

GEOTECHNICAL FEASIBILITY REPORT
for
PROPOSED RESIDENTIAL SUBDIVISION
on
Capitola Drive
Napa, California
for
NORTH BAY CIVIL ENGINEERING & DESIGN

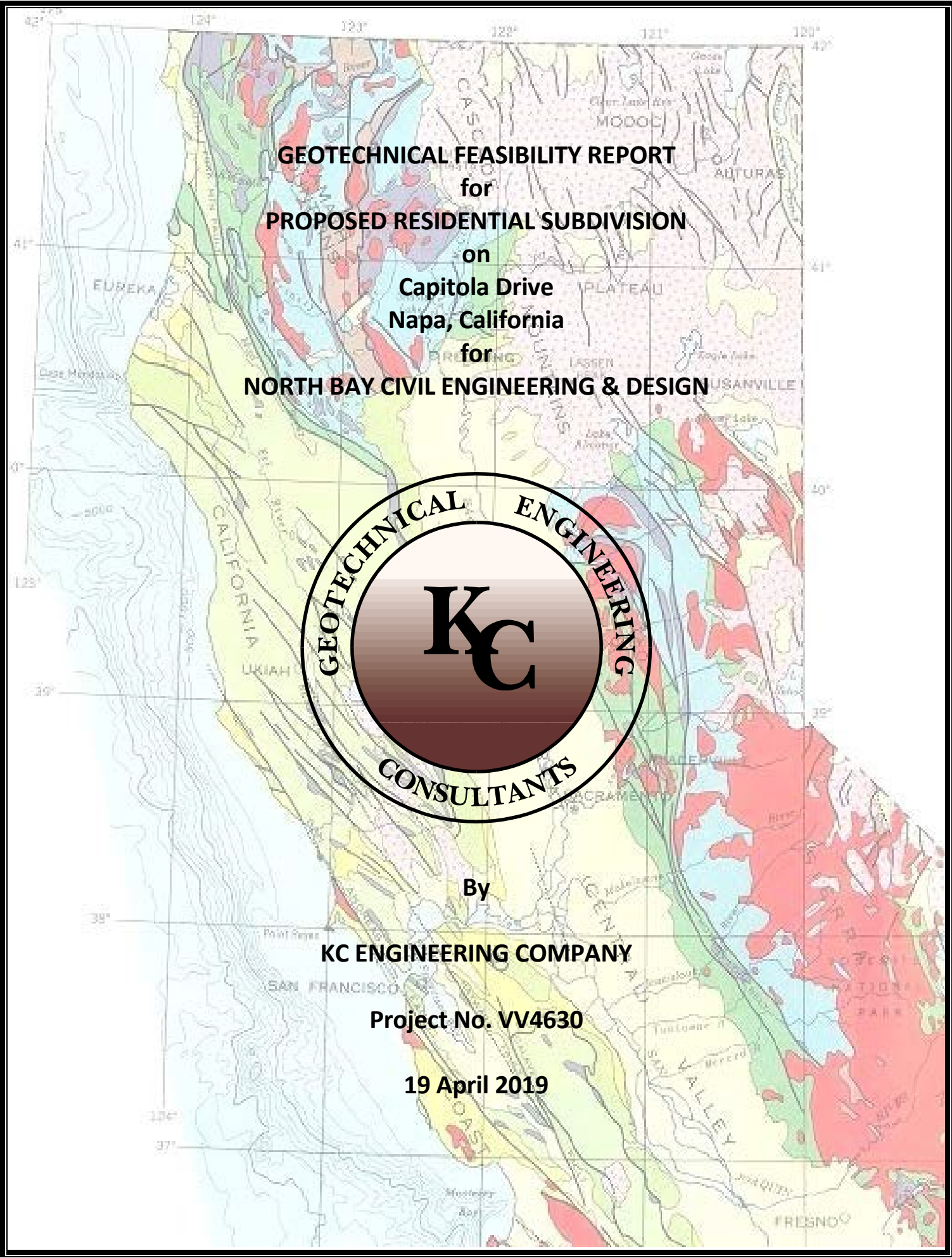


By

KC ENGINEERING COMPANY

Project No. VV4630

19 April 2019



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KC ENGINEERING COMPANY
A SUBSIDIARY OF MATERIALS TESTING, INC.

