Geologic Impact Analysis

Lillian Commons/Morgan Hill Medical Campus
Juan Hernandez Property
Juan Hernandez Drive
Morgan Hill, California

EMC Planning Group Inc.

301 Lighthouse Avenue, Suite C | Monterey, California 93940

October 16, 2019 | Project No. 403487001

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

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SPS/PCC/DCS/TKW/slt

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1 INTRODUCTION

In accordance with your authorization, we have performed a Geologic Impact Analysis for the proposed Lillian Commons/Morgan Hill Medical Campus development on the Juan Hernandez Property located at the southeast corner of the intersection of Juan Hernandez Drive and Barrett Avenue in Morgan Hill, California (Figures 1 and 2). The purpose of this study was to evaluate the geologic and soil conditions at the project site based on available regional information, and to assess potential impacts related to geology and soils that may result from the proposed project.

Our scope of services for this study consisted of a site reconnaissance and a review of regional geologic maps, seismic hazard reports, seismic hazard maps, project plans, topographic data, soil surveys, and aerial imagery. The findings from this study will be incorporated into an Environmental Impact Report (EIR) for the project.

2 PROJECT DESCRIPTION

The proposed Lillian Commons/Morgan Hill Medical Campus development on the Juan Hernandez property is a multi-use project including medical facilities, retail/restaurants, and multifamily residential housing (Figure 3). The approximately 20-acre site consists of three assessed parcels of which, one is currently occupied by existing medical office and surgical facilities, while the other two are undeveloped. The master plan subdivides the project into four parcels: Parcels A, B, C, and D. Parcel D includes the existing medical office and surgical facilities.

Parcel A will include a 3-story 100,000 square feet medical office/hospital building with a building footprint of approximately 40,800 square feet, a 3-story parking structure, and a small park/open space area. Parcel B will consist of a 1-story 10,000 square feet retail/restaurant building with at-grade parking. Parcel C will consist of five 3- and 4-story multifamily residential units with building footprints of approximately 9,750 square feet, a 1-story 3,000 square feet club/office building, at-grade parking, park/open space, and a community swimming pool and play areas. Parcel D will include a new 1-story 10,000 square feet medical office building, a new 1-story 4,500 square feet urgent care building, and new at-grade parking. Access to the development will be provided by two private interior roadways off of Juan Hernandez Drive and two driveways off of Barrett Avenue.

3 PHYSICAL SETTING

The subject property is located at the southeast corner of the intersection of Juan Hernandez Drive and Barrett Avenue in Morgan Hill, California (Figures 1 and 2). The approximately 20-acre site is bounded by Highway 101 to the east, Barrett Avenue to the north, Juan Hernandez Drive to the west, and by undeveloped land to the south. The majority of the project site is currently undeveloped and covered with various types of grasses and weeds along with a few scattered trees. The existing medical facility is located at the southwest corner of the site and consists of two medical buildings and a paved parking lot. The site is relatively flat with elevations ranging from approximately 344 feet above mean sea level (MSL) in the northeast corner to 337 feet in the southwest corner (Google Earth, 2019).

4 GEOLOGIC SETTING

The project study area is located south of San Francisco Bay in the Coast Ranges geomorphic province of California. The Coast Ranges are comprised of several mountain ranges and structural valleys formed by tectonic processes commonly found around the Circum-Pacific belt (Ring of Fire). Basement rocks have been sheared, faulted, metamorphosed, and uplifted, and are separated by thick blankets of Cretaceous and Cenozoic sediments that fill structural valleys and line continental margins. The San Francisco Bay Area has several ranges that trend northwest, parallel to major strike-slip faults such as the San Andreas, Hayward, and Calaveras (Figure 4). Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement.

4.1 Site Geology

A review of published geologic maps indicates that the project study area is underlain by Pleistocene age alluvial fan deposits (Wentworth et al., 1999; and McLaughlin et al., 2001). According to Wentworth et al. (1999), the Pleistocene alluvial fan deposits typically consist of gravel within a clayey and sandy matrix. Cobbles are also present, and layers within the deposit are crudely bedded. A regional geologic map is presented as Figure 5.

4.2 Soil

A regional soil survey from the Natural Resources Conservation Service (NRCS, 2019) indicates that the soil units in the study area include the Arbuckle gravelly loam and San Ysidro loam. Arbuckle gravelly loam generally consists of well drained gravelly loam and gravelly sandy clay loam that formed in alluvium derived from sedimentary and metamorphic rocks. San Ysidro loam generally consists of moderately well drained clay loam, sandy loam and silty clay loam that formed in alluvium derived from sedimentary rocks.

4.3 Groundwater

Regional groundwater information compiled by the Santa Clara Valley Water District (2019) indicate that groundwater may lie at a depth of approximately 20 to 30 feet beneath the site.

Historical groundwater information summarized by Clark (1916) indicates that groundwater was at a depth of about 25 to 50 feet in the fall of 1914.

Fluctuations in the groundwater level across the site and over time may occur due to seasonal precipitation, variations in topography or subsurface hydrogeologic conditions, or as a result of changes to nearby irrigation practices or groundwater pumping.

5 GEOLOGIC AND SEISMIC HAZARDS

This study considered a number of geologic and seismic hazards relevant to the proposed development. These hazards are discussed in the following subsections.

5.1 Historic Seismicity

The site is located in a seismically active region. Figure 3 presents the location of the site relative to the epicenters of historic earthquakes with magnitudes of 5.5 or more from 1800 to 2000. Table 1 summarizes the significant historic earthquakes with a magnitude of 6 or more that have occurred within 100 kilometers (km) of the site since 1900. Records of historic ground effects related to seismic activity (e.g. liquefaction, sand boils, lateral spreading, ground cracking) compiled by Knudsen et al. (2000), indicate that no ground effects related to historic seismic activity have been reported for the site.

Table 1 – Significant Historic Earthquakes

Date	Place	Location	Magnitude	Epicentral Distance
1989-10-18	Loma Prieta	37.036°N,121.880°W	6.9	24.2 km
1984-04-24	Northern California	37.309°N,121.679°W	6.2	21.3 km
1926-10-22	Offshore Central California	36.725°N,122.180°W	6.3	65.9 km

Reference: https://earthquake.usgs.gov/earthquakes/search

5.2 Ground Surface Fault Rupture

The site is not located within an Alquist-Priolo Earthquake Fault Zone established by the State Geologist (CGS, 1976) or a County of Santa Clara (2012) Fault Rupture Hazard Zone. These zones delineate regions of potential ground surface rupture adjacent to active faults. As defined by the California Geological Survey (CGS), active faults are faults that have caused surface displacement within Holocene time, or within approximately the last 11,700 years (CGS, 2018). The regional fault map presented as Figure 4 indicates that several faults are located near the site (Jennings and Bryant, 2010). The closest active fault to the site is the Calaveras fault, which is located approximately 3⅓ miles to the northeast.

