Desktop Geotechnical and Geologic Hazard Evaluation
University Community Plan Update
San Diego, California

Prepared For:
DUDEK.
605 Third Street
Encinitas, California 92024

PREPARED BY:
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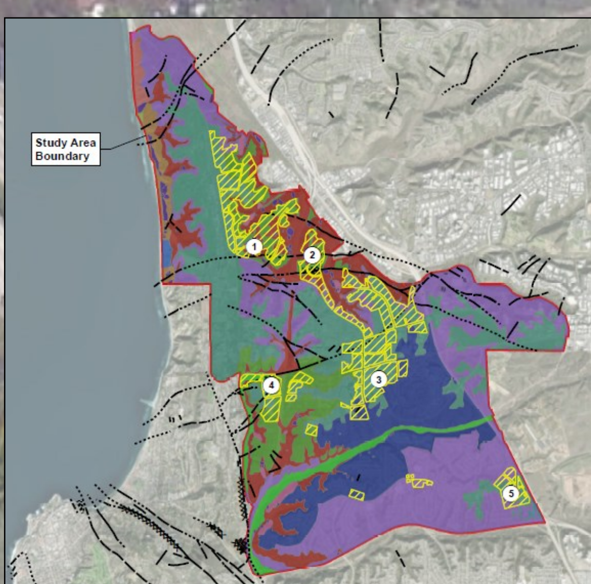

April 2020
Project No. 9127009

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April 21, 2020
Project No. 9127009

Ms. Asha Bleier, AICP
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605 Third Street
Encinitas, CA 92024

Subject: Desktop Geotechnical and Geologic Hazard Evaluation
University Community Plan Update
San Diego, California

Dear Ms. Bleier,

We are pleased to submit our Geotechnical and Geologic Hazard Study report. The report was prepared in support of the University Community Plan Update and identifies geotechnical and geologic hazards within the University Plan area and the significance of these hazards to existing and future land uses in the Plan area.

Respectfully submitted,

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EXECUTIVE SUMMARY

This Geotechnical and Geologic Hazard Evaluation (Study) identifies geotechnical and geologic hazards that could have potentially adverse effects on manmade improvements within the University Community Plan Update (UCPU) area (Study Area). For this study, we reviewed relevant geologic maps and guidelines published by the City of San Diego, State of California, and the United States Geologic Survey. In-house resources were also reviewed.

A summary of the geology and geologic hazards is provided below.

- In increasing order of age, soils in the Study Area consist of artificial fill (both documented and undocumented), young alluvium, estuarine deposits, landslide deposits, old paralic deposits (Units 2-4 and 6), very old paralic deposits (Units 9, 10, 10a, and 11), and formational materials of the Scripps Formation, Ardath Shale, Torrey Sandstone and Delmar Formation. Undocumented fill, landslide deposits and young alluvium may be subject to consolidation under additional fill or structural loads. The other geologic formations are well consolidated to strongly cemented and will support most fill and structural loads. The very old paralic deposits and formational materials contain layers of cemented sandstone, gravel and cobbles which may be difficult to excavate and may impact excavations in these materials. The Scripps Formation, Ardath Shale, and Del Mar Formation are susceptible to instability where they underlie steep slopes and coastal bluffs.
- The central portion of the Study Area is underlain by potentially active faults. The faults do not offset Quaternary deposits and do not parallel the active structural grain in the San Diego Area. A large earthquake on the nearby Rose Canyon fault zone could cause moderate to severe ground shaking in the Study Area. Like the rest of San Diego, the Study Area is in a region of active faults and will be subject to strong ground motion in the event of an earthquake on active faults in the vicinity.
- Liquefaction occurs in soft, saturated soil during moderate to severe ground shaking during earthquakes. According to City of San Diego maps, most of the lower elevation portions of the Study Area (areas close to the bottom of the major canyons) are defined as having a potential for liquefaction.
- Landslide hazards are mapped in the Study Area both by the State of California and the City of San Diego. Both the State and City of San Diego show landslides in the slopes along Soledad Valley and Rose Canyon, their tributaries, and the coastal bluffs in the northwest portion of the Study Area. The formations beneath these canyon slopes are potentially unstable. The mesa areas between the drainages, however, do not contain steep slopes and are not susceptible to landslide hazards according to the City of San Diego.
- Expansive soils form on very old paralic deposits, Scripps Formation, Ardath Shale, and Del Mar Formation. Most the Study Area consists of soils that range from very low to highly expansive in nature. Expansive soil can adversely affect structures and pavements.
- Potentially corrosive soils may be present in some localized areas on the mesa.
- Infiltration rates for at grade soil will be affected by shallow impermeable formational material and soil types. In general, the earth materials within 10 feet of the current ground surface will have good to poor infiltration characteristics.

The geologic hazards identified above that are encroached by planned development in the Study Area can be mitigated through avoidance or by engineering design in accordance with established State of California and City of San Diego requirements and codes. There are no policies or recommendations of the UCPU that will have a direct or indirect significant environmental effect with regards to geologic hazards. The proposed land uses are compatible with the known geologic hazards provided geotechnical structural engineering recommendations are incorporated into the design and construction of improvements. Storm water infiltration into soils may be limited locally and alternative systems like bioswales or bioretention basins may be needed. Geotechnical investigations are recommended for any construction adding additional loads to soils within 25 feet of the top of slopes exceeding 10 feet in height or on undocumented fills.

1. INTRODUCTION

The Bodhi Group has completed a Geotechnical and Geologic Hazards Study (Study) of the University Community Plan Update area (Study Area). The Study was performed at a California Environmental Quality Act (CEQA) level for the Study Area. This report presents the results of our "desktop" evaluation of the geotechnical and geologic hazards potentially affecting the Study Area. The purpose of our evaluation was to identify geotechnical and geologic conditions or hazards that might affect future development and/or redevelopment within the Study Area. The following services were provided:

- Reviewed relevant published geologic information including; State of California-issued geologic and hazard maps, the City of San Diego Seismic Safety Study Geologic Hazards and Faults maps, "Guidelines for Preparing Geologic Reports for Regional-Scale Environmental and Resource Management Planning," California Geological Survey (California Division of Mines and Geology) Note 52, and the City of San Diego Guidelines for Geotechnical Reports and City of San Diego Significance Determination Thresholds.
- Reviewed and summarized regional and local geology and identified potential geotechnical and geologic hazards.
- Researched other City and County resources, and our in-house library of historical vertical aerial photographs, geotechnical and geological hazards such as faulting, seismicity, liquefiable soils, etc.
- Prepared this technical report that identifies geotechnical and geologic hazards. Included in this report is a location map (Figure 1), a map of the regional and Study Area geology showing distribution of surficial deposits and geologic units (Figure 2); a map of the active regional faults in southern California (Figure 3); a map of the faults in and near the Study Area; a map of potential areas of inundation by tsunami or dam failure (Figure 5); and a geologic hazards map identifying areas susceptible to the potential geologic hazards described in this report (Figure 6).

1.1. Significant Assumptions

Documentation and data provided by the client or from the public domain, and referred to in the preparation of this study, are assumed to be complete and correct and have been used and referenced with the understanding that the Bodhi Group assumes no responsibility or liability for their accuracy. The conclusions contained herein are based upon such information and documentation. Because Study Area conditions may change and additional data may become available, data reported and conclusions drawn in this report are limited to current conditions and may not be relied upon on a significantly later date or if changes have occurred at the Study Area.

Reasonable CEQA-level efforts were made during the Study to identify geologic hazards. "Reasonable efforts" are limited to information gained from information readily-accessible to the public. Such methods may not identify Study Area geologic or geotechnical issues that are not listed in these sources. In the preparation of this report, the Bodhi Group has used the degree of care and skill ordinarily exercised by a reasonably prudent environmental professional in the same community and in the same time frame given the same or similar facts and circumstances. No other warranties are made to any third party, either expressed or implied.

2. PROJECT LOCATION AND DESCRIPTION

The Study Area comprises approximately 8,700 acres and is located in the northwestern portion of the City of San Diego. The Study Area is generally bound to the east by Interstate 805 (I-805), to the west by Torrey Pines State Beach and to the north by Sorrento Valley and to the south by San Clemente Canyon (Figure 1). The current plan has 5 Focus Areas as shown on Figure 1. Topographically, most of the Study Area is situated on a gently rolling mesa top dissected by number of tributary canyons to Rose and San Clemente Canyons and Sorrento Valley. The mesa areas are heavily developed. Where canyon areas have not been encroached by improvements, they are mostly used for open space.

University is currently a mixed-use community consisting of multi- and single-family residences, schools, and commercial centers, hospitals, research and office centers. Infrastructure includes paved streets, and above and below ground utilities. Major thoroughfares include north-south interstates I-5 and I-805; east-west La Jolla Village Drive, Noble Drive, and Governor Drive; and north-south North Torrey Pines Road, Gillman Drive, Regents Road and Genesee Avenue. Public transportation within the area is mostly by buses provided by the San Diego Metropolitan Transit System. The San Diego Metropolitan Transit System is currently constructing light rail to serve the University of California San Diego (UCSD) along the I-5 corridor.

The current University Community Plan provides the framework to guide development in University. Originally adopted in 1987, (San Diego Planning Department 1987, rev. 2019) the plan has undergone 19 amendments in the intervening years. According to the City of San Diego Planning Department website (2018), the UCPU seeks to bring the existing Plan up-to-date by: analyzing current land use, development, and transportation needs; evaluating changes in demographics that may affect land use needs; understanding demand for housing and commercial development; working with community members and stakeholders to determine key issues of concern, desires, and preferences to establish a vision and objectives for the plan update; and evaluating infrastructure and transportation needs to address climate change.

The UCPU anticipates that improvements will occur in 5 Focus Areas (Figure 1). The Focus Areas are currently commercial centers, research parks, business and light industrial parks, and transportation hubs. The planned improvements will be within the 5 focus areas and include construction of buildings and transportation improvements. It is assumed that the improvements will be constructed on existing graded pads and that future grading will likely be minor.