Project No. VV4630
19 April 2019

Mr. Thomas Hodge
North Bay Civil Engineering & Design
1963 Iroquois Street
Napa, CA 94559

Subject: Proposed Residential Subdivision
Capitola Drive, Napa, California
GEOTECHNICAL FEASIBILITY REPORT

Dear Mr. Hodge:

In accordance with your authorization, **KC ENGINEERING COMPANY** has performed a reconnaissance of the existing property and reviewed available geotechnical and geologic information concerning the site and surrounding area. The purpose of our reconnaissance and review was to determine whether the proposed residential subdivision is geotechnically feasible for construction and to provide recommendations for further investigation.

In summary, our findings indicate that the proposed residential subdivision is geotechnically feasible for construction on the subject site. Due to the presence of existing structures and variable soil conditions, we anticipate that conventional earthwork operations including demolition, dewatering, subdrain installation, over-excavation, site processing and compaction will be required to construct the proposed building pads, underground utilities and streets. Various foundation systems such as spread footings, pier and grade beam, and post-tension slab systems will be required to support the proposed single-family residences. Once the project receives planning department approval, a site specific geotechnical subsurface exploration will be required to determine the actual soil conditions and foundation design parameters.

Should you have any questions relating to the contents of this report or should you require additional information, please contact our office at your convenience.

Respectfully Submitted,
KC ENGINEERING COMPANY


David V. Cymanski, G.E.
Principal Engineer



Purpose & Scope

KC ENGINEERING COMPANY has performed a reconnaissance of the existing property and reviewed available geotechnical and geologic information concerning the site and surrounding area. The purpose of our reconnaissance and review was to determine whether the proposed residential subdivision is geotechnically feasible for construction and to provide preliminary recommendations. In summary, our findings indicate that the proposed residential subdivision is geotechnically feasible for construction on the subject site. The following sections describe our review, findings, discussions and recommendations.

Site Location and Description

The subject property is located at the southern end of Capitola Drive in Napa, California as shown on Figure 1, "Aerial Vicinity Map" included in the Appendix of this report. The property is bounded on the north by existing residences and Capitola Drive, on the east by existing residences, on the south by existing residences, and on the west by Silverado Trail. The property currently contains a number of old residences and detached sheds and garages. Asphalt driveways access the structures. A shallow man-made water feature is located in the central portion of the site which receives storm water from Capitol Drive. Storm drain and sewer pipelines cross the property. An artesian water well is located behind the central residence and barn. Numerous mature trees are scattered across the site. The ground surface topography generally consists of two low hills on the west and east sides of the property. The central area is relatively flat.

The above description is based on a reconnaissance of the site by the Geotechnical Engineer, a review of a Google aerial image dated 9/1/18, and a review a proposed subdivision layout provided by North Bay Civil Engineering & Design. The Google aerial image was used as the basis for our Figure 1, "Aerial Vicinity Map", and the proposed subdivision layout was used as our Figure 2, "Site Plan" included in the Appendix.

Proposed Development

The proposed development is planned to consist of demolishing the existing structures and improvements followed by constructing approximately 21 single-family residences within the proposed lots shown on Figure 2, "Site Plan". The proposed residences are expected to be constructed of conventional wood-framing and are expected to be one to two stories in height. Although specific development plans are not available at this time, split-level and flat pad construction is expected due to the varying terrain on the property. Capitola Drive is planned to be extended through the site. Two new asphalt concrete roads and cul-de-sacs, along with a parking lot are planned to provide access and parking for the residential lots. Grading of the site is expected to consist of various cuts and fills of about 10 vertical feet or less to create flat or split-level building

pads. Retaining walls of 10 feet or less are also expected. Additional site improvements are expected to consist of relocating existing storm drain and sewer pipelines, as well as constructing new underground utilities. The central man-made water feature will be removed and the area filled.

Geotechnical Review

It is pointed out that we recently performed a geotechnical exploration for the first two residences located on the northeast corner of the subject property as presented in our report “Geotechnical Exploration Report, Proposed Custom Residence & Secondary Dwelling, 808 Capitola Drive, Napa, California” dated 4/17/19. Our exploration included excavation of three exploratory test pits and laboratory testing. Our findings revealed moderately to highly expansive sandy clays underlain by dense alluvium and volcanic tuff bedrock. Recommendations were then provided for earthwork grading, drainage, foundations and pavements.