5.3 Seismic Ground Motion

The 2007 Working Group on California Earthquake Probabilities (WGCEP, 2008) predicted that the probability of a magnitude 6.7 or greater earthquake occurring in the greater Bay Area in the next 30 years was 63 percent. The United States Geological Survey (USGS) performed a probabilistic seismic hazard assessment in 2013 to estimate the distribution of likely shaking intensity across the Bay Area by considering seismic events with a return interval of approximately 500 years on various regional faults. The scenarios predicting high levels of shaking intensity from this assessment are summarized in Table 2 with the likely shaking severity at the site based on the Modified Mercalli Intensity scale, earthquake magnitude considered, fault location, and fault distance to the site in kilometers. The results of this assessment indicate that the site could experience a violent degree of seismic ground shaking in the future.

Table 2 – Estimated Future Ground Shaking from Nearby Faults

Fault (Segment)	Fault to Site Distance (km)	Moment Magnitude	Shaking Severity
Calaveras (All Segments)	5.4	7.0	VIII (very strong)
Hayward (South)	14.8	6.8	VI (moderate)
Hayward (North & South)	14.8	7.0	VI (moderate)
San Andreas (All Northern)	16.6	7.8	VIII (very strong)
San Andreas (Peninsula)	45.7	7.2	VI (moderate)

Reference: http://gis.abag.ca.gov/website/Hazards

5.4 Liquefaction

The strong vibratory motions generated by earthquakes can trigger a rapid loss of shear strength in saturated, loose, granular, or fine-grained soils of low plasticity (liquefaction). Liquefaction is generally not a concern at depths of more than 50 feet below ground surface. Liquefaction can result in a loss of foundation bearing capacity or lateral spreading of sloping or unconfined ground. Liquefaction can also generate sand boils leading to settlement at the ground surface.

The site is located within an area where liquefaction hazard has not yet been evaluated by the California Geological Survey. Regional studies of liquefaction susceptibility by the U.S. Geological Survey (Knudsen et al., 2000; Witter et al., 2006) indicate that the site is in area considered to have a low susceptibility to liquefaction and related hazards (Figure 6). Additionally, the study area is not within a liquefaction hazard zone based on the Santa Clara County Geologic Hazard Zones Map (County of Santa Clara, 2012). The potential for liquefaction, lateral spreading and sand boils, and the need for their mitigation can be further evaluated by site-specific subsurface evaluation of the various areas proposed for development.

5.5 Dynamic Settlement

The strong vibratory motion associated with earthquakes can also dynamically compact loose granular soil leading to settlement and ground subsidence. Dynamic settlement may occur in both dry and saturated sand and silt. The study area is within the area considered to have a low susceptibility to liquefaction (Figure 6). As such, the potential for dynamic settlement following an earthquake is likely to be low. The potential for dynamic settlement and the need for mitigation can be further evaluated by site-specific subsurface evaluation of the various areas proposed for development.

5.6 Expansive Soils

Some clay minerals undergo volume changes upon wetting or drying. Unsaturated soils containing those minerals will shrink/swell with the removal/addition of water. The heaving pressures associated with this expansion and shrink/swell movement can damage structures and flatwork. Expansive soils may be present within the study area. The potential for shrink/swell movement due to expansive soils and the need for mitigation can be further evaluated by site-specific evaluation of the various areas proposed for development.

5.7 Consolidation Settlement

Compression or consolidation of loose or soft soil due to overburden fill, large structures, or local dewatering can result in ground subsidence. Based on the proposed project, mitigation of ground subsidence due to compression or consolidation settlement may be needed if loose or soft soil is present and fill is placed to raise grades a few feet or more. The potential for ground subsidence due to consolidation or compression and the need for mitigation can be further evaluated by site-specific subsurface evaluation of the various areas proposed for development.

5.8 Collapsible Soils

Loose, dry, low-density soil can "collapse" or compact with the addition of water under foundation loads or the weight of overlying soil. Ground settlement occurs when the collapsible soil is first saturated or is saturated to depths greater than those achieved by typical rain events. Undocumented fills, young alluvial fans, debris flow sediments, and deposits of wind-blown soil may include collapsible soils, particularly in arid or semi-arid environments. Although regional mapping indicates that wind-blown soil deposits are not present and the alluvial fan deposits in the study area are of Pleistocene age, loose undocumented fills may be present based on past land use practices. As such, collapsible soils may be present within the study area. The potential for ground settlement due to collapsible soils and the need for mitigation can be further evaluated by site-specific evaluation of the various areas proposed for development.

5.9 Flood Hazards and Dam Failure Inundation

Our review of the flood hazard map covering the property (FEMA, 2009) indicates that the site lies within the 0.2 percent annual chance flood plain (Figure 7). Flooding should be considered during design phases of the proposed development.

Flooding can also occur when dams of nearby reservoirs fail and inundate the surrounding downstream areas. The site is located within the inundation area for the Leroy Anderson Dam, which is located approximately 3 miles to the northeast. A portion of the inundation map prepared by the Santa Clara Valley Water District (2016) is provided as Figure 8. Flooding due to dam failure should be considered during design phases of the proposed development.

5.10 Landsliding and Slope Stability

The study area and surrounding areas are relative flat. According to Association of Bay Area Governments Resilience Program, there are no existing landslides and potential debris flow sources in the study area (Figure 9). Accordingly, the potential for landsliding and slope stability in the study area is very low.

5.11 Regional and Local Ground Subsidence

Ground subsidence or settlement of the ground surface can occur over large areas as a result of groundwater pumping, oil or gas extraction, or decomposition of organic soil. The study area is not within or near mapped areas of recorded ground subsidence from these sources (USGS, 2018). Accordingly, the potential for ground subsidence in the study area due to groundwater pumping, oil/gas extraction, or decomposition of the organic soil is low.

Underground voids resulting from historic mining activities or the dissolution of soluble rocks in karst terrane can cause ground subsidence by collapse of these voids or by sinkholes where overlying soil is transported into the void through erosion. The geology in the study area is not consistent with karst terrane and a database maintained by the California Department of Conservation (2016) contains no records of historic mining activities in the study area. Accordingly, the potential for ground subsidence in the study area due to sinkholes or collapsing ground related to historic mining activities or karst terrane is very low.

6 IMPACT ANALYSIS

The following sections present our analysis of potential impacts related to geology and soils that may result from the proposed project. The impacts considered are consistent with the California Environmental Quality Act (CEQA) guidelines for geology and soil.