3. HISTORY

Prior to World War II, the Study Area was part of a large Mexican land grant that supported cattle grazing. During World War II and Korean War, the United States Marine Corps established Camp Mathews on a portion of the Study Area. In 1956, the University of California purchased portions of Camp Mathews to construct the University of California, San Diego campus. The initial plan for the area was to create a “College Town” atmosphere of single-family residences and research centers. In the 1970’s, a regional shopping mall (La Jolla Towne Center) was constructed and office centers, hospitals, and hotels were built over the next 40 years. Large scale earth moving was utilized throughout the Study Area to create building pads and infrastructure. Most of the early development occurred on the relatively flat mesa tops. Over time, urbanization has filled some of the tributary canyons and encroached on the mesa edges and steeper Sorento Valley slopes.

4. GEOLOGY

San Diego is located within the western (coastal) portion of the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges encompass an area that roughly extends from the Transverse Ranges and the Los Angeles Basin, south to the Mexican border, and beyond another approximately 800 miles to the tip of Baja California (Harden, 1998). The geomorphic province varies in width from approximately 30 to 100 miles, most of which is characterized by northwest-trending mountain ranges separated by subparallel fault zones. In general, the Peninsular Ranges are underlain by Jurassic-age metavolcanic and metasedimentary rocks and by Cretaceous-age igneous rocks of the southern California batholith. Geologic cover over the basement rocks in the westernmost portion of the province in San Diego County generally consists of Upper Cretaceous-, Tertiary-, and Quaternary-age sedimentary rocks. Figure 2, Regional Geologic Map, modified from Kennedy and Tan (2008), shows the regional geology.

Structurally, the Peninsular Ranges are traversed by several major active faults. The Elsinore, San Jacinto, and the San Andreas faults are major active fault zones located northeast of San Diego and the Rose Canyon, San Diego Trough, Coronado Banks and San Clemente faults are major active faults located within or west-southwest of San Diego. Major tectonic activity associated with these and other faults within this regional tectonic framework is generally right-lateral strike-slip movement. These faults, as well as other faults in the region, have the potential for generating strong ground motions in the Study Area. Figure 3, Regional Fault map shows the proximity of the Study Area to nearby mapped Quaternary faults. Figure 4 shows faults in and near the Study Area.

4.1. Local Geology

In increasing order of age, soils in the Study Area consist of artificial fill (both documented and undocumented), young alluvium, landslide deposits, Old paralic deposits (Units 2-4, and 6), Very old paralic deposits (Units 11, 10, 10a, and 9), Scripps Formation, Ardath Shale, Torrey Sandstone, and Delmar Formation. The distribution of the units is shown on Figure 2, Regional Geologic Map. Descriptions of the general characteristics of these units are presented below.

- *Af Artificial fill (late Holocene).* Although there are no mapped limits of artificial fill on Figure 2, manmade fill underlies large portions of the Study Area. Most areas underlain by fill are associated with construction of buildings or infrastructure. Many fills were constructed in the 1950’s and 1960’s when compaction standards were not as stringent as current standards. These fills may be subject to settlement under new building or additional fill loads. Fills placed in 1980 or more recently are likely compacted to current standards and less likely to settle under new loads.
- *Qya – Young alluvial deposits (Holocene and late Pleistocene).* Young alluvial deposits are characterized as poorly consolidated, poorly sorted, permeable canyon deposits of sandy, silty, or clay-bearing alluvium. These deposits occur in the bottoms of the major canyons: Rose and San Clemente Canyons and Sorrento Valley (Kennedy and Tan, 2008). Young alluvial deposits may settle under structural or additional fill loads. Compacted fill overlying settlement prone young alluvial deposits may settle under new building or additional fill loads.
- *Qpe – (late Holocene).* Unconsolidated estuarine deposits composed of fine-grained sand and clay. The estuarine deposits are found along the base of the slopes on the west side of Sorrento Valley.
- *Qls – Landslide deposits (late Pleistocene to Holocene).* Landslide deposits are mapped in the slopes and tributaries to Rose and San Clemente Canyons, the slopes and tributary canyons bordering the west side of Sorrento Valley, and along the coastal bluffs (Kennedy and Tan, 2008, City of San

Diego, 2008). The landslides appear related to weak, slide-prone formations (Scripps Formation, Ardath Shale, and Delmar Formation) and faulted areas in combination with steep natural slopes.

- *Qop2-4 – Old paralic deposits, Units 2-4 undivided (late to middle Pleistocene).* The old paralic deposits are moderately permeable, reddish-brown, interfingered strandline, beach, estuarine, and colluvial deposits composed of siltstone, sandstone, and conglomerate (Kennedy and Tan, 2008). The paralic deposits are difficult to separate into individual units as they merge and interfinger with one another (Kennedy and Tan, 2008). The deposits are poorly to moderately consolidated. The Unit 2-4 deposits are located in the northern most portion of the Study Area and will not underlie or be affected by any of the Focus Area improvements.
- *Qop6 – Old paralic deposits, Unit 6 (late to middle Pleistocene).* Old paralic deposits underlie portions of the northern portion of the planning area, along the base of the slopes bordering the western side of Sorrento Valley. The Old paralic deposits consist of poorly sorted, moderately permeable, reddish brown, interfingered strandline, beach, estuarine and colluvial deposits. The deposits are predominately siltstone, claystone, sandstone and conglomerate. The Old paralic Unit 6 deposits are poorly to moderately consolidated (Kennedy and Tan, 2008). The Unit 6 deposits do not underlie any of the Focus Area Improvements.
- *Qvop11 – Very old paralic deposits, Unit 11 (middle to early Pleistocene).* The Very old paralic deposits, Unit 11, are found on the western most portion of the mesa areas and were deposited on the Clairemont Terrace (elevation 300-312 feet) (Kennedy and Tan, 2008). The Very old paralic deposits, Unit 11, consist of poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. The Unit 11 deposits are moderately to well consolidated and locally strongly cemented (Kennedy and Tan, 2008).

  All of the very old paralic deposits (Units 11-9) are exposed on the top of the mesa in the Study Area (Figure 2). They are differentiated by subtle changes in lithology and basal elevation (progressively higher elevation marine-cut terraces upon which the sediments were deposited) and age (oldest units to the east becoming younger to the west). The very old paralic deposits are well consolidated and are usually suitable for light structural or thin fill loads. They are locally cemented and may create difficult excavation conditions for utility trenches or basements. An expansive highly plastic clay residual soil often forms on these deposits on the mesa tops.
- *Qvop10 – Very old paralic deposits, Unit 10 (middle to early Pleistocene).* The Very old paralic deposits, Unit 10, underlies the western central portion of the mesa and were deposited on the Tecolote Terrace (elevation 338-344 feet). The Very old paralic deposits, Unit 10, consist of poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. The Unit 10 deposits are moderately to well consolidated and locally well cemented (Kennedy and Tan, 2008).
- *Qvop10a – Very old paralic deposits, Unit 10a (middle to early Pleistocene).* Unit 10a paralic deposits consist of poorly sorted, moderately permeable, dark reddish-brown, dune and back beach “beach ridge” deposits composed of cross-bedded sandstone (Kennedy and Tan, 2008). The deposits area locally moderately to strongly cemented and are resistant to weathering which has caused the deposits to form long, elongated ridges.
- *Qvop9 – Very old paralic deposits, Unit 10 (middle to early Pleistocene)* The Very old paralic deposits, Unit 9, underlies the western central portion of the mesa and were deposited on the Linda Vista Terrace (elevation 384-391feet). The Very old paralic deposits, Unit 9, consist of poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach estuarine and colluvial deposits

composed of siltstone, sandstone and conglomerate. The Unit 9 deposits are moderately to well consolidated and locally strongly cemented (Kennedy and Tan, 2008).

- *Qvop9a – Very old paralic deposits, Unit 9a (middle to early Pleistocene).* The Very old paralic deposits, Unit 9a, underlie a subtle ridge in the middle of the mesa. They were deposited on the Linda Vista Terrace (elevation 384-391 feet). The Unit 9a deposits consist of poorly sorted, moderately permeable, reddish-brown, dune and back beach (beach ridge) deposit. The sediments are composed of cross-bedded sandstone. The Unit 9a deposits are typically, moderately to highly consolidated and locally strongly cemented (Kennedy and Tan, 2008).
- *Tsc – Scripps Formation (middle Eocene).* This formation consists of yellowish-gray, medium-grained, sandstone with lenses of cobble conglomerate and claystone. The Scripps Formation underlies the entire Study Area and is exposed in the slopes of all the canyons, Sorrento Valley, and coastal bluffs (Kennedy and Tan, 2008). The Scripps Formation is well consolidated and locally strongly cemented (concretion beds) and can typically support high structural and fill loads. Bedding is highly variable and can create potential slope instability where adverse structure and local claystone beds combine.
- *Ta – Ardath Shale (middle Eocene).* The Ardath shale is exposed in most canyon slopes in all portions of the Study Area. The formation is composed of highly fractured silty claystone and intercalated fine sandstone (Kennedy and Tan, 2008). Where fresh, the formation is well consolidated and locally strongly cemented. Where weathered, the formation desiccates into weak, sheared and remolded clay that is expansive and is unstable in slopes. Clay seams, shears, and faults in the unweathered formation can create unstable conditions in slopes where the local structure is adverse.
- *Tt – Torrey Sandstone (middle Eocene).* Torrey Sandstone is a white to light-brown, medium to coarse grained, moderately well indurated, massive to broadly cross-bedded sandstone underlying the northern portion of the Study Area (Kennedy and Tan, 2008). The formation is named for the exposures in Torrey Pines State Park. The Torrey Sandstone is very well consolidated and can typically support fill and structural loads.
- *Td – Delmar Formation (middle Eocene).* The Delmar formation is composed of interbedded lenses of sandstone and claystone. The Delmar Formation, where fresh, is well consolidated, and locally moderately to strongly cemented. Where weathered, especially in slopes, the claystone becomes fractured and weak creating unstable conditions. The Delmar Formation is only present at the base of the coastal bluffs in the northernmost portion of the Study Area.

