High
Vaqueros Formation	Tv	Gray or buff, fine- to medium-grained sandstone with light brown, thin-bedded siltstone interbeds and occasional conglomerate or coquina interbeds.	Oligocene	High
Sespe Formation	Tsp	Pinkish-gray to buff, laminated sandstone with red or green shale and siltstone interbeds. Locally, contains conglomerate or red to green sandstone.	Eocene	High
Espada Formation	KJe	Greenish-brown, well-bedded, shale and fine-grained sandstone with locally occurring lenses of pebble to cobble conglomerate.	Jurassic to Cretaceous	High

Figure 4.6-5 Geolgoic Map and Palaeontolgical Sensitivity of Solvang



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Geologic data provided by "Santa Maria and Point Conception 30' x 60" Sweetkind, D.S., 2021

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CR Geologic Paleo Sensitivity

4.6.2 Regulatory Setting

a. Federal Regulations

Disaster Mitigation Act of 2000

The Disaster Mitigation Act of 2000 provided a new set of mitigation plan requirements for State and local jurisdictions that encourage them to coordinate disaster mitigation planning and implementation. States are encouraged to complete a "Standard" or an "Enhanced" Natural Mitigation Plan. Enhanced plans demonstrate increased coordination of mitigation activities at the State level and, if completed and approved, increase the amount of funding through the Hazard Mitigation Grant Program.

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1977 to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the act established the National Earthquake Hazard Reduction Program. This program was substantially amended in November 1990 by the National Earthquake Hazards Reduction Program Act, which refined the description of agency responsibilities, program goals, and objectives to focus on minimizing loss from earthquakes after they occur. The National Earthquake Hazards Reduction Program promotes the adoption of earthquake hazard reduction activities by all scales of government and works to develop national building standards and model codes for use by engineers, architects, and all others involved in the planning and construction of buildings and infrastructure.

Clean Water Act Section 402

Section 402 of the Clean Water Act requires that all construction sites on an acre or greater of land, as well as municipal, industrial and commercial facilities discharging wastewater or stormwater directly from a point source (e.g., pipe, ditch, or channel) into a surface water of the United States must obtain permission under the National Pollutant Discharge Elimination System (NPDES) permit. All NPDES permits are written to ensure that the surface water receiving discharges will achieve specified water quality standards.

According to federal regulations, NPDES permit coverage for stormwater discharges associated with construction activity can be obtained through individual state permits or general permits. Individual permitting involves the submittal of specific data on a single construction project to the appropriate permitting agency that will issue a site-specific NPDES permit to the project. NPDES coverage under a general permit involves the submittal of a Notice of Intent by the regulated construction project that they intend to comply with a general permit to be developed by the United States Environmental Protection Agency or a state with delegated permitting authority. In California, the NPDES program is administered by the State Water Resources Control Board (SWRCB) through the nine Regional Water Quality Control Boards. Further discussion of the NPDES program and permits in California relevant to the proposed project is provided in discussion of State regulations, below.

b. State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (Alquist-Priolo Act; California Public Resources Code (PRC) Sections 2621 through 2630) was passed into law following the destructive magnitude of 6.6 San Fernando earthquake on February 9, 1971. The Alquist-Priolo Act provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the Alquist-Priolo Act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. Generally, structures for human occupancy must be set back from active faults by approximately 50 feet. Therefore, if a project site is in an active earthquake fault zone, the local agency must withhold development permits until geologic investigations demonstrate that the site is not threatened by surface displacement from future faulting.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 was enacted, in part, to address seismic hazards not included in the Alquist-Priolo Act, including strong ground shaking, landslides, and liquefaction. Under this Act, the State Geologist is assigned the responsibility of identifying and mapping seismic hazards. CGS Special Publication 117, adopted in 1997 by the State Mining and Geology Board, contains guidelines for evaluating seismic hazards other than surface faulting and for recommending mitigation measures under PRC Section 2695(a). In accordance with the mapping criteria, the CGS seismic hazard zone maps identify areas with the potential for a ground shaking event that corresponds to 10 percent probability of exceedance in 50 years.