Site Geology

According to Geologic Map of the Napa 7.5' Quadrangle¹, the geologic formations underlying the property are mapped as latest Pleistocene to Holocene alluvium and stream terrace deposits. The hillside areas just east of the site are mapped as the Sonoma Volcanics comprising tuff breccia. The alluvium and stream terrace deposits consist of well-sorted and bedded sand, gravel, silt and clays. A geologic map of the property and surrounding areas is included as Figure 3, “Geologic Map”. The materials encountered and observed on the site generally correlate with those mapped on the site and vicinity.

Geo-Hazards & Seismicity

The site is not located within an Alquist-Priolo Earthquake Fault Zone². There are no known active or inactive faults crossing the site as mapped and/or recognized by the State of California. Significant earthquake related ground shaking should be expected during the design life of the structures at the site. The California Geological Survey (CGS) has defined an active fault as one that has had surface displacement in the last 11,000 years, or has experienced earthquakes in recorded history.

¹ Clahan, Wagner, Saucedo, Randolph-Loar and Sowers, 2004, *Geologic Map of the Napa 7.5' Quadrangle, Napa County, California*, California Geological Survey

² Parish, J.G., 2018 *Earthquake Fault Zones*, California Geological Survey, Special Publication 42, Revised 2018.

Based on our review of the Fault Activity Map of California³ and the USGS Fault Database⁴, the nearest active faults are the West Napa Fault, the Green Valley Fault, the Hunting Creek-Berryessa Fault, and the Hayward-Rodgers Creek Fault located approximately 2.3 miles west, 6.1 miles east, 11.6 miles northeast, and 14.8 miles west of the site, respectively.

The 2016 CBC specifies that the potential for liquefaction and soil strength loss should be evaluated for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with an adjustment for site class effects in accordance with American Society of Civil Engineer (ASCE 7-10)⁵. Structures at the site will need to be designed to withstand the anticipated ground accelerations. Specific earthquake design values will be determined during future specific investigations.

Fault Rupture

The site is not located within an Alquist-Priolo Earthquake Fault Zone. Based on our review of geologic maps, no known active, or inactive faults cross or project toward the subject site. In addition, no evidence of active faulting was visible on the site during our site reconnaissance. It is our opinion that there is no potential for fault-related surface rupture at the subject site.

Landsliding

No obvious signs of slope instability were observed on the site during our reconnaissance. Geologic mapping does not show landsliding in the area. After site grading, the proposed home sites will be located on a flat pads. In our opinion, the property is not subject to seismically induced landsliding.

Liquefaction

Soil liquefaction is a phenomenon in which loose and saturated cohesionless soils are subject to a temporary, but essentially total loss of shear strength, due to pore pressure build-up under the reversing cyclic shear stresses associated with earthquakes. Our recent exploration on the northeastern lots revealed shallow volcanic rock and dense gravelly sands that are not subject to liquefaction. Further liquefaction evaluation will be required for the remainder of the site during future site specific geotechnical explorations.

³ Jennings, C.W. and Bryant, W.A., 2010, *Fault Activity Map of California*, California Geological Survey Geologic Data Map No. 6, scale 1:750,000

⁴ U.S. Geological Survey, 2008 National Seismic Hazards Maps – Source Parameters, accessed 4/17/19, from USGS web site: https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_main.cfm

⁵ American Society of Civil Engineer (ASCE), 2010, Minimum Design Loads for Buildings and Other Structures, Standard 7-10.

Conclusions, Discussions and Recommendations

Based on our review, recent exploration on the site, experience in the Napa area and site reconnaissance, it is the opinion of **KC ENGINEERING COMPANY** that the proposed residential subdivision is geotechnically feasible for construction and can be safely developed on the subject site.

Due to the presence of existing structures, the man-made water feature and expected variable soil conditions, we anticipate that conventional earthwork operations including demolition, dewatering, subdrain installation, over-excavation, site processing and compaction will be required to construct the proposed building pads and streets.

The primary geotechnical and geologic hazards identified on the property consist of expansive surface soils and the potential for differential fill thickness and soil conditions under proposed structure locations. The site soils are prone to heave and shrink movements with changes in moisture content and, consequently, must be carefully considered in the design of grading, foundations, and drainage. Considering the varying depths of materials and the highly expansive nature of the soils, differential foundation movements can be anticipated if the structure is not adequately supported. Therefore, it is the opinion of **KC ENGINEERING COMPANY** that the proposed structures will need to be supported on either thickened post-tensioned slab foundation systems, or a well-reinforced and deepened pier and grade beam foundation with a raised wood floor foundation system. Conventional spread footings may also be utilized where shallow bedrock conditions are present.