4.2. Local Structural Geology

In general, the older geology (Scripps Formations, Ardath Shale, Torrey Sandstone, and Delmar Formation) dips gently to the south in Study Area as evident by the older formations exposed in the costal bluffs north along Scripps Beach and Torrey Pines State Park. However, pre-Quaternary faulting has created local variations in structure throughout the Study Area (Kennedy and Tan, 2008). The pre-Quaternary faulting consists of a series of northeast to easterly striking normal (up-down relative offset) faults that can be seen in the coastal bluffs and traced as far as 4.5 miles inland (Figure 2). The very old paralic deposits are flat lying or dip gently to the west. With respect to slope stability, the formational structure is considered favorable where it dips into slopes and adverse where it dips out of slopes. However, the mapped landslides in the Study Area appear to be more influenced by weathering, fracturing and faulting or local variations in bedding than the gross structure.

5. TECTONICS AND SEISMICITY

San Diego is affected by the boundary between the North American and Pacific tectonic plates. The North American and Pacific plates are sliding past each other at a rate of about 22-24 inches per year. The North American plate is moving north, and the Pacific plate is moving south, relative to one another. This boundary is called the San Andreas fault system (Wallace, 1990). The boundary, in southern California, is characterized by a roughly 150 wide zone of predominantly northwest-striking, right-slip faults that span the Imperial Valley and Peninsular Range to the offshore California Continental Borderland Province (from the California continental slope to the coast). The San Clemente fault zone located 50 miles west of San Diego and the San Andreas fault zone 70 miles east of San Diego define the boundary for the Study Area (Figure 3). The most active faults based on geodetic and seismic data are the San Andreas, San Jacinto, and Imperial faults. These faults take up most of the plate motion. Smaller faults, however, are active enough to create damaging earthquakes and these include the Elsinore, Newport-Inglewood-Rose Canyon, and the offshore Coronado Banks, San Diego Trough, and San Clemente fault zones (Singleton, Rockwell et al., 2019) (Figure 3). The Rose Canyon fault is moving roughly 0.06 inches per year.

5.1. Local and Regional Faults

Table 1 summarizes the local and regional fault characteristics for the active faults that will affect the Study Area. A Quaternary fault is defined by the State of California (2007) as a fault that shows evidence of movement in the last 1.6 million years. Quaternary (Holocene and Pleistocene) faults can be classified as either active or potentially active faults. Active faults are those Quaternary Holocene faults which have been shown to have ruptured in the last 11,000 years. Potentially active faults are those Quaternary faults which have been shown to have ruptured during the past 1.6 million years but do not show evidence of rupture in the last 11,000 years. Potentially active faults have a much lower probability for future activity than active faults. The northern and central portions of Study Area are underlain by potentially active faults (Figure 4). Since larger earthquakes occur on faults, generally, the closer the causative fault is to a specific location, the stronger the earthquake shaking. Earthquakes on the faults summarized below will create ground shaking that can affect the Study Area.

The nearest active fault is the Rose Canyon fault which has created most of the major landforms in the vicinity of the Study Area (Figure 4). Uplift on the fault has created Mount Soledad and down warping has created San Diego Bay. The Rose Canyon fault zone begins offshore south of Coronado Island where it consists of three discrete fault traces: the Spanish Bight, Coronado, and Silver Strand faults (Figure 3). Moving northward, the faults cross San Diego Bay and intersect the shoreline near the east end of the San Diego Airport runway and into downtown San Diego. The fault zone appears to narrow as it approaches Old Town. The fault crosses the San Diego River and trends northward along the east side of Interstate 5. Just north of Balboa Avenue, the fault separates into two strands, the Mount Soledad fault and Rose Canyon fault. The faults enter the Pacific Ocean near La Jolla Shores and trend northward, offshore until the fault zone appears to connect with the Newport Inglewood fault zone near San Onofre.

Table 1 - Fault Characteristics for Active Faults in the Region

Fault Name	Approximate Distance to Study Area	Slip Rate (mm/yr)	Fault Length (miles)	Estimated Magnitude (Maximum Moment Magnitude (Mw))
Newport-Inglewood-Rose Canyon Fault Zone	3 miles	1.5	130	7.2
Coronado Bank Fault Zone (offshore)	15 miles	3.0	115	7.6
San Diego Trough Fault Zone (offshore)	27 miles	1.5	106	7.5
San Miguel-Vallecitos Fault Zone (Northern Baja California)	48 miles	0.2	100	6.9
Elsinore Fault Zone	50 miles	5.0	190	7.0
San Clemente Fault Zone (offshore)	55 miles		129	7.7
San Jacinto Fault Zone	80 miles	4.0	152	6.8
Southern San Andreas Fault Zone	115 miles	25	140	7.2

Table 1 references: CDMG, 2002; CGS, 2010; Hirabayashi et al., 1996; Kahle et al., 1984; Ryan et al., 2012.

The potentially active faults that underlie the Study Area have not offset the early Pleistocene Very old paralic deposits. The faults are normal faults and strike at nearly 90 degrees to the north-northwest trend of the strike-slip faults that form the structural trend of southern California (Figure 4).

5.2. Ground Shaking

Ground shaking is the result of a fault rupturing deep in the earth. The resulting energy is released as seismic waves that propagate away from the focus of the earthquake. The larger the earthquake the more intense the shaking. The shaking does attenuate over distance so distant earthquakes will shake less violently than a nearer earthquake of the same magnitude. Earthquakes on the faults listed in Table 1 can cause shaking in the Study Area. The nearest fault capable of causing a large earthquake is the Rose Canyon fault zone.

The Rose Canyon fault is capable of causing a maximum moment magnitude 7.2 earthquake. A recent study was performed to see effects of earthquake shaking by modeling a 6.9 magnitude earthquake occurring on the Rose Canyon fault with an epicenter just offshore of Encinitas (EERI, 2020). The model predicts that the Study Area would experience ground shaking estimated to be 55 percent of gravity. Ground shaking resulting from large earthquake on faults in the vicinity (Table 1) will be significantly less than the modeled acceleration.

5.3. Ground Rupture

Earthquakes occur on faults deep below the ground surface. If the earthquake is large enough, the strain will reach the ground surface creating offset where one side of the fault moves with respect to the other. Ground rupture can break the ground for miles along the fault trace. The State of California has created special study zones (Alquist Priolo Earthquake Fault Zone) to identify faults with the potential for ground rupture. There are no Alquist Priolo Earthquake Fault Zones within the Study Area (Figure 4). There are no previously mapped active faults within the Study Area.

5.4. Historical Earthquakes

The available record of historical (dating back to the late 1700s) earthquakes larger than Magnitude 6 (M6) in the coastal San Diego area is as complete as other regions in the State of California (Anderson et al., 1989). Only a small number of earthquakes have been reported in coastal San Diego whereas other portions of southern California and Baja California, Mexico, have experienced many moderate to large earthquakes in the same historical window.

Strong shaking and minor damage have occurred in the coastal San Diego region as a result of large earthquakes on distant faults or smaller earthquakes on local faults (Agnew et al., 1979; Toppozada et al., 1981). Earthquakes in Imperial County and northern Baja California in 1800, 1862, and 1892 are believed to have produced the strongest intensities in the San Diego area. The 1862 earthquake is believed to have occurred on the Rose Canyon fault (Singleton et al., 2019)

In the 1930s seismographs were established in San Diego. Since that time, swarms of small to moderate magnitude earthquakes have been recorded in San Diego Bay. In 1964, a swarm of small earthquakes was reported generally in the south San Diego Bay (Simmons, 1977). In 1985 a swarm of earthquakes with a maximum magnitude of M4.7 occurred just over one-half mile south of the Coronado Bay Bridge (Reichle et al., 1985). A magnitude M5.3 earthquake and a series of aftershocks occurred about 44 miles west of Oceanside in 1986 (Hauksson and Jones, 1988). The 1986 earthquake was widely felt but did not cause significant damage.

6. LANDSLIDES AND SLOPE STABILITY

Slopes with potentially unstable characteristics in the Study Area are associated with the San Clemente and Rose Canyons and their tributaries, slopes and tributary canyons to the west side of Sorrento Valley, and the coastal bluffs adjacent to the Torrey Pines Municipal Golf Course and Torrey Pines State Park. The unstable slopes and existing landslides are associated with the Scripps Formations, Ardath Shale, and faulted areas within the Study Area (Figures 2 and 6). The mesa areas are underlain by very old paralic deposits which have high shear strengths and provide the stable cap that creates the mesa on which most of University was developed. The combination of steep natural slopes, building and fill loads, and infiltration of irrigation and storm water can create conditions that result in landslides in an urban development (City of San Diego, 2008a). Figure 6 shows slope inclinations in the Study Area where natural slopes in excess of 2:1 (horizontal:vertical) should be considered potentially unstable. Man-made slopes resulting from grading associated with commercial and residential development are presumed to have been engineered in accordance with City of San Diego requirements.

The coastal bluffs located on the eastern edge of the Study Area exhibit slope stability conditions that range from moderately stable to unstable with numerous ancient and active landslides. Because the Focus Areas are about 4,000 feet, or more, from the coastal bluffs, the stability of the coastal bluffs will not affect the Focus Area improvements, nor will the improvements affect the stability of the bluffs.

7. SOILS AND INFILTRATION

Infiltration of storm water into soil is a goal of the San Diego Regional Water Quality Control Board (RWQCB) and the City of San Diego. The Focus Areas have been altered by grading to create level building sites or streets. Some portions of the graded pads are created by fills and other portions by cuts into the formational materials. As a result, the permeability estimates based on old predevelopment soil mapping are irrelevant. Other factors should be considered in evaluating storm water infiltration feasibility including lateral migration of water on impermeable very old paralic deposits and groundwater mounding. A full list of criteria is enumerated in the City of San Diego Storm Water Standards, Part 1, 2017 Edition (City of San Diego, 2017).