General Construction Activity Stormwater Permit

The *General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities*, Order No. 2022-0057-DWQ, NPDES No. CAS000002 (Construction General Permit), adopted by the SWRCB, regulates construction activity that includes clearing, grading, and excavation resulting in soil disturbance of at least one acre of total land area. The Construction General Permit authorizes the discharge of stormwater to surface waters from construction activities. The Construction General Permit requires that all developers of land where construction activities will occur over more than one acre do the following:

- Complete a Risk Assessment to determine pollution prevention requirements pursuant to the three risk levels established in the Construction General Permit;
- Eliminate or reduce non-stormwater discharges to storm sewer systems and other waters of the United States;
- Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) that specifies Best Management Practices (BMPs) that will reduce pollution in stormwater discharges to the Best Available Technology/Economically Achievable/Best Conventional Pollutant Control Technology standards;
- Perform inspections and maintenance of all BMPs; and
- Conduct stormwater sampling, if required based on risk level.

To obtain coverage in accordance with the Construction General Permit, a project applicant must electronically file all permit registration documents with the SWRCB prior to the start of construction. Permit registration documents must include:

- Notice of Intent, including Risk Level determination;
- Site Drawings and Maps;
- SWPPP;
- Applicable plans, calculations, and other supporting documentation for compliance with existing permitted Phase I or Phase II municipal separate storm sewer system post-construction requirements or the post-construction standards of the Construction General Permit;
- Annual fee per the current 23 California Code of Regulations Chapter 9 fee schedule for NPDES stormwater permits; and
- All applicable additional Permit Registration Document information.

Typical BMPs included in in SWPPPs are designed to minimize erosion during construction, stabilize construction areas, control sediment, control pollutants from construction materials, and control the volume and velocity of dewatering discharges.

California Building Code

The California Building Code (CBC) Title 24, Part 2, provides building codes and standards for the design and construction of structures in California. The purpose of the CBC is to establish minimum standards to safeguard public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of building and structures.

The CBC contains specific requirements for seismic safety, excavation, foundations, retaining walls, and site demolition. It also regulates grading activities, including drainage and erosion control. Chapter 16 of the CBC contains definitions of seismic sources and the procedure used to calculate seismic forces on structures. In addition, the CBC contains necessary California amendments, which are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (e.g., flood, wind) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California. The CBC also provides standards for various aspects of construction, including, but not limited to, excavation, grading, and earthwork construction; preparation of the site prior to fill placement; specification on fill materials and fill compaction and field testing; retaining wall design and construction; foundation design and construction; and seismic requirements. It includes provisions to address issues such as, but not limited to, construction on expansive soils and soil strength loss.

The CBC is updated every three years by order of the legislature, with supplements published in intervening years. State law mandates that local governments enforce the CBC. In addition, a city and/or county may establish more restrictive building standards reasonably necessary because of local climatic, geological, or topographical conditions. The 2022 CBC, which took effect on January 1, 2023, adds regulations for the use of tall wood and mass timber, accessibility of public buildings, interior environment design, and structural design.

California Public Resources Code

Section 5097.5 of the Public Resources Code states:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

Here “public lands” means those owned by, or under the jurisdiction of, the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, public agencies are required to comply with Public Resources Code Section 5097.5 for their own activities, including construction and maintenance, and for permit actions (e.g., encroachment permits) undertaken by others.

c. Local Regulations

Solvang Municipal Code

Title 10, Chapter 1

Title 10, Chapter 1 of the City’s Municipal Code incorporates the most current CBC into the City’s development standards.

Title 11, Chapter 16

Title 11, Chapter 16 of the City’s Municipal Code establishes procedures for issuing land use permits that are required by the City planning division for new developments and land uses. This chapter states that a land use permit shall not be required for grading that involves less than 1,500 cubic yards of cut and fill on slopes less than 30 percent grade unless that grading “would adversely impact paleontological, archaeological or uniquely important cultural resources” among other stipulations.

Title 12, Chapter 7

Title 12, Chapter 7 of the City’s Municipal Code includes special grading provisions related to the development of subdivisions which are intended to prevent the creation of unsightly raw earth areas, prevent erosion and stability problems, and to promote a natural appearance. These provisions are intended to keep graded areas and cuts and fills to a minimum. Limitations may be placed on the size of areas to be graded or to be used for building pads, as well as on the size, height, and angles of cut slopes and fill slopes.