6.1 Ground Surface Rupture

Known active faults are not mapped in the study area and the site is not located within a fault-rupture hazard zone established by the California Geological Survey or the County of Santa Clara. The potential for ground surface fault rupture that could expose people or structures to potential adverse effects is considered less than significant.

6.2 Strong Ground Shaking

The study area is in a seismically active region with a potential for a strong ground shaking at the site following an earthquake on a nearby fault. The impact of strong ground shaking can be mitigated by designing and constructing the improvements in accordance with the California Building Code to resist the anticipated strong ground shaking by adding the appropriate connections and lateral-force-resisting elements. The potential for strong ground shaking to expose people or structures to substantial adverse effects is therefore considered to be less than significant with mitigation incorporated.

6.3 Seismic-Related Ground Failure

The study area is located within an area with a low susceptibility to liquefaction and not within a seismic hazard zone for earthquake-induced landslides (Figures 6 and 9). The potential for seismic-related ground failure exposing people or structures to substantial adverse effects is likely to be low.

If seismic-related ground failure is encountered during future evaluations, their impact can be mitigated by appropriate foundation type selection and design, remedial grading, or other ground improvement. Accordingly, seismic-related ground failure may be considered a less than significant impact with mitigation incorporated.

6.4 Landslides

The study area and surrounding areas are relative flat and there are no existing landslides and potential debris flow sources in the study area (Figure 9). Accordingly, there is no potential impact due to landslides.

6.5 Soil Erosion

The proposed project will disturb existing ground during site preparation, and expose soil during grading. As such, the proposed project could potentially result in substantial soil erosion including the loss of topsoil by erosion. Impacts related to erosion and loss of topsoil are typically mitigated by compliance with the Best Management Practices stipulated in the grading permits issued the local building official. These practices generally consist of utilizing sedimentation control measures such as silt fences, straw wattles, or sediment traps during construction, and the installation of appropriate soil stabilization measures including erosion control blankets, slope drains with outlet protection, and the establishment of vegetative cover. Erosion and loss of topsoil may therefore be considered a less than significant impact with mitigation incorporated.

6.6 Unstable Soil

The project is located on soil that could be considered unstable due to liquefaction, lateral spreading, collapse with the addition of water, or ground subsidence resulting from consolidation or compression of soft or loose soil, dynamic settlement with seismic shaking, or liquefaction-induced sand boils. In general, the impact of these hazards can be mitigated by appropriate foundation type selection and design, drainage improvements, remedial grading, or ground improvement. Accordingly, unstable conditions due to lateral spreading, subsidence, liquefaction, or collapse may be considered a less than significant impact with mitigation incorporated.

6.7 Expansive Soil

Expansive soils may be present within the project study area and create a risk for property damage where project improvements are constructed on or adjacent to expansive soils. The impact of expansive soil can be mitigated by removing the expansive soil, chemically treating the soil to reduce the expansion characteristic, or by designing structures to accommodate the heaving pressures and shrink/swell movement associated with expansive soils. The potential for property damage due to expansive soil may therefore be considered a less than significant impact with mitigation incorporated.

7 LIMITATIONS

The limited geologic hazards assessment and geologic impact analysis presented in this report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions and opinions presented in this report. Our findings are based on a review of the referenced geologic literature. Geologic variations may exist on the site, and conditions not described in this report may be encountered.

The purpose of this study was to evaluate geologic hazard conditions within the study area using readily available data and to provide a geologic impact analysis which can be utilized in the preparation of environmental documents for the project. A more detailed geotechnical and geologic evaluation, including site reconnaissance, subsurface exploration, and laboratory testing, should be performed prior to design and construction of the proposed project.

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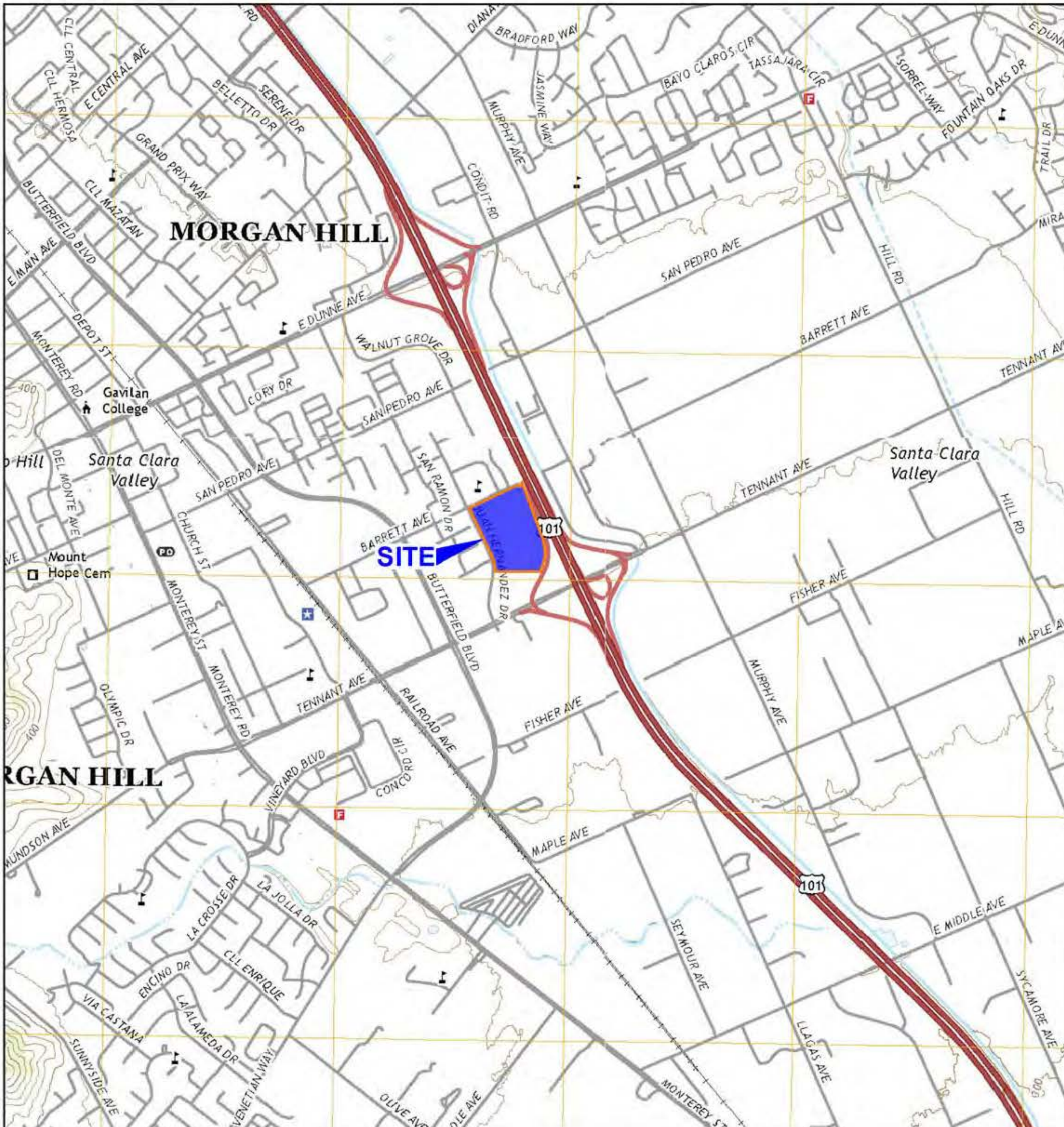
FIGURES



NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE | REFERENCE: USGS, 2018

N

SCALE (FEET)

0 2,000 4,000

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FIGURE 1

SITE LOCATION

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE
MORGAN HILL, CALIFORNIA
403487001 | 10/19

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LEGEND

SITE BOUNDARY

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE | REFERENCE: GOOGLE EARTH, 2019

N

SCALE (FEET)

0 200 400

FIGURE 2

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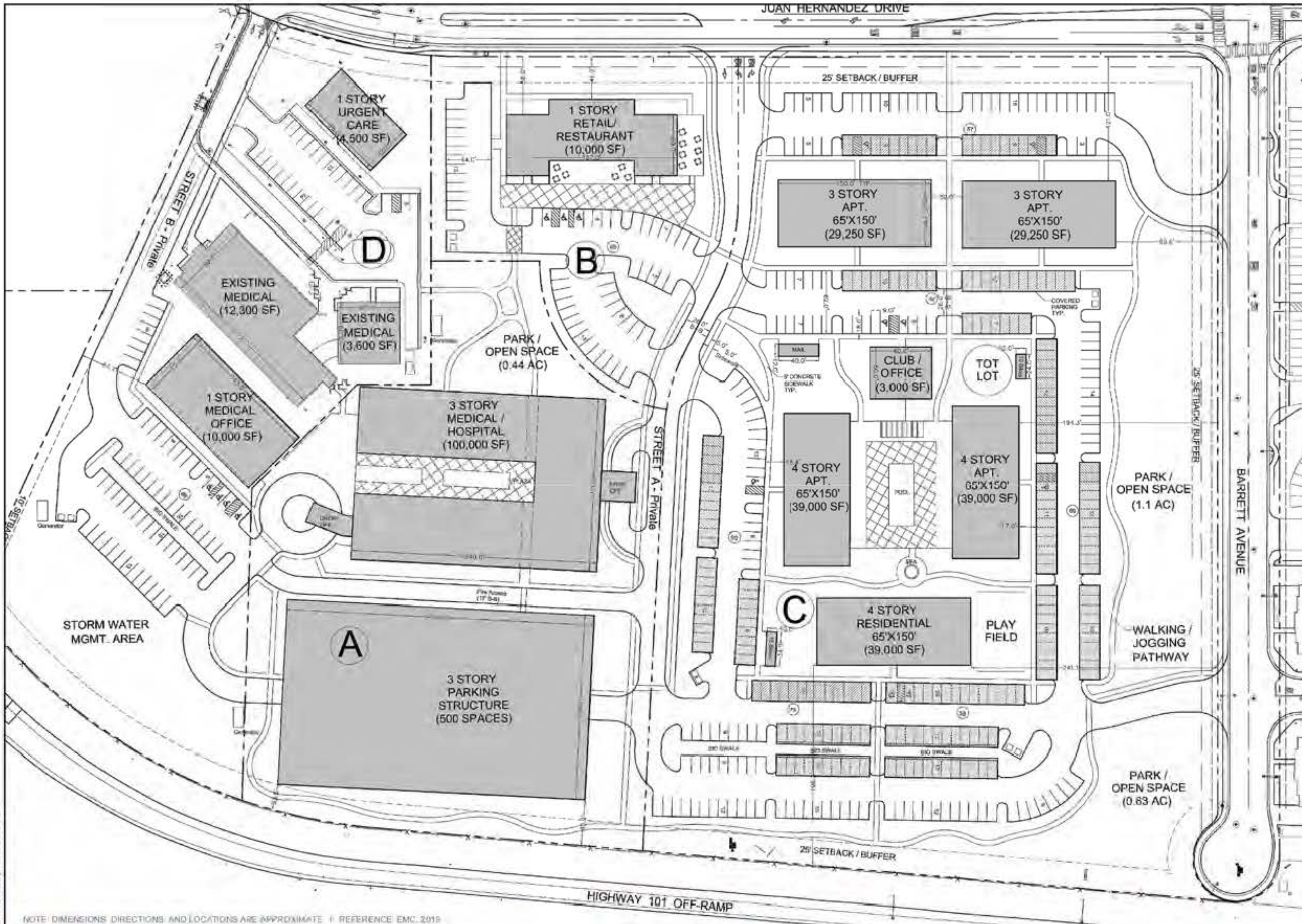
AERIAL PHOTOGRAPH

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE
MORGAN HILL, CALIFORNIA
403487001 | 10/19



NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE. | REFERENCE: EMC, 2019

LEGEND

- SITE BOUNDARY (WHITSON ENGINEERING)
- STRUCTURES ON SITE
- PARKING CARPORTS

SITE DATA:

APN: 817-09-039, 040, AND 041
SITE AREA: GLA -19.67 AC, 856782 SF
STRUCTURE SIZE:
- PARCEL A - PROPOSED MEDICAL OFFICES/HOSPITAL - 4.17 AC
  - 100,000 SF, 500 PARKING SPACES
  - 0.44 AC PASSIVE PARK
- PARCEL B - PROPOSED COMMERCIAL/RESTAURANT - 1.78 AC
  - 10,000 SF, 55 PARKING SPACES
- PARCEL C - PROPOSED RESIDENTIAL APARTMENTS - 9.49 AC
  - 175,500 SF RESIDENTIAL 359 PARKING SPACES
  - 3,000 SF LEASING OFFICE/CLUB HOUSE
  - 2.42 AC PARK/RECREATION
- PARCEL D - PROPOSED URGENT CARE/EXISTING MEDICAL - 4.13 AC
  - 15,900 SF EX. MEDICAL
  - 4,500 SF PROPOSED URGENT CARE
  - 10,000 SF PROPOSED MEDICAL OFFICE
  - 96 PARKING SPACES
- RIGHT-OF-WAY DEDICATION = 0.10 AC