8. HYDROGEOLOGY

According to the San Diego Basin Plan (RWQCB, 1994), the Study Area lies within three separate hydrologic basins. The hydrologic basins and beneficial use information is listed below.

- The majority of the northern half of the Project area is located in the Miramar Reservoir Hydrologic Area (HA) of the Penasquitos Hydrologic Unit (HU). The Miramar Reservoir HA has existing beneficial use for municipal, agricultural, and industrial supply.
- The southernmost portion of the Project area is located in the Miramar HA of the Penasquitos HU. The Miramar HA is excepted from beneficial use for municipal supply and has potential beneficial use for industrial supply.
- A small portion of the Project area located in the northwest is located in the Scripps HA of the Penasquitos HU. The Scripps HA is excepted from beneficial use for municipal supply and does not have any other beneficial uses.

Based on a review of previous environmental investigation reports and monitoring well data collected from State Water Resources Control Board-managed GeoTracker website (Geotracker), groundwater levels vary across the Project area and groundwater has been encountered as shallow as approximately 18 feet, and deeper than 100 feet below ground surface (bgs). The groundwater flow directions vary within the Study Area.

9. DRAINAGE AND FLOODING

The Study Area is situated mostly on a highly urbanized, gently rolling mesa. Drainage is mainly along streets, gutters and storm drain pipelines that empty into the canyons incising the mesas. Graded slopes use concrete swales that empty into storm drains for drainage. The natural slopes drain into adjacent canyons or tributaries. Low gradients on streets and storm drains as well as blocked storm drain inlets can create local, short duration flooding during very heavy rainfall. The Study Area and 5 Focus Areas are not shown to be in 100- or 500-year Federal Emergency Management Agency flood zones. Areas of inundation caused by tsunami or dam failure border the west and east boundaries of the Study Area but do not overlap the Study Area or Focus Areas (Figure 5).

10. MINERALOGIC RESOURCES

Data from the U.S. Geological Survey (USGS) Mineral Resource Data System show that there are no mineralogic resources in the Study Area or 5 Focus Areas.

11. GEOLOGIC HAZARDS AND IMPACTS

This section identifies geologic hazards that may affect proposed policies and programs of the UCPU and proposed land use. These hazards include seismicity and ground motion; ground rupture; liquefaction; seismically induced settlement; slope instability; subsidence; expansive and corrosive soils; impermeable soils; shallow groundwater, and flooding. These hazards can be mitigated through administrative controls (e.g., avoiding building in hazard-prone areas or structure setback) and/or engineering improvements (e.g., ground improvement, ground restraints, or appropriate structure foundation). Site-specific and hazard-specific geotechnical investigations would be required to evaluate the appropriate mitigation measure or combination of measures.

The City of San Diego Seismic Safety Study Geologic Hazards and Faults maps document the known and suspected geologic hazards and faults in the region. The maps show potential hazards and rates them by relative risk, on a scale from nominal to high. The Seismic Safety Study is intended as a tool to determine the level of geotechnical review to be required by the City for planning, development, or building permits. The Study Area is shown on portions of map grid tiles 29, 30, 31, and 34 of the City of San Diego Geologic Hazards and Fault maps. Figure 6, Geotechnical Hazards shows the location of hazards as defined by the City maps. The mesa area is underlain by “level mesa underlain by terrace deposits or bedrock with nominal risk” (51), “other level areas or gently sloping to steep terrain with favorable geologic structure.” Low risk (52), “Steeply sloping terrain, unfavorable geologic structure” moderate risk (54) and “Modified terrain (graded sites) with nominal risk” (55). Slope areas are underlain by “Ardath Shale with neutral or favorable geologic structure” (25), “Ardath Shale with unfavorable geologic structure” (26). The bottoms of drainages are designated as Category 32 which exhibit a “low potential for liquefaction due to fluctuating groundwater levels”. Landslide deposits are “Confirmed, known, or highly suspected” (21, 22).

Coastal bluff stability has been classified as “Generally unstable, numerous landslides, high steep bluffs, severe erosion, unfavorable geologic structure” (41); “Generally unstable, unfavorable bedding planes, high erosion” (42), and “Moderately stable, mostly stale formations, local high erosion” (44).

The Study Area contains fault zones described as “Potentially Active, Inactive, presumed inactive, or Activity Unknown”.

11.1. Seismicity and Ground Motion

An active fault is defined by the State Mining and Geology Board as one that has experienced surface displacement within the Holocene epoch, i.e., during the last 11,000 years (California Geological Survey, 2007). The Study Area is subject to potential ground shaking caused by active faults located outside, but near the Study Area.

Ground shaking during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and the type of geologic material underlying the area. The composition of underlying soils, even those relatively distant from faults, can intensify ground shaking. Areas that are underlain by bedrock tend to experience less ground shaking than those underlain by unconsolidated sediments such as artificial fill or unconsolidated alluvial fill.

As previously noted, the Study Area is subject to ground shaking hazards caused by earthquakes on regional active faults. Based on a Probabilistic Seismic Hazards Ground Motion Interpolator provided by the California Department of Conservation (2008), the Study Area is located in a zone where the horizontal peak ground acceleration having a 10 percent probability of exceedance in 50 years is 0.247g (where g represents the acceleration of gravity). Although much less probable, a large earthquake on the Rose Canyon fault zone could create twice the accelerations and cause much more widespread damage in the Study Area (EERI, 2020). Earthquake shaking will affect all the Focus Areas.

11.2. Ground Rupture

There are no active faults in the Study Area. The potentially active faults are relatively short and do not parallel the active structural trend in the San Diego Region. The potentially active faults are predominantly normal faults whereas the active faults in the region are transform or orthogonal faults (horizontal or predominantly horizontal with a lesser component of vertical motion). The potential for ground rupture in the Focus Areas is very low.

11.3. Liquefaction, Seismically Induced Settlement

Liquefaction is a phenomenon whereby unconsolidated and/or near-saturated soils lose cohesion as a result of severe vibratory motion. The relatively rapid loss of soil shear strength during strong earthquake shaking results in temporary, fluid-like behavior of the soil. Soil liquefaction causes ground failure that can damage roads, pipelines, underground cables, and buildings with shallow foundations. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction.

A potential hazard of liquefaction is the reduction of shear strength due to loss of grain-to-grain contact during liquefaction resulting in dynamic settlement on the order of several inches to several feet. Other factors such as earthquake magnitude, distance from the earthquake epicenter, thickness of the liquefiable layers, and the fines content and particle sizes of the liquefiable layers will also affect the amount of settlement.

While lateral spreads are also associated with these ground failures, the liquefaction prone soil in the Study Area is confined to existing canyon bottoms and Sorrento Valley which are not likely to undergo lateral spreading.

Liquefiable soil is located in the bottoms of San Clemente, Rose and Sorrento Valley in the Study Area (Figure 6). No Focus Areas are within liquefiable hazard areas.

11.4. Tsunamis, Seiches, and Dam Failure

A tsunami is a sea wave generated by a submarine earthquake, landslide, or volcanic action. Submarine earthquakes are common along the edge of the Pacific Ocean, thus exposing all Pacific coastal areas to the potential hazard of tsunamis. However, no Focus Area lies within a mapped tsunami inundation zone (Figure 5). A seiche is an earthquake-induced wave in a confined body of water, such as a lake, reservoir, or bay. However, no portion of the Study Area lies near a confined body of water on which a seiche could be expected to occur. The Study Area is not affected by flooding caused by dam failure (Figure 5).

11.5. Slope Instability

According to the City of San Diego Seismic Safety Study (City of San Diego, 2008), the slopes in the Study Area are underlain by landslides, Scripps Formations and Ardath Shale with neutral, adverse, and favorable structure (Geologic Hazard Category 21, 22, 25, 26, and 54). The risk of landsliding is not discussed on the maps. Since there are landslides on slopes with neutral and favorable geologic structure, all slopes underlain by the Scripps Formation, and Ardath Shale should be considered potentially unstable. The tops of the slopes are mapped as being at low to moderate risk for landsliding (Hazard Category 53 and 54). The slopes should be considered potentially unstable. Buildings or infrastructure older than 1985 within 50 feet of the tops of natural slopes may have been designed without consideration of slope stability (this area is in general agreement with Hazard Category 53, City of San Diego, 2008). Additions of new building loads in these locations may not meet current City of San Diego standards for slope stability. Focus Areas 1 and 2 will be impacted by slope instability. Coastal bluff stability will not affect the Focus Areas due to their distance from the hazard.

11.6. Subsidence

Subsidence typically occurs when extraction of fluids (water or oil) cause the reservoir rock to consolidate. Water extraction is minimal in the Study Area and the geologic materials area well consolidated. Subsidence is not a hazard in the Study Area.

Settlement of unconsolidated soil (fill or alluvium) may occur locally where new loads are imposed on previously uncompacted fill, compacted fill on unconsolidated material such as weathered very old paralic deposits or alluvium, or unconsolidated alluvium.

11.7. Expansive or Corrosive Soils

Other potential geological hazards include expansive or corrosive soils. Expansion of the soil may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors. Soils with a relatively high fines content (clays dominantly) are generally considered expansive or potentially expansive. Very old paralic deposits typically on mesa tops typically have a thick clayey weathering profile that can be expansive. Grading has mixed the natural soils with the granular formational materials and will affect the potential for expansive soil greatly. Parking lot subgrades with expansive soil may be suitable for pavements but unsuitable for other structures. Expansive and corrosive soil may impact all the Focus Areas.

11.8. Impermeable Soil and Excavatability

The permeability of soil within 10 feet of the current ground surface is important when evaluating the potential for and the design of storm water infiltration devices. The soil permeability in the Study Area will be highly variable. Well consolidated and frequently cemented very old paralic deposits that are impermeable may be encountered at very shallow depths. As a result, the use of typical shallow infiltration systems may be problematic in some locations.

Cemented very old paralic deposits often create difficult excavation conditions which may increase grading or excavation costs.