Title 14, Chapter 3

Title 14, Chapter 3 of the City’s Municipal Code requires BMPs to be installed, implemented, and mandated throughout the duration of construction of a new or redeveloped project and at industrial and commercial facilities to minimize the discharge of pollutants to the storm drain system. These requirements may include a combination of structural and non-structural BMPs that are consistent with the California Storm Water Quality Association (CASQA) Best Management Practice Handbooks or equivalent and shall include requirements to ensure the proper long-term operation and maintenance of these BMPs. This Chapter also provides erosion management requirements based on an individual project's size.

4.6.3 Impact Analysis

a. Methodology and Significance Thresholds

Methodology

Geology and Soils

The impact analysis is based on existing geological conditions in Solvang, including topography, soil conditions, and seismic hazards, as described in Section 4.6.1, *Setting*. This analysis identifies potential impacts based on the predicted interaction between the affected environment and construction, operation, and maintenance activities related to the 2045 General Plan.

Paleontological Resources

In the absence of other sensitivity criteria required by certain federal, state, or local regulatory agencies, the paleontological sensitivity scale explained in the Society of Vertebrate Paleontology's (SVP) *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* is generally used (SVP 2010). According to this system, geologic units can be assigned a high, low, undetermined, or no potential for containing scientifically significant nonrenewable paleontological resources. Following the literature review, a paleontological sensitivity classification was assigned to each geologic unit mapped within the project site. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. The potential for impacts to significant paleontological resources is based on the potential for ground disturbance to directly impact paleontologically sensitive geologic units.

In general, for geologic units with high sensitivity, full-time monitoring is recommended during any project-related ground disturbance. For geologic units with low or no sensitivity, protection or salvage efforts are not required. For geologic units with undetermined sensitivity, field surveys by a qualified paleontologist are usually recommended to specifically determine the paleontological potential of the rock units present within the study area.

Significance Thresholds

CEQA Guidelines Appendix G provides the following significance thresholds to determine if a project would have a potentially significant impact on geology and soils. For the purposes of this EIR, implementation of the proposed project may have a significant adverse impact if it would:

1. 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;
    d. Landslides;

2. Result in substantial soil erosion or the loss of topsoil;
3. 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;
4. 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;
5. 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; or
6. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

This section does not analyze the exposure of new structures to geologic hazards because it is an impact of the environment on the project. The California Supreme Court held in a December 2015 opinion (*California Building Industry Association v. Bay Area Air Quality Management District*) that an analysis of impacts of the environment on a project is not required for CEQA compliance.

b. Project Impacts and Mitigation Measures

Threshold 1a:	Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?
Threshold 1b:	Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?
Threshold 1c:	Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?
Threshold 1d:	Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?
Threshold 3:	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 off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?
Threshold 4:	Would the project be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

Impact GEO-1 CONSTRUCTION OF NEW DEVELOPMENT FACILITATED BY THE 2045 GENERAL PLAN MAY EXACERBATE SEISMIC HAZARDS RISK, SUCH AS LIQUEFACTION OR LANDSLIDES. ADHERENCE TO REQUIREMENTS OF THE CALIFORNIA BUILDING CODE AND IMPLEMENTATION OF 2045 GENERAL PLAN GOALS AND POLICIES WOULD MINIMIZE THE POTENTIAL FOR LOSS, INJURY, OR DEATH FOLLOWING A SEISMIC EVENT, LANDSLIDE, LIQUEFACTION, OR OTHER GEOLOGIC HAZARDS. THIS IMPACT WOULD BE LESS THAN SIGNIFICANT.

As discussed in Section 4.6.1b, *Geologic and Seismic Hazards*, there is one active fault which runs along the Santa Ynez River. There are other active faults within Santa Barbara County with the potential to affect Solvang, including the Santa Ynez, Nacimiento, Ozena, Suey, and Little Pine Faults.