ZONING: SERVICE COMMERCIAL - CS W/PD OVERLAY
EXISTING GENERAL PLAN DESIGNATION: COMMERCIAL
PROPOSED GENERAL PLAN AMENDMENT: MIXED USE FLEX
PARKING: TOTAL REQUIRED 1,161 SPACES/PROVIDED 1,010 SPACES*
- REQUIRED: MEDICAL OFFICE/HOSPITAL @ 1/200 = 652 SPACES
- PROPOSED: MEDICAL OFFICE/HOSPITAL @ 1/219 = 596 SPACES
- REQUIRED: RETAIL/RESTAURANT @ 1/250 AND 1/100 = 70 SPACES
  - (ASSUMES 5,000 RETAIL AND 5,000 RESTAURANT)
- PROPOSED: RETAIL/RESTAURANT 55 SPACES
- REQUIRED: APARTMENTS @ 1.5/1 BDRM AND 2.02/2 BDRM = 375 SPACES
  - GUEST PARKING @ 1/3 DU = 68 SPACES
  - TOTAL = 443 (203 COVERED)
- PROPOSED: APARTMENTS 359 SPACES
- * SHARED PARKING PROPOSED PER MUNICIPAL CODE SECTION 18.72.050

LOT COVERAGE:
- BUILDING = 212,319 SF (25% NLA)
- PARKING/DRIVEWAYS = 227,804 SF
- LANDSCAPE/STORM WATER MANAGEMENT = 335,045 SF
- HARDSCAPE = 81,614 SF

FLOOR AREA RATIO: 351,786 SF (0.42%)

SCALE (FEET)
0 100 200

FIGURE 3

SITE PLAN

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE
MORGAN HILL, CALIFORNIA
403487001 | 10/19

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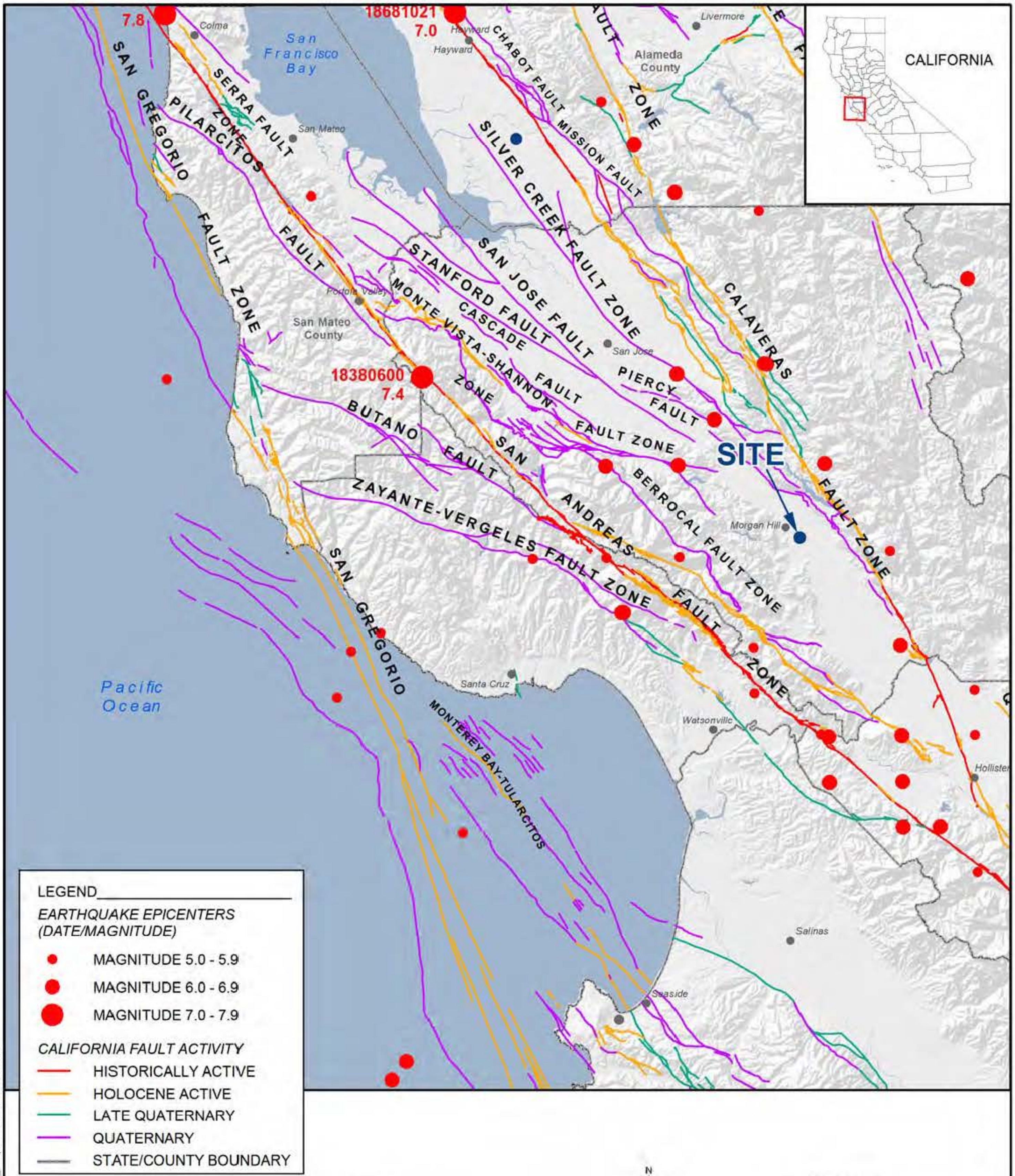

NOTE: DIRECTIONS, DIMENSIONS, AND LOCATIONS ARE APPROXIMATE

SOURCES: CALIFORNIA GEOLOGICAL SURVEY, 2010, FAULT ACTIVITY MAP OF CALIFORNIA; CALIFORNIA GEOLOGICAL SURVEY, 2000, MAP SHEET 49