11.9. Groundwater

The permanent groundwater table is expected to be too deep to impact the planned developments shown on the UCPU. Local shallow groundwater and perched groundwater may be present locally due to leaking storm drains, water lines, and irrigation. Excavations deeper than 5 feet may encounter groundwater conditions that might affect construction (temporary slope stability, shoring, dewatering and permanent drainage behind walls).

12. IMPACT MITIGATION

The impacts summarized above may be mitigated through administrative controls (e.g., avoiding building in hazard-prone areas or structural setback areas) and/or engineering improvements (e.g., ground improvement, ground restraints, remedial grading or foundation design). Site specific geotechnical investigations are required to recommend the appropriate mitigation measure(s).

12.1. Seismicity and Ground Motion

The entire Study Area will be affected by seismicity and ground motion. Mitigation can be accomplished by geotechnical and structural engineering design. Geotechnical investigations should be conducted in accordance with City of San Diego Guidelines for Geotechnical Reports and State of California requirements. Most mitigation measures will involve foundation design and or ground improvement.

12.2. Ground Rupture

Ground rupture will not affect the Study Area.

12.3. Liquefaction, Seismically Induced Settlement

Predicted liquefaction will occur in the major canyon bottoms and in Sorrento Valley within the Study Area. None of the Focus Areas are within liquefiable zones. Seismically induced settlement of fills associated with existing development may occur if compaction or proper remedial grading was not performed during earthwork. Mitigation can be accomplished by ground improvement and or foundation design. Geotechnical investigations should be conducted in accordance with City of San Diego Guidelines for Geotechnical Reports and State of California requirements.

12.4. Tsunamis, Seiches, and Dam Failures

No mitigation measures are necessary for Tsunami or Seiches because the Study Area is not affected by these hazards.

12.5. Slope Instability

Mitigation may be achieved by avoidance of development on slopes or stabilizing the slopes through grading or using specially designed foundations. Geotechnical investigations should be conducted in accordance with City of San Diego Guidelines for Geotechnical Reports with an emphasis on slope stability. Additions to existing structures or development of ancillary structures to existing development will need independent geotechnical investigations if located within 25 feet of slopes in excess of 10 feet high, and on undocumented fills. The investigations should be applied in Hazard Categories 21-25 and 53.

12.6. Subsidence

Construction of improvements in areas underlain by alluvium or fill should be designed to withstand settlement of unconsolidated soil. Geotechnical investigations for design of settlement resistant structures should be conducted in accordance with City of San Diego Guidelines for Geotechnical Reports. Mitigation measures typically include ground improvement and/or foundation design.

12.7. Expansive or Corrosive Soil

Expansive soil measures include specially reinforced foundations or removal and replacement of expansive soil with less expansive material. Roadways may need heavier pavement sections. Remedial grading conducted in the past for current parking lots that may have left expansive soils in place may not be suitable for other structures. Geotechnical investigations should be conducted in accordance with City of San Diego Guidelines for Geotechnical Reports to provide appropriate recommendations. Corrosive soil should be evaluated by a Corrosion Engineer for recommendations for soil replacement or cathodic protection.

12.8. Impermeable Soil and Excavatability

Infiltration potential should be evaluated in accordance with City of San Diego Storm Water Standards, Part 1, 2017 Edition (City of San Diego, 2017). Cemented subgrade will require heavier than normal equipment to excavate and may be identified through subsurface geotechnical exploration or geophysical surveys.

12.9. Groundwater

The effects of potential groundwater on construction should be evaluated by geotechnical investigations in accordance with City of San Diego Guidelines for Geotechnical Report. Recommendations for dewatering, temporary and permanent slope stabilization, and subsurface drainage should be discussed.

13. THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the CEQA Guidelines, the project will have a significant effect on the environment if it would:

G-1: Expose people to potential substantial adverse effects, including the risk of loss, injury or death involving: a) fault rupture, b) seismic shaking, c) seismic ground failure, d) landsliding.

G-2: Result in substantial soil erosion or loss of top soil.

G-3: Be located in a geologic unit or soil that is unstable (landsliding, settlement, lateral spreading) or that would become unstable as a result of the project.

G-4: Be located on expansive soil causing substantial risk to life or property.

G-5: Having soils incapable of supporting the use of septic tanks where sewers are not available.

13.1. Threshold G-1 a) Fault Rupture

Not significant. There are no active faults within the Study Area.

13.2. Threshold G-1 b) Strong Seismic Ground Shaking

Less than significant. Construction of buildings and other civil works will be required to use seismic resistant designs in accordance with California and City standards and codes. If not constructed to these standards, the impact would be significant.

13.3. Threshold G-1 c) Seismic Ground Failure

Less than significant. Buildings will be required to be built in accordance with City and California standards and codes. Foundation or geotechnical ground improvement can be used to reduce the impact of ground failure.

13.4. Threshold G-1 d) Seismic Induced Landsliding

Less than significant. Planned development will be required to have geotechnical recommendations for slope stability mitigation for both static and pseudostatic conditions. Slopes within developed areas have been constructed in accordance with City of San Diego standards and codes and are assumed to be stable under static and pseudostatic conditions.

13.5. Threshold G-2 Substantial Soil Erosion and Loss of Topsoil

Less than significant. The Study Area is almost fully developed with landscaping, buildings, and paving. Areas not developed are dedicated open space areas that are well covered with natural vegetation. Most of the Study Area is located on a mesa where gradients are very low. As a result, the potential for erosion is very low. Since construction will be required to follow City of San Diego standards and code that stipulate protection against temporary and permanent erosion, the impact of erosion and loss of topsoil is less than significant.

13.6. Threshold G-3 Unstable Soil (Landslide, Settlement, Lateral Spreading)

Landslide: Less than significant. Landslides and landslide prone geologic formations are exposed along the slopes of canyons and the coastal bluffs. The UCPU shows planned development only in areas previously developed. These areas have been stabilized or have utilized suitable setbacks by the previous development. Any new development in these areas should include geotechnical review of the as-built conditions and evaluation of the impact new construction will have on the stability of new and old structures. New development should be designed in accordance with State and City codes and standards.

Settlement: Less than significant. Settlement prone soil within the UCPU consists of undocumented fills, fills placed on settlement prone soil or soils within 25 feet of the tops of slopes 10 feet high or higher. The impact of these settlement prone soils will occur when new structures, structure additions, or new fills place new loads on settlement prone soil. Geotechnical investigations performed in accordance the City of San Diego Guidelines should be required for any new development that would add additional loads on undocumented fills, fills placed on settlement prone soil, or soil within 25 feet of slopes in excess of 10 feet in height to evaluate the effect of the additional loads. If geotechnical investigations are not performed or recommendations of the investigations are not implemented, settlement can be significant.

Lateral Spreading: Less than significant. Lateral Spreading occurs in sloping liquefaction prone soil or liquefaction prone soil with an open face (slope). Liquefaction prone soil in the Study Area is overlain by fill or is confined to stream channel bottoms. The potential for lateral spreading in the Study Area is less than significant.

13.7. Threshold G-4 Expansive Soil

Less than significant. Expansive soil is present on the mesa portions of the Study Area. This area has been heavily modified by previous development, so the distribution of the expansive soil will be location-dependent. Geotechnical investigations as required by the City of San Diego will identify the effects of expansive soil on the planned development. Typical remediation measures include removal of unsuitable soil and replacement with non-expansive soil, chemical treatment of expansive clay, or specially designed and reinforced foundations.

13.8. Threshold G-5 Soil Unsuitable for Onsite Sewage Disposal Systems

Less than significant. Soil and geologic formations with poor percolation characteristics are widespread in the Study Area. The Study Area is currently well served by existing sewer systems. The use of onsite sewage disposal systems is not anticipated.

14. CONCLUSIONS

Conclusions of this Study are listed below.

- There are no geologic hazards that cannot be avoided or mitigated
- There are no policies or recommendations of the UCPU which will have a direct or indirect significant environmental effect with regard to geologic hazards.
- The proposed land uses are compatible with the known geologic hazards.
- There are no potential impacts related to geologic hazards from the implementation of the UCPU that cannot be avoided, reduced to an acceptable level of risk, or reduced below a level of significance through mandatory conformance with applicable regulatory requirements or the recommendations of this technical report.
- The impact of unstable soil can be reduced to less than significant levels by requiring geotechnical investigations on all construction on ground underlain by settlement prone undocumented fills, fills on settlement prone soil, or soil within 25 feet of the tops of slopes in excess of 10 feet high.

15. LIMITATIONS

This report was prepared in general accordance with current guidelines and the standard-of-care exercised by professionals preparing similar documents near the Study Area. No warranty, expressed or implied, is made regarding the professional opinions presented in this document. As this report represents a review of existing documentation on geotechnical conditions of the planning areas rather than in-depth on-site investigation, it cannot account for variations in individual site conditions or changes to existing conditions. Please also note that this document did not include an evaluation of environmental hazards.

The conclusions, opinions, and recommendations as presented in this document, are based on a desktop analysis of data, some of which were obtained by others. It is our opinion that the data, as a whole, support the conclusions and recommendations presented in the report.

The purpose of this study was to evaluate geologic and geotechnical conditions within the planning areas to assist in the preparation of environmental impact documents for the project. Comprehensive geotechnical evaluations, including subsurface exploration and laboratory testing, should be performed prior to design and construction of structural improvements. Any future projects on individual sites in the planning areas will require site-specific geotechnical studies as required by State and City regulations.