Implementation of the 2045 General Plan would facilitate future residential development in Solvang. While additional residents, employees, and new structures would be exposed to the effects of existing seismic hazards, including fault rupture, seismic ground shaking, liquefaction, landslides, lateral spreading, subsidence, and collapse from local and regional earthquakes, the project itself would not exacerbate the risk of seismic hazards occurring. The 2045 General Plan would encourage infill development and redevelopment of existing underutilized land uses, which could replace older buildings subject to seismic damage with newer structures built to current seismic standards that would better withstand the adverse effects of strong ground shaking. The CBC regulates the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking. Foundations and other structural support features are required to be designed to resist or absorb damaging forces from strong ground shaking and liquefaction.

Structures built on steep slopes could be exposed to an existing risk of landslide, or if improperly constructed, could exacerbate existing landslide conditions through improper weight distribution. Potential structural damage and exposure of people to the risk of injury or death from structural failure would be minimized through required compliance with the CBC which provides earthquake design requirements, including earthquake loading specifications for design and construction to resist effects of earthquake motions in accordance with the American Society of Civil Engineers Standard 7-05.

In addition to mandatory compliance with CBC requirements, implementation of the following 2045 General Plan Safety Element policies would further reduce the potential for loss, injury, or death from seismic hazards by requiring geotechnical reports for development, requiring development to avoid and/or mitigate potential impacts to slope instability, and prohibiting new or expanded development in areas of landslide activity:

- **Policy SAF-2.1: Earthquake Resistant Design.** The City shall continue to require earthquake resistant designs for all structures and utilities.
- **Policy SAF-2.2: Critical Facilities Placement.** New critical structures such as hospitals, police substations, fire stations, emergency communication centers, schools, high occupancy buildings and bridges shall be located away from high-risk earthquake, landslide, and liquefaction zones.
- **Policy SAF-2.3: Geotechnical Reports.** The City shall continue to require the preparation of geotechnical reports and impose appropriate mitigation measures for new development in areas of potential seismic or geologic hazards to ensure, within the limits of technical and economic feasibility, that new structures are able to withstand the effects of seismic activity, including liquefaction, slope instability, expansive soils or other geologic hazards.
- **Policy SAF-2.4: Underground Utilities.** The City shall continue to require the design of underground utilities, particularly water and natural gas mains, to resist seismic forces in accordance with state requirements.
- **Policy SAF-2.5: Identification and Abatement of Risk for Existing Structures.** The City shall identify and encourage risk abatement for existing structures that will be hazardous during an earthquake event, especially high occupancy structures that have the greatest potential effect on public safety.
- **Policy SAF-2.6: Alquist-Priolo Earthquake Fault Zoning Act.** The City shall continue to enforce the Alquist-Priolo Earthquake Fault Zoning Act that requires geologic studies to be performed so

that habitable structures and essential facilities will be sited away from active and potentially active faults.

- **Policy SAF-3.1: Landslide and Slope Instability Hazard Mitigation.** The City shall continue to require development to avoid and/or mitigate any potential impacts a project contributes to landslides and slope instability hazards on neighboring property, appurtenant structures, utilities, and roads.
- **Policy SAF-3.2: Expansion of Development in Areas of Landslide Activity.** The City shall prohibit the expansion of existing structures or developments in areas of known landslide activity except when the project will incorporate measures to reduce the potential for loss of life and property.
- **Policy SAF-3.3: New Development in Areas of Landslide Activity.** The City shall prohibit new development in areas of known landslide activity unless development plans indicate that the hazard can be reduced to a less than significant level prior to beginning development.

Implementation of 2045 General Plan Safety Element policies would minimize risks associated with potential fault rupture, seismic shaking, and other geologic hazards in Solvang. Pursuant to Policy SAF-2.3, a detailed review of design and construction plans and incorporation of additional structural safety features would be required on a project-by-project basis, as necessary, for structures that would be located in areas of potential seismic or geologic hazards, including expansive soils. Implementation of these policies, in addition to compliance with the CBC, would minimize the potential for loss, injury, or death following a seismic event. Therefore, this impact would be less than significant.

Mitigation Measures

No mitigation measures are required because this impact would be less than significant.