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FIGURE 4

FAULT LOCATIONS AND EARTHQUAKE EPICENTERS

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE, MORGAN HILL, CALIFORNIA

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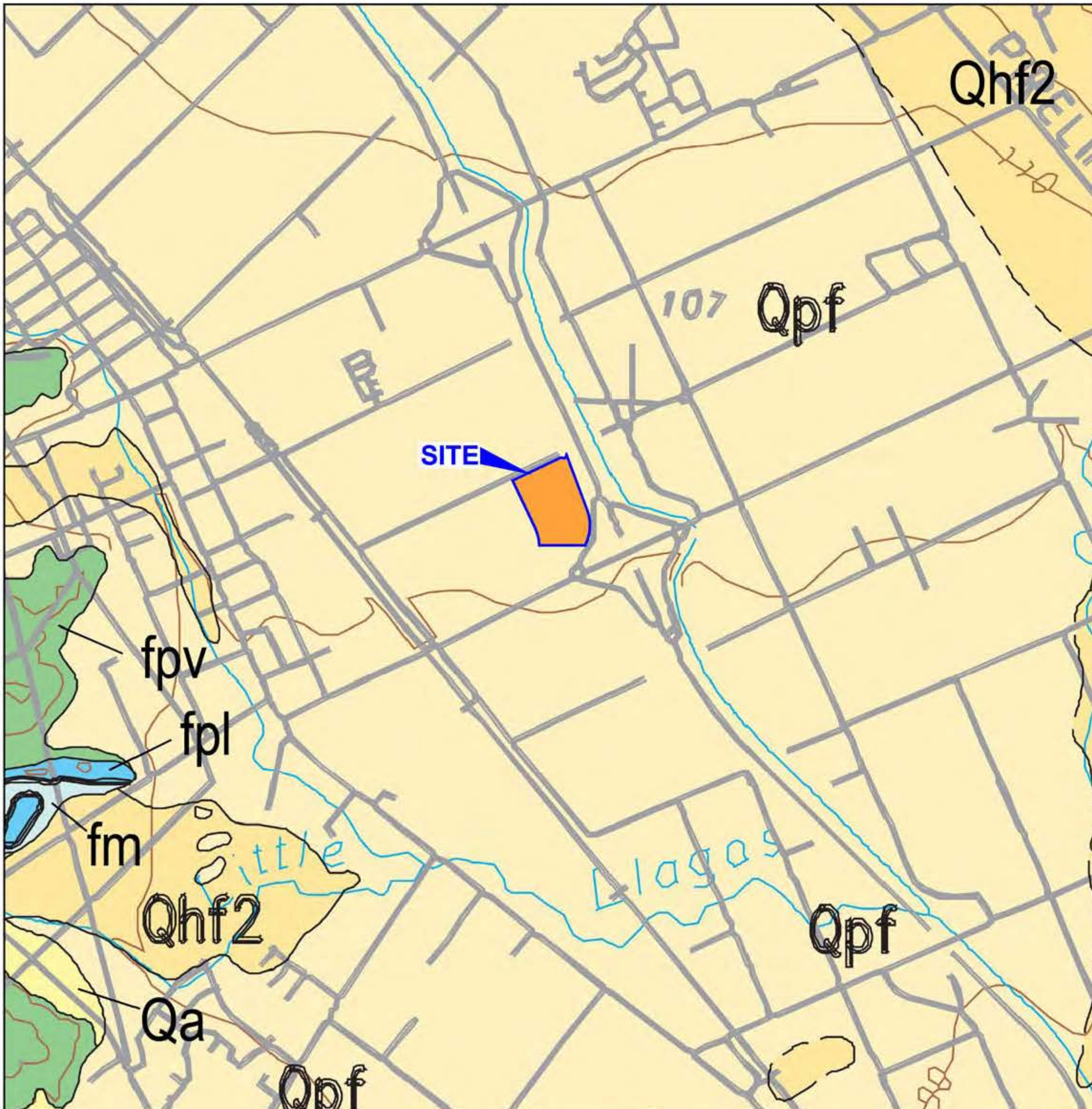

LEGEND

Qa	ALLUVIUM, UNDIVIDED (QUATERNARY)	Qpf	ALLUVIAL FAN DEPOSITS (PLEISTOCENE)	fpl	LIMESTONE (CRETACEOUS)		
Qhf2	ALLUVIAL FAN DEPOSITS (HOLOCENE)	fm	MELANGE (CRETACEOUS)	fpv	BASALTIC VOLCANIC ROCKS (CRETACEOUS)		

THRUST FAULT
FAULT
GEOLOGIC CONTACT
STRIKE AND DIP OF BEDDING

N

SCALE (FEET)
0 2,000 4,000

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE
REFERENCE: USGS, WENTWORTH, ET AL, 1999

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FIGURE 5

REGIONAL GEOLOGY

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE
MORGAN HILL, CALIFORNIA
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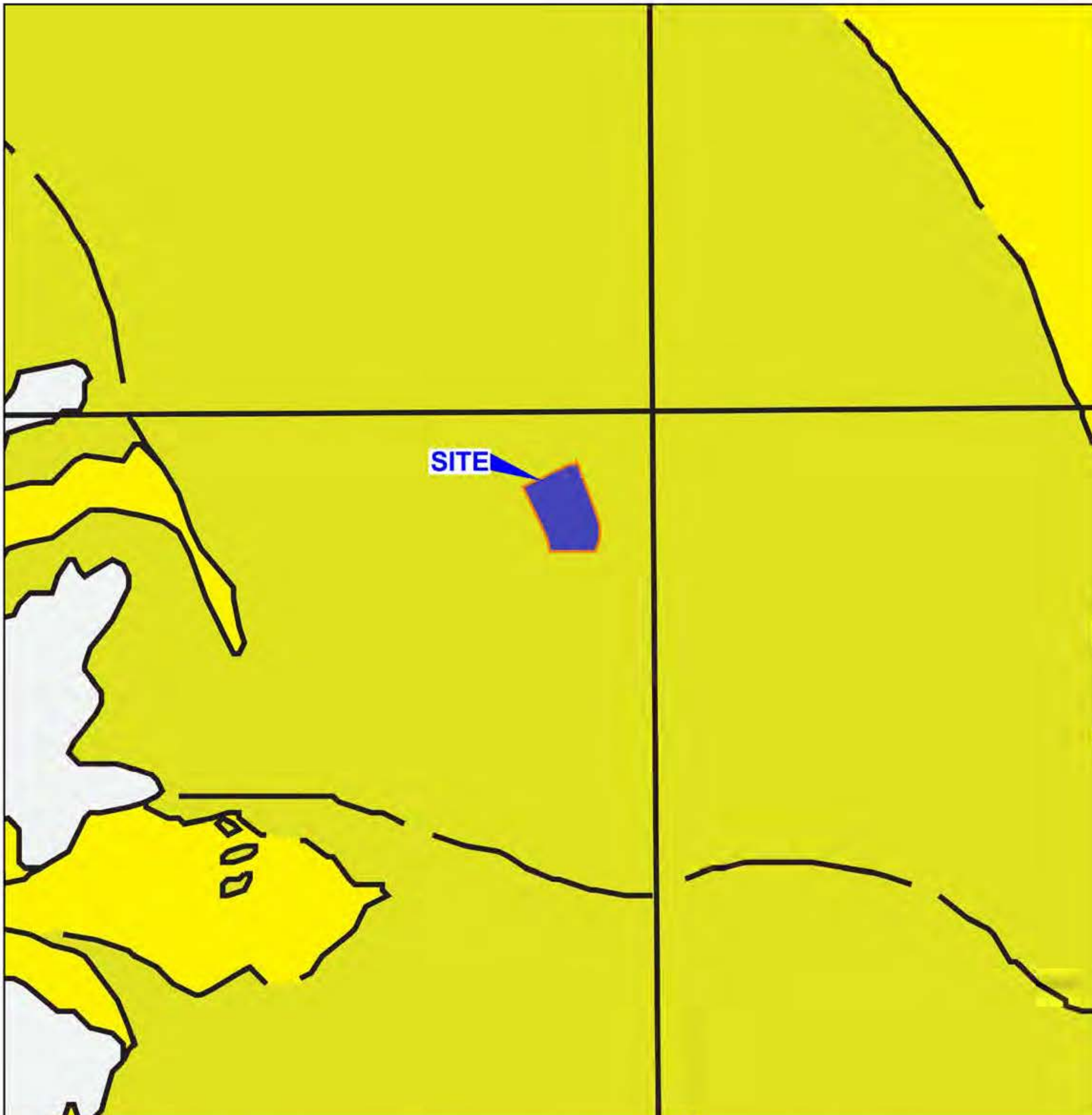