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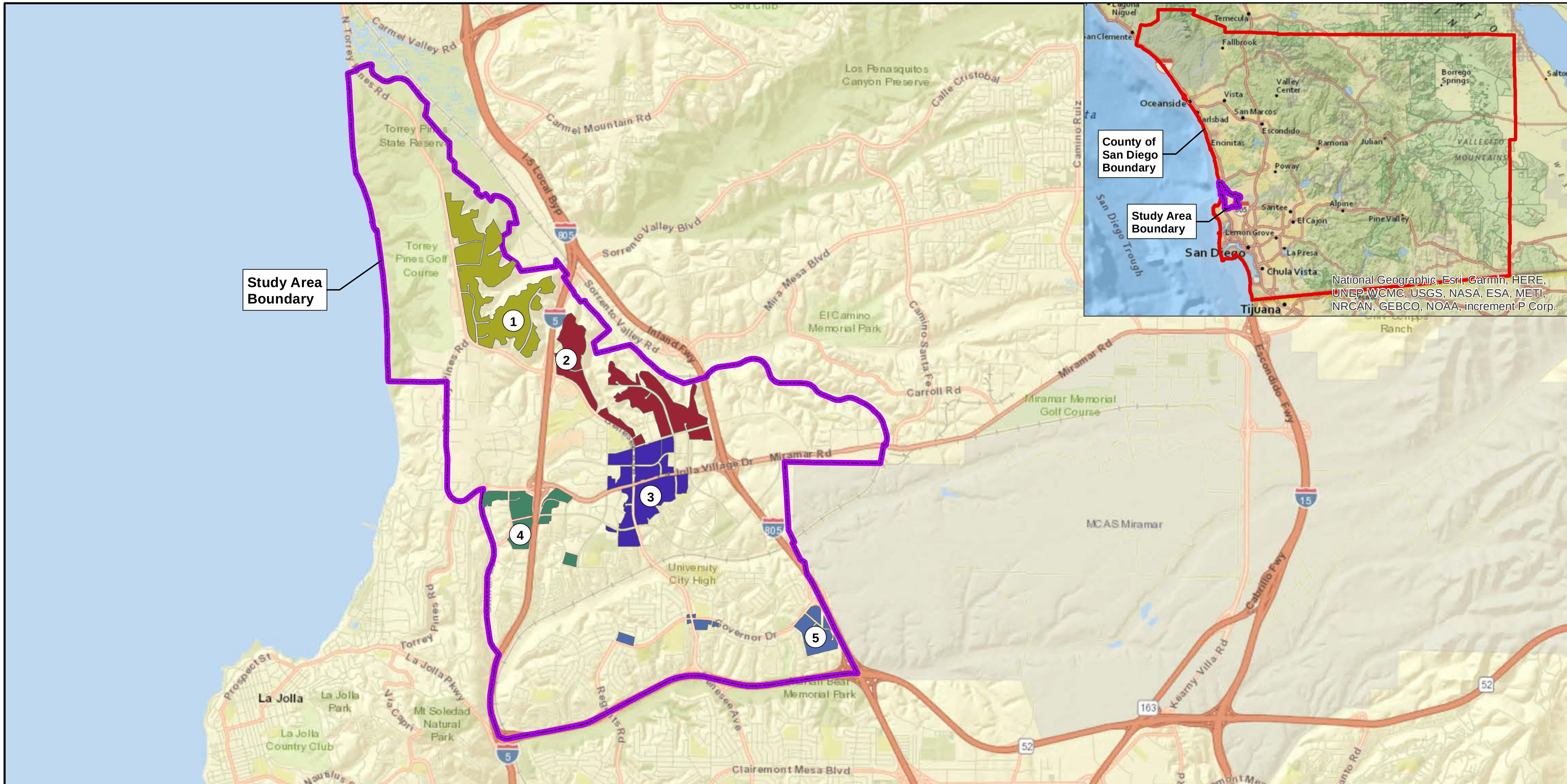
FIGURES



Legend

- Focus Area 1
- Focus Area 2
- Focus Area 3
- Focus Area 4
- Focus Area 5
- University CPU Boundary (Study Area Boundary)