Threshold 2:	Would the project result in substantial soil erosion or the loss of topsoil?

Impact GEO-2 CONSTRUCTION OF DEVELOPMENT FACILITATED BY THE 2045 GENERAL PLAN WOULD INCLUDE GROUND DISTURBANCE THAT WOULD RESULT IN LOOSE OR EXPOSED SOIL THAT COULD RESULT IN THE LOSS OF TOPSOIL. COMPLIANCE WITH THE CONSTRUCTION GENERAL PERMIT, THE CALIFORNIA BUILDING CODE, AND CITY MUNICIPAL CODE WOULD MINIMIZE THE POTENTIAL FOR EROSION AND LOSS OF TOPSOIL AND WOULD ENSURE THIS IMPACT WOULD BE LESS THAN SIGNIFICANT.

Development facilitated by the 2045 General Plan would involve construction activities such as stockpiling, grading, excavation, paving and other earth disturbing activities. These construction activities may result in loose and disturbed soils in Solvang, which can increase the potential for erosion and loss of topsoil.

Construction activities that disturb one or more acres of land are subject to the NPDES General Construction Permit process, which would require development of a SWPPP that outlines project-specific BMPs to control erosion, sediment release, and otherwise reduce the potential for discharge of pollutants from construction into stormwater. Typical erosion control and sediment control BMPs include, but are not limited to, installation of silt fences, erosion control blankets, and anti-tracking pads at site exits to prevent off-site transport of soil material. Construction activities would also be required to comply with CBC Chapter 70 standards, which are designed to ensure implementation of appropriate measures during grading and construction to control erosion and storm water pollution.

As required by the City's Municipal Code, if a project would disturb less than one acre of land, the applicant would be required to prepare and obtain City approval of a project-specific Erosion and Sediment Control Plan which is required to include BMPs that would be implemented during project construction and operation. Therefore, erosion from ground-disturbing activities associated with development facilitated by the 2045 General Plan would be controlled through implementation of the requirements and BMPs contained in existing regulations, including the General Construction Permit and City Municipal Code. In addition, the City would require implementation of project-specific post-construction BMPs as necessary to ensure pollutant loads in runoff are minimized. Compliance with the regulations discussed above would reduce the risk of soil erosion from construction activities such that there would be minimal change in risk compared to current conditions with existing development, and this impact would be less than significant.

Mitigation Measures

No mitigation measures are required because this impact would be less than significant.

Threshold 5:	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?

Impact GEO-3 DEVELOPMENT FACILITATED BY THE 2045 GENERAL PLAN WOULD OCCUR WHERE EXISTING SEWER SYSTEMS ARE PRESENT. THEREFORE, IMPLEMENTATION OF THE 2045 GENERAL PLAN WOULD NOT RESULT IN A SIGNIFICANT IMPACT TO SOILS THAT ARE INCAPABLE OF SUPPORTING SEPTIC TANKS OR ALTERNATIVE WASTEWATER DISPOSAL SYSTEMS. NO IMPACT WOULD OCCUR.

The 2045 General Plan encourages growth management and development within Solvang with existing wastewater infrastructure. In general, development facilitated by the 2045 General Plan is not anticipated to include the use of septic systems because new development would occur where existing sewer systems are in place. Therefore, the 2045 General Plan would not result in a significant impact associated with soils that are incapable of supporting septic tanks or alternative wastewater disposal systems and no impact would occur.

Mitigation Measures

No mitigation measures are required because no impact would occur.

Threshold 6:	Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Impact GEO-4 DEVELOPMENT FACILITATED BY THE 2045 GENERAL PLAN HAS THE POTENTIAL TO IMPACT PALEONTOLOGICAL RESOURCES. IMPACTS WOULD BE LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED.

Adverse effects to paleontological resources can only be determined once a specific project has been proposed because the effects are highly dependent on both the individual project site conditions (e.g., local environment, level of disturbance) and the characteristics of the proposed ground-disturbing activity (maximum depth, total volume, nature of ground disturbance). However, ground-disturbing activities associated with construction facilitated by the 2045 General Plan, particularly in areas that have not previously been developed with urban uses, have the potential to encounter and damage or destroy paleontological resources that may be present on or below the ground surface in areas of high paleontological sensitivity. Consequently, damage to or destruction of fossils could occur due to development under the 2045 General Plan and impacts would be potentially significant.