LEGEND

VERY HIGH SUSCEPTIBILITY | HIGH SUSCEPTIBILITY | MODERATE SUSCEPTIBILITY | LOW SUSCEPTIBILITY | VERY LOW SUSCEPTIBILITY

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE
REFERENCE: USGS, KNUDSEN, ET AL, 2000

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FIGURE 6

LIQUEFACTION SUSCEPTIBILTY

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
JUAN HERNANDEZ DRIVE
MORGAN HILL, CALIFORNIA
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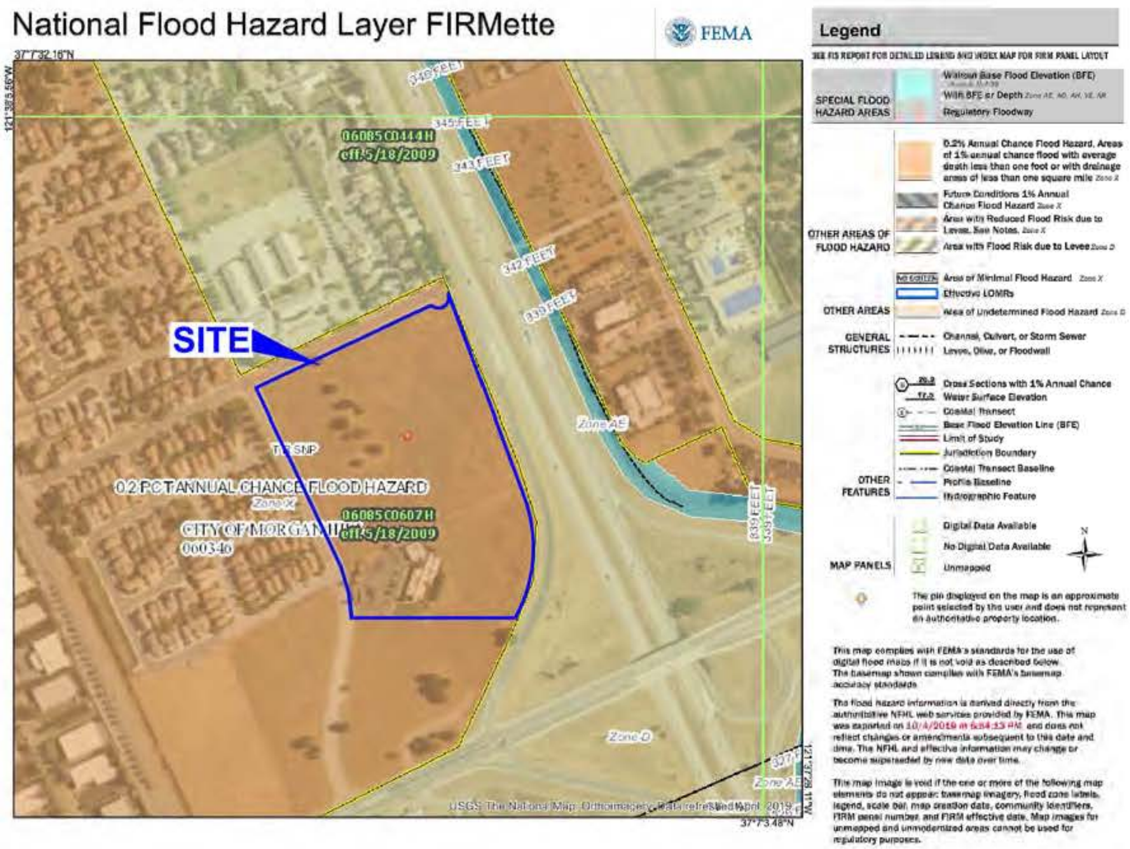