N / W / E / S

0 2,500 5,000 Feet

Project No. 9127009

Date: 04/2020

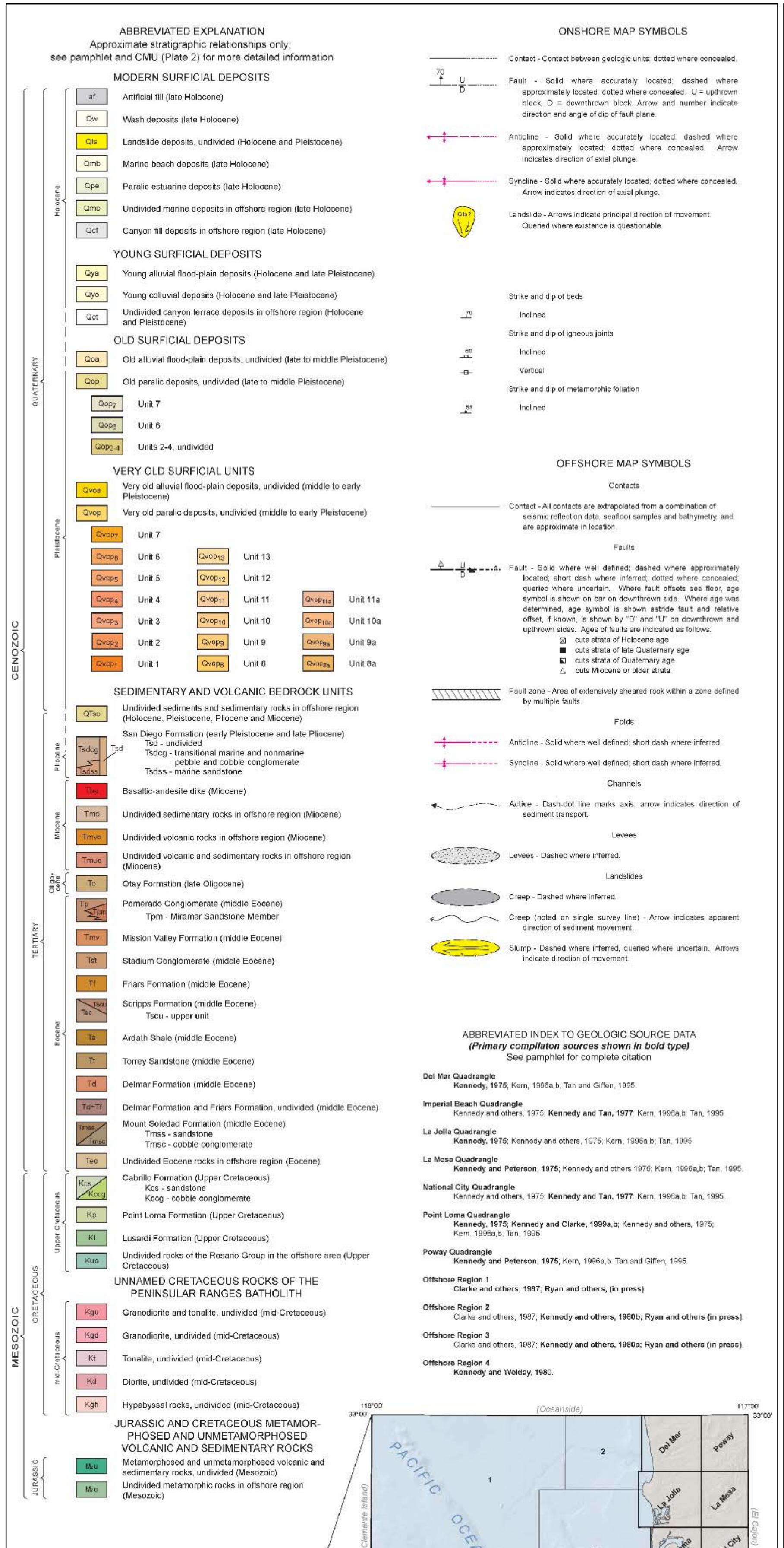
Drawn By: SG

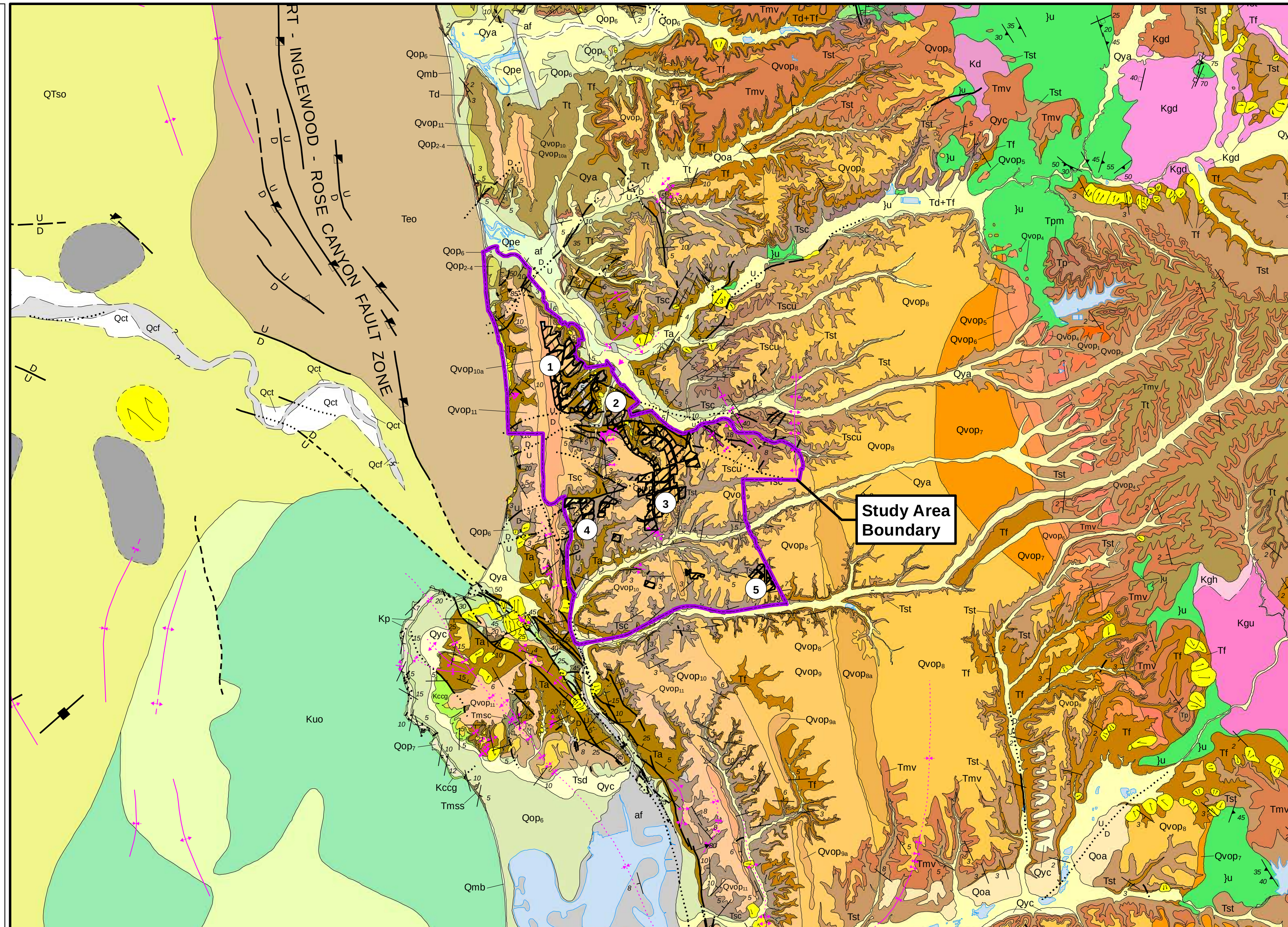
Study Area Location Map

University Community Plan Update San Diego, California

Figure 1

THE BODHI GROUP — INNOVATING | SUSTAINING | SOLVING





Legend

Focus Areas

Site Boundary

N
W E
S

0 5,000 10,000 Feet

Project No. 9127009

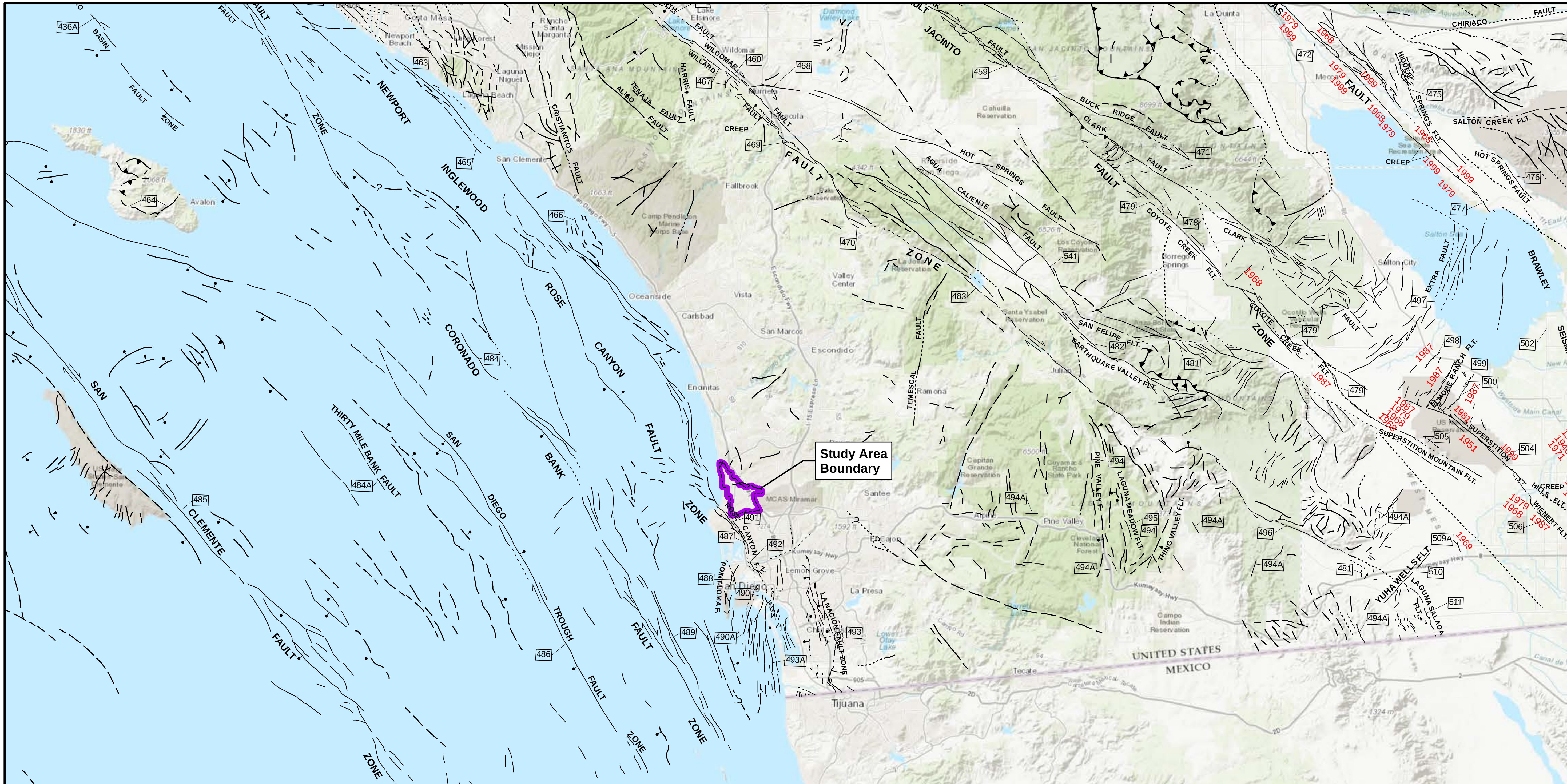
Date: 04/2020

Drawn By: SG

Study Area Regional Geology

University Community Plan Update San Diego, California

Figure 2



Legend

Study Area	thrust fault, approx. located	thrust fault, certain (2)	fault, concealed, queried (ball and bar, 2)
fault, approx. located	thrust fault, concealed	thrust fault, approx. located (2)	fault, certain (dip)
fault, approx. located, queried	dextral fault, certain	thrust fault, concealed (2)	fault, approx. located (dip)
fault, certain	dextral fault, approx. located	fault, certain (ball and bar)	fault, concealed (dip)
fault, concealed	dextral fault, concealed	fault, approx. located (ball and bar)	reverse fault, certain
fault, concealed, queried	sinistral fault, certain	fault, concealed (ball and bar)	reverse fault, approx. located
fault, inferred, queried	sinistral fault, approx. located	dextral fault, certain (ball and bar)	reverse fault, concealed
thrust fault, certain	sinistral fault, concealed	fault, concealed, queried (ball and bar)	

N
W E
S

0 6 12 Miles

Project No. 9127009

Date: 04/2020

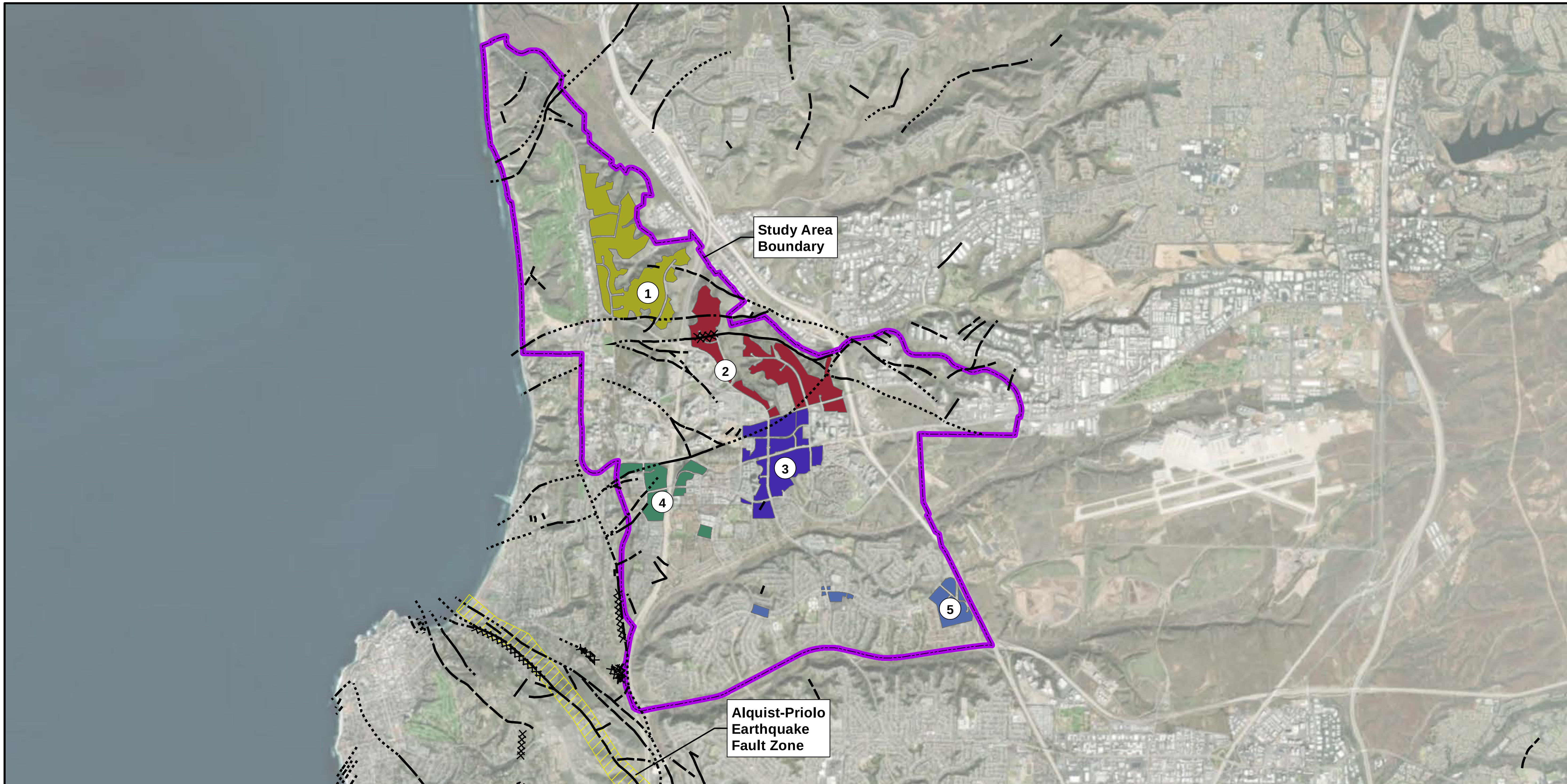
Drawn By: SG

Study Area
Regional Fault Map

University Community
Plan Update
San Diego, California

THE BODHI GROUP
INNOVATING | SUSTAINING | SOLVING

Figure 3



Legend

- Study Area
- Focus Area 1
- Focus Area 2
- Focus Area 3
- Focus Area 4
- Focus Area 5
- Alquist-Priolo Earthquake Fault Zone
- Fault
- Inferred Fault
- Concealed Fault
- Shear Zone