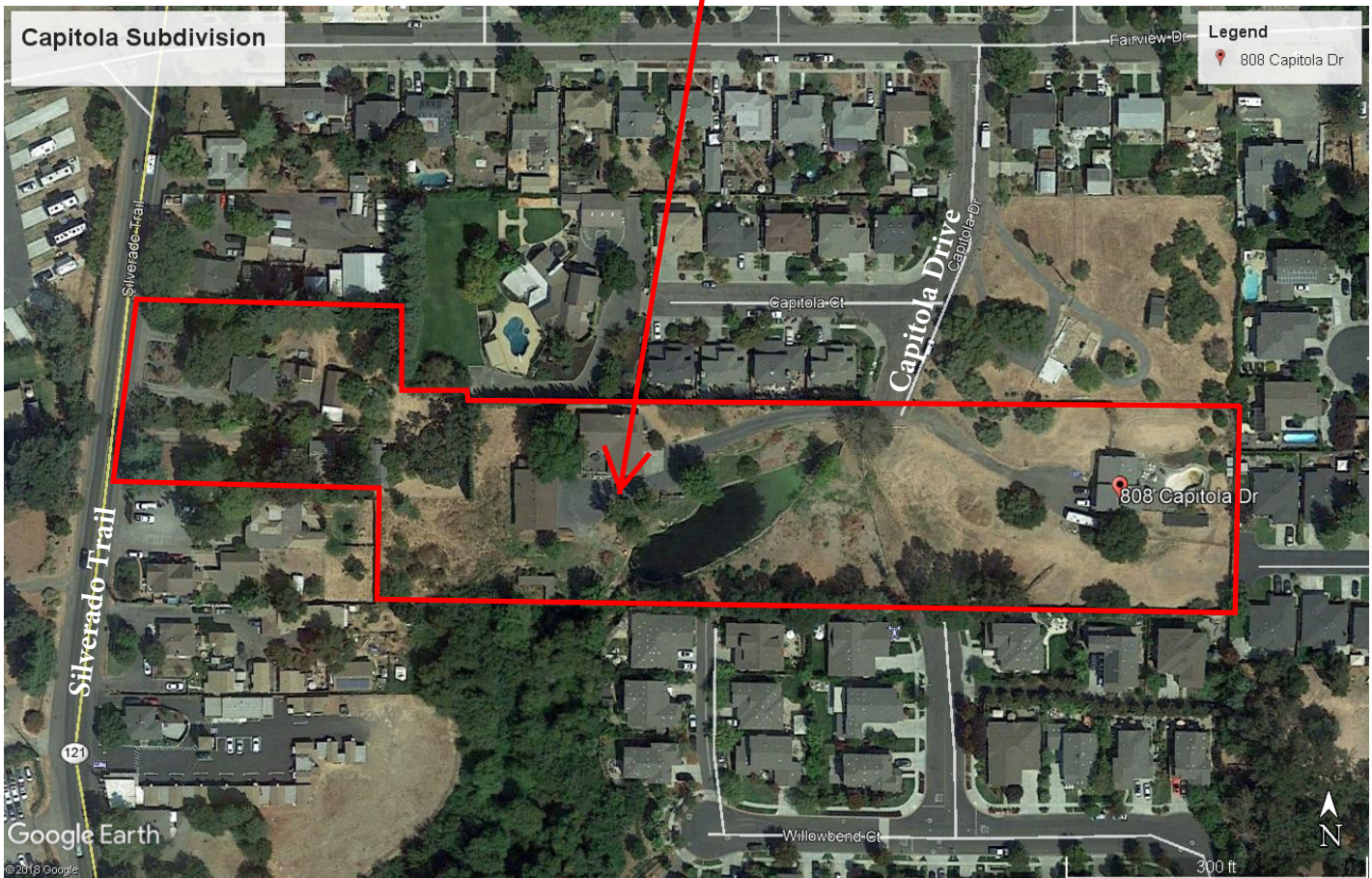
Once the project receives planning department approval, we recommend that a site specific geotechnical subsurface exploration and laboratory testing program be performed to determine the actual soil conditions and foundation design parameters as required in the 2016 California Building Code, Chapter 18 "Soils and Foundations", Section 1803. Lot specific geotechnical recommendations can then be provided for site grading, foundation type and design, retaining walls, slabs, drainage improvements and driveway sections. In our opinion, the site should be investigated by a combination of conventional exploratory drilling and sampling with associated laboratory testing, as well as exploratory test pits to evaluate the underlying soil deposits and their geotechnical characteristics.