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE | REFERENCE: FEMA, 2019

SCALE (FEET)
0 750 1,500

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FIGURE 7

FLOOD HAZARD

LILLIAN COMMONS/MORGAN HILL MEDICAL CAMPUS
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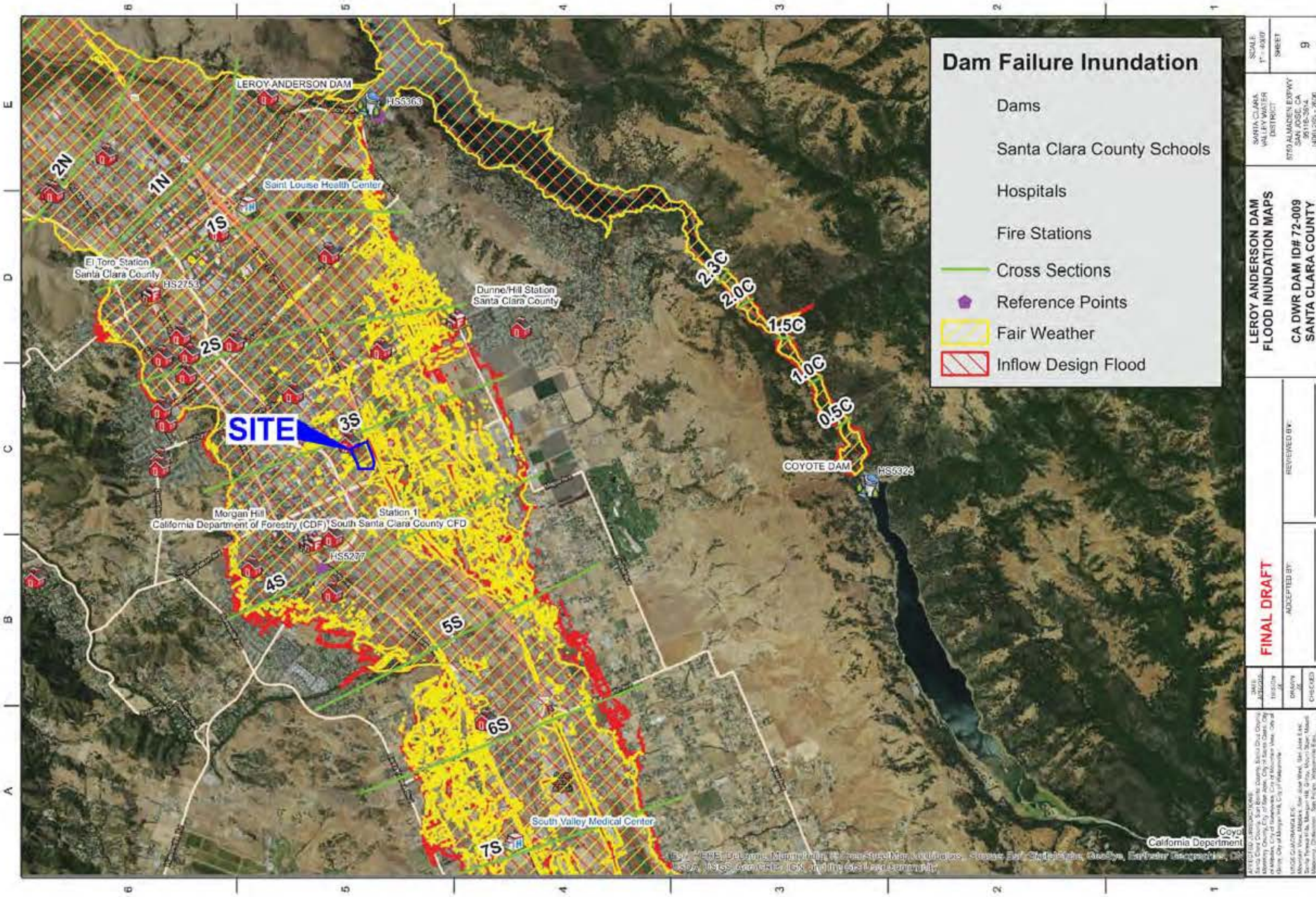

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE | REFERENCE: SCVWD, 2019

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FIGURE 8

DAM FAILURE INUNDATION

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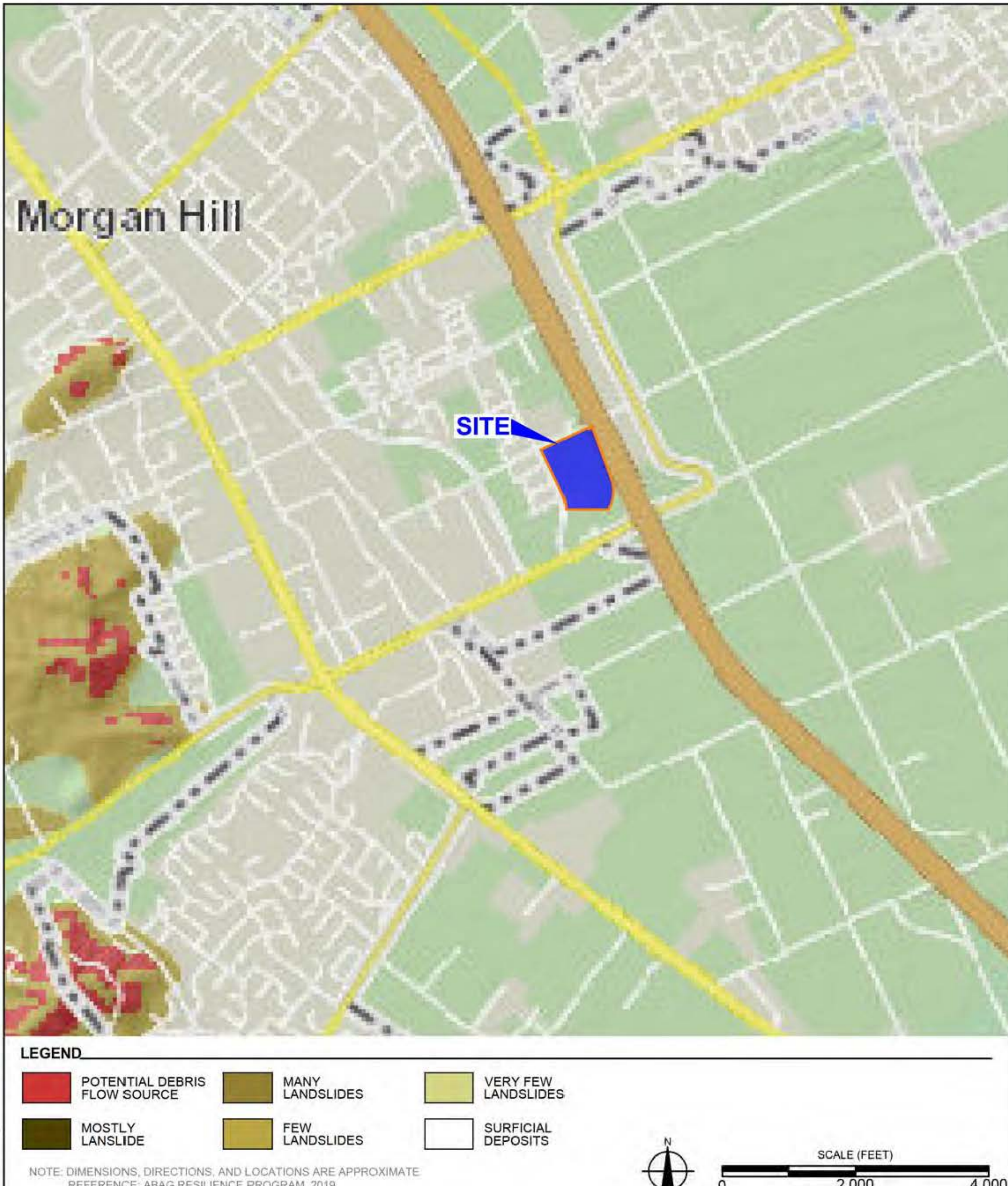

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FIGURE 9

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LANDSLIDE DISTRIBUTION AND DEBRIS FLOW SOURCE AREAS

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