Fault classifications follow the City of San Diego convention (City of San Diego, 2008)

N S E W

0 2,500 5,000 Feet

Project No. 9127009

Date: 04/2020

Drawn By: SG

Study Area Fault Zone Map

University Community Plan Update San Diego, California

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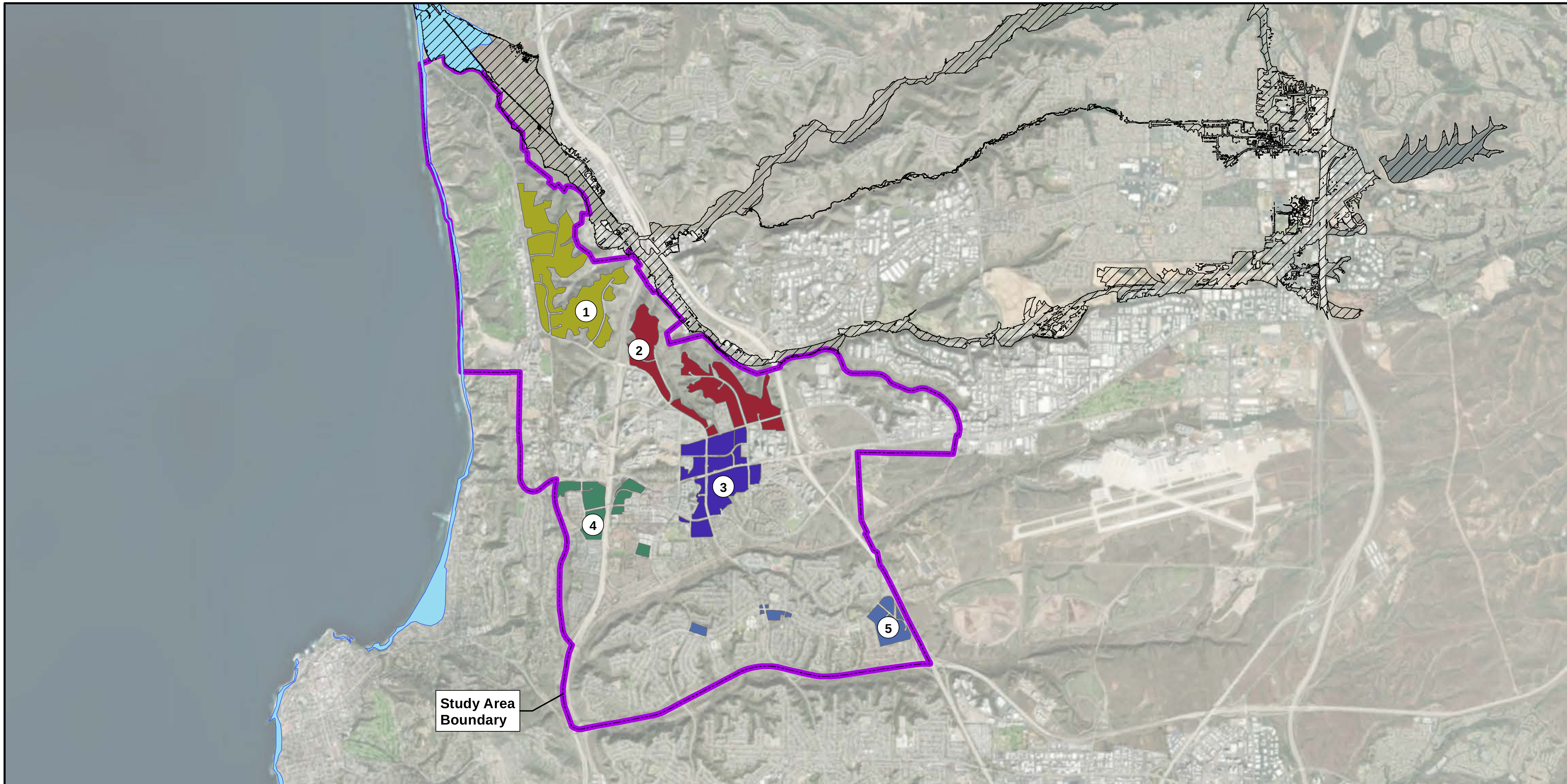
Figure 4



Legend

- University CPU Boundary
- Areas subject to Dam Failure Inundation Flooding
- Areas Subject to Tsumani Inundation Flooding
- Focus Area 1
- Focus Area 2
- Focus Area 3
- Focus Area 4
- Focus Area 5

N W E S

0 2,500 5,000 Feet

Project No. 9127009

Date: 04/2020

Drawn By: SG

Study Area Inundation Map

University Community Plan Update San Diego, California

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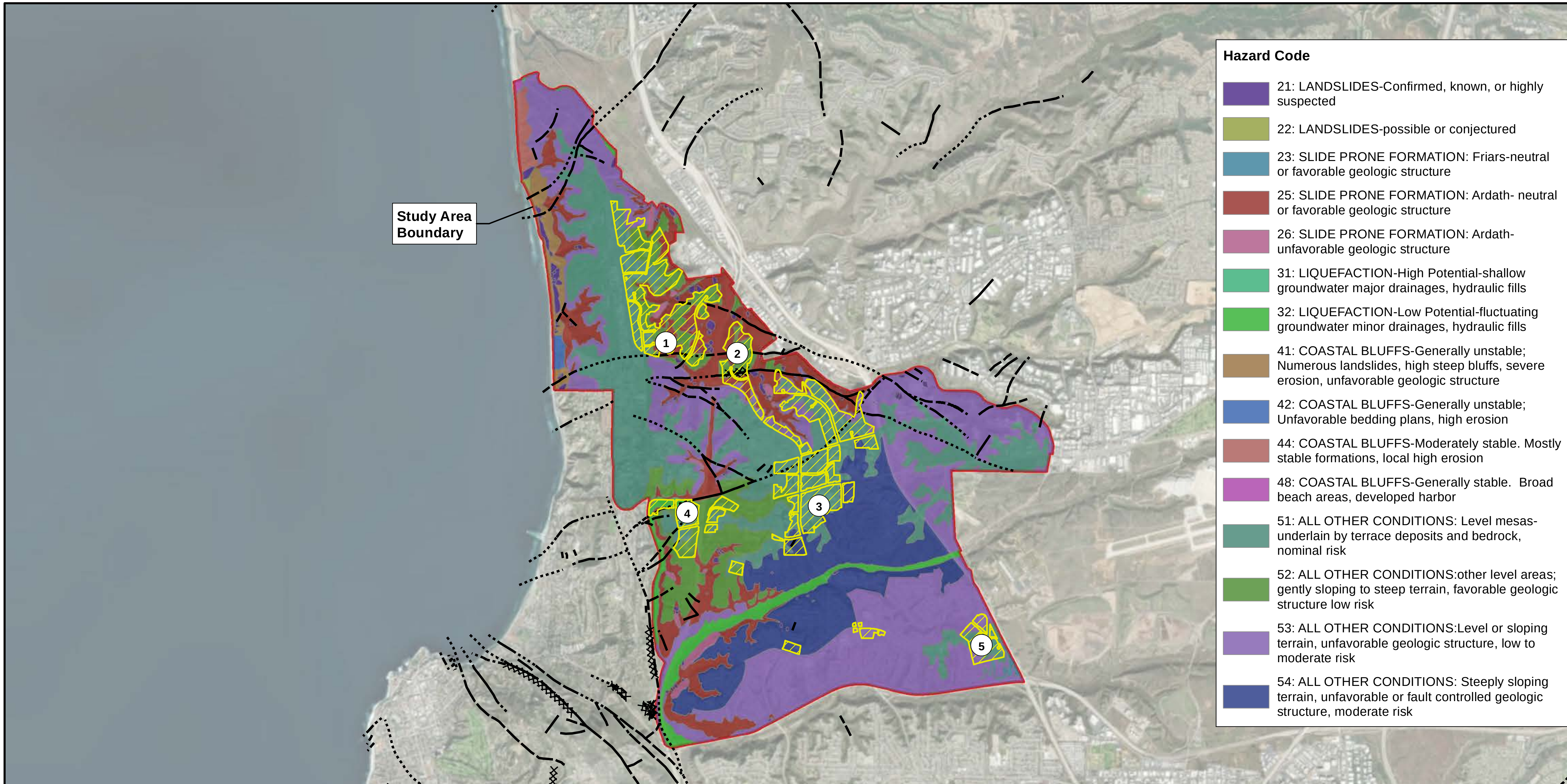
Figure 5



Legend

- Clairemont CPU Boundary
- Focus Areas
- Potentially Active Fault
- Potentially Active Inferred Fault
- Potentially Active Concealed Zone
- Potentially Active Shear Zone

Modified from City of San Diego Geologic Hazards and Fault Maps.
Fault classifications follow the City of San Diego convention (City of San Diego, 2008)

N W E S

0 2,500 5,000 Feet

Project No. 9127009

Date: 04/2020

Drawn By: SG

Study Area
Summary of Geohazards

University Community Plan Update
San Diego, California

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Figure 6