APPENDIX

Aerial Vicinity Map

Site Plan

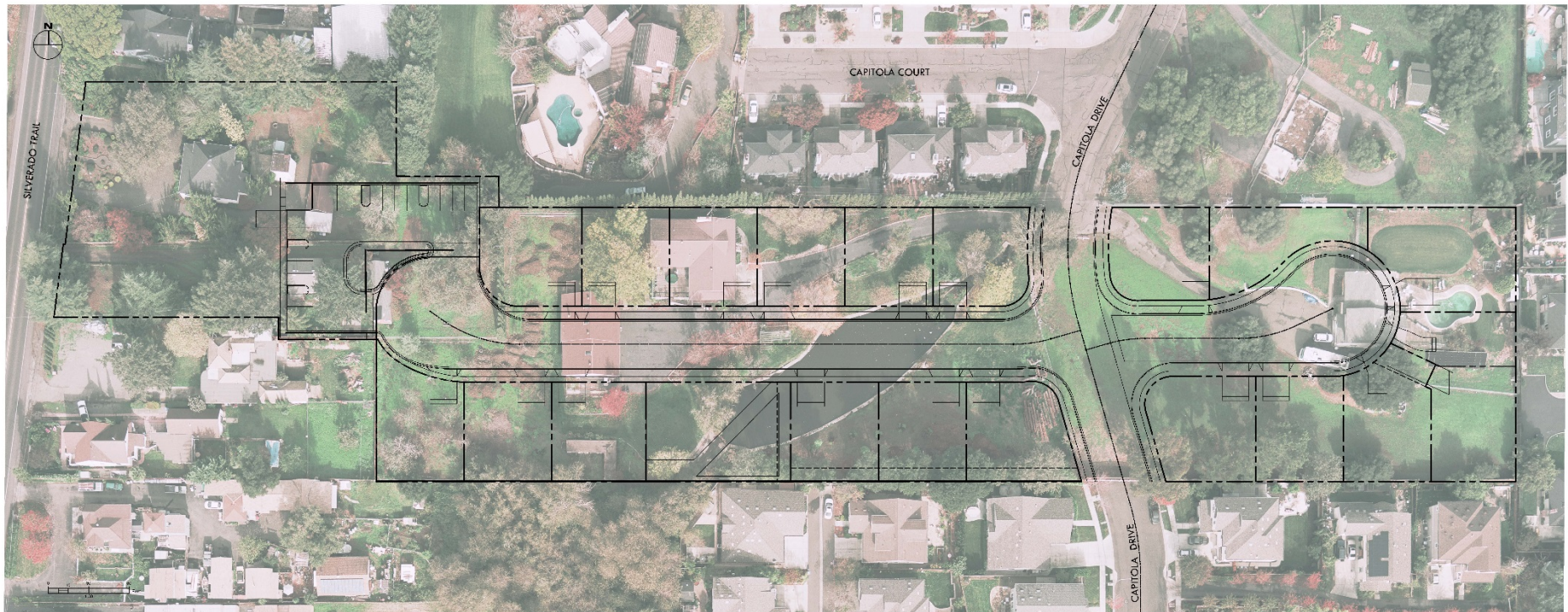
Geologic Map



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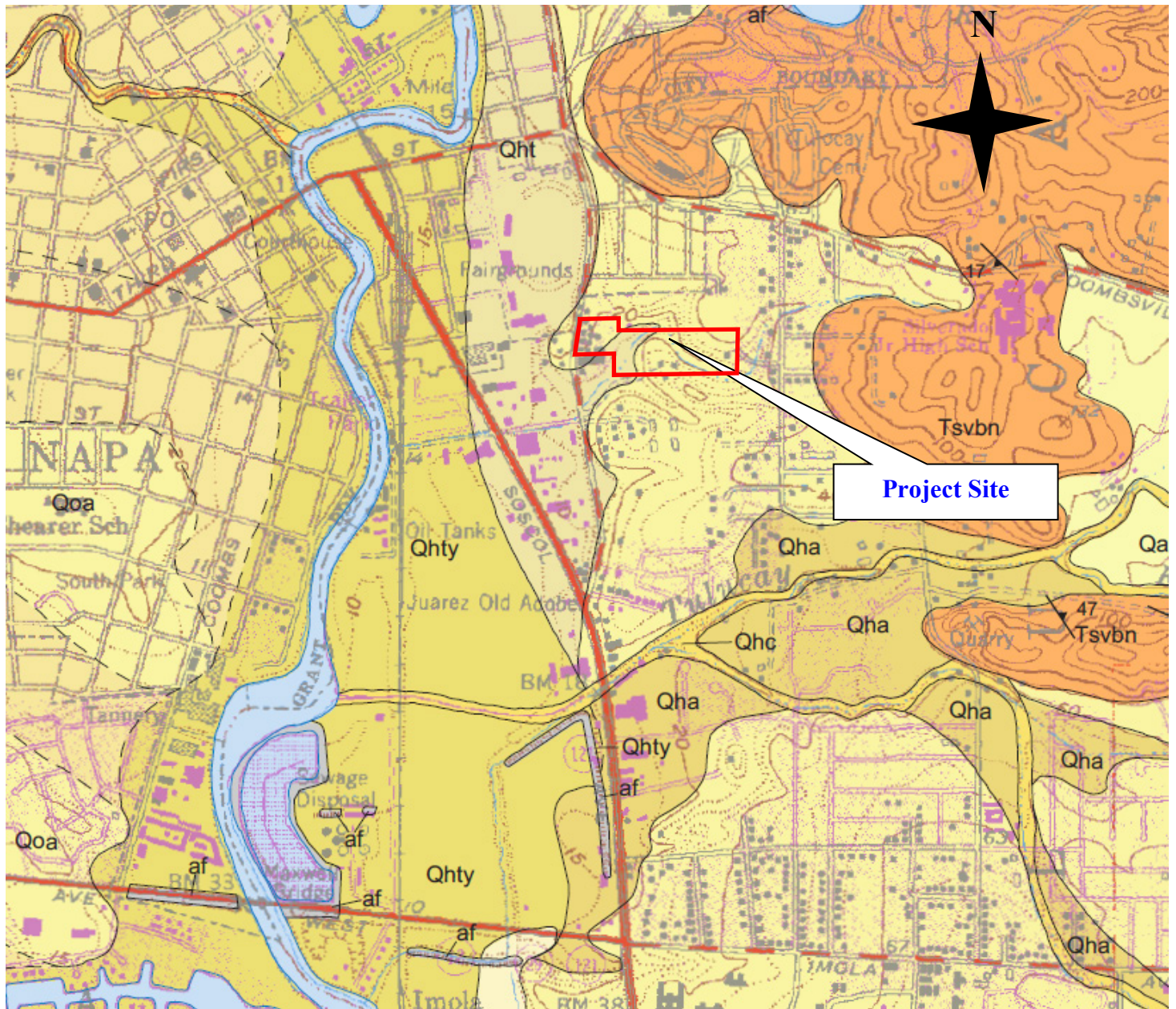
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Figure 1 – AERIAL VICINITY MAP

CAPITOLA SUBDIVISION



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Figure 2 – SITE PLAN



GEOLOGIC MAP OF THE
 NAPA 7.5' QUADRANGLE
 NAPA COUNTY, CALIFORNIA: A DIGITAL DATABASE

VERSION 1.0

By

Kevin B. Clahan¹, David L. Wagner², George J. Saucedo¹, Carolyn E. Randolph-Loar³, and Janet M. Sowers³

Digital Database

by:

Carlos I. Gutierrez²
 2004

- Qa** Alluvium, undivided (latest Pleistocene to Holocene) - Flat, relatively undissected fan, terrace, and basin deposits.
- Qht** Stream terrace deposits (Holocene <10,000 years) - Stream terraces deposited as point bar and overbank deposits, composed of moderately to well-sorted and bedded sand, gravel, silt, and minor clay.
- Qha** Alluvium, undivided (Holocene) - Alluvium deposited on fans, terraces, or in basins, composed of sand, gravel, silt, and clay that are poorly sorted.



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Figure 3 – GEOLOGIC MAP