Sites B and C and the Old Lumberyard site are partially or entirely underlain by geologic units with high paleontological sensitivity (i.e., Qto and Tsq; Figure 4.6-5). Development of these sites has the potential to significantly impact paleontological resources. Site D is underlain by low-sensitivity alluvial fan and fluvial deposits. Therefore, development of site D is not expected to significantly impact paleontological resources.

The following 2045 General Plan goal and policy is applicable paleontological resources in Solvang:

- **Goal ENV-4:** To protect the historic and cultural resources in order to preserve the heritage of native peoples and the area's earliest settlers.
- **Policy ENV-4.1: Protect Archaeological Resources.** The City shall provide for the protection of both known and potential archaeological resources citywide. To avoid significant damage to important archaeological sites, all available measures shall be explored at the time of a development proposal. Where such measures are not feasible and development would adversely affect identified archaeological or paleontological resources, mitigation shall be required in accordance with the relevant provisions of federal and State laws.

Policy ENV-4.1 requires development projects that have the potential to adversely affect identified paleontological resources to follow federal and State laws to mitigate those effects. However, damage to or destruction of previously unidentified paleontological resources still constitutes a significant impact under CEQA or adverse effect under federal environmental laws. Therefore, the impact would be potentially significant.

Mitigation Measures

GEO-1 Protection of Paleontological Resources

The City of Solvang shall add the following policies providing for the protection of paleontological resources to the 2045 General Plan prior to its adoption. These policies shall include the following stipulations:

- A Qualified Professional Paleontologist, as defined by the Society of Vertebrate Paleontology (SVP), must be retained to conduct a paleontological resources analysis prior to the initiation of projects that may impact sediments with high paleontological sensitivity to determine whether there is a potential for the project to significantly impact paleontological resources.
- If potential impacts to paleontological resources are found to be significant, then a Qualified Professional Paleontologist shall be retained to develop and implement a Paleontological Resources Mitigation Program (PRMP) to ensure that impacts to paleontological resources are mitigated. This PRMP may include:
  - Worker Environmental Awareness Program (WEAP) training;
  - Pre-construction surveys;
  - Paleontological construction monitoring;
  - Retention of an on-call Qualified Professional Paleontologist;
  - Salvage, laboratory preparation, and curation of paleontological resources; and/or
  - Reporting to regulatory agencies.

- Should paleontological resources be encountered during any construction activity, all activity that could damage or destroy the resources shall be suspended until a Qualified Professional Paleontologist has examined the site. Construction shall not resume until the resource is properly evaluated and, if necessary, mitigation actions are carried out to address the impacts of the project on these resources.

Significance After Mitigation

Mitigation Measure GEO-1 would require paleontological resources protected, if applicable, which would reduce potential impacts to a less than significant level.

4.6.4 Cumulative Impacts

Geology, soils, and seismicity impacts may be related to exacerbation of seismic hazards and increased erosion and/or loss of topsoil. These effects occur independently of one another, and result from site-specific and project-specific characteristics and conditions. Therefore, no cumulative impacts related to geology, soils, and seismicity would occur within the cumulative impact analysis area.

Cumulative development under the 2045 General Plan could disturb areas that may potentially contain paleontological resources. The potential for impacts from individual developments are site-specific and depend on the location and extent of ground disturbance associated with each individual development proposal. All future development projects would continue to be subject to existing state and local requirements, and discretionary projects may be subject to project-specific mitigation requirements under CEQA. In addition, future development in the City would comply with 2045 General Plan policies and goals to ensure that paleontological resources encountered during construction would be properly recovered and curated. Therefore, the proposed project's contribution to cumulative impacts related to the destruction, damage, or loss of undiscovered scientifically important paleontological resources would be less than significant. Cumulative impacts related to geology, paleontology, soils, and seismicity would be less than significant, and the 2045 General Plan would not result in a cumulatively considerable contribution to cumulative paleontological impacts.

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