PRELIMINARY GEOTECHNICAL INFORMATION
CHARCOT AVENUE EXTENSION OVER INTERSTATE 880
SAN JOSE, CALIFORNIA

For

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1.0 INTRODUCTION

This report presents preliminary geotechnical information for the proposed Charcot Avenue Extension over Interstate 880 (Project) to be constructed in the City of San Jose within Santa Clara County, California. The approximate Project location is shown on the Project Location Map, Plate No. 1.

No new geotechnical exploration and laboratory test are conducted for this study. The field investigation for this Project will be conducted during the PS&E phase. Detailed geotechnical information will be provided once the specific subsurface soil conditions become available. This preliminary geotechnical information report is based on readily available geologic data.

2.0 PROJECT DESCRIPTION

The City of San Jose proposes to construct a new extension of Charcot Avenue from Paragon Drive on the west side of Interstate 880 (I-880) to the intersection of existing Silkwood Lane and Oakland Road on the east side of I-880 in the City of San Jose, California. The extension will include an overcrossing across O'Toole Avenue and I-880. The Charcot Avenue Extension (Project) would be constructed with single travel lanes in both the westbound and eastbound directions, Class IV bikeway (separated bikeway) and sidewalks along both sides. The proposed facility will improve connectivity of the roadway network in the area, provide additional capacity as an alternative east/west vehicular route, and establish safe pedestrian and bicycle access across the freeway. Charcot Avenue is currently designated as a minor arterial; however, it is anticipated to be re-designated as a major arterial in the future. No new interchange ramps to I-880 are proposed.

3.0 GEOLOGY

Regional Geologic Setting

The Project site is in the southern portion of the San Francisco Bay area in the Coast Range geomorphic province of northern California. The Coast Range forms a nearly continuous topographic barrier between the California coastline and the San Joaquin Valley. In general, the

Coast Range in this region is a double chain of mountains running north-northwest. Between the two chains of mountain lies the basin of San Francisco Bay, including the valleys at the end of the Bay, Petaluma on the north and Santa Clara on the south. Three prominent geologic blocks dominate the San Francisco Bay Area: the Santa Cruz Mountains (western block), the San Francisco Bay (central block), and the East Bay Hills/Diablo Range (eastern block).

The Santa Clara Valley is part of a fault-bounded valley which includes San Francisco Bay. It is believed that this trough formed in Pliocene Epoch and has been subjected to extensive deposition during the Pleistocene time. This deposition has resulted in filling the trough with marine and alluvial sediments derived from the adjoining hills. Normal processes associated the development of streams, alluvial fans, flood plains and deltas, along with the multiple cycles of erosion and deposition due to sea level changes have resulted in a very complex sedimentary sequence. The deposits within the general area may be characterized by irregular bedding, interfingering of fine and coarse grained materials, stream braiding and lenses. Individual deposits could be highly variable in both thickness and lateral extent.

Site Geology

Geologic features pertaining to the Project site were evaluated by referencing to the Geologic Map of the Milpitas Quadrangle, Alameda & Santa Clara Counties, California, by Dibblee, T.W. (2005). Based on the map, two major Holocene age units are present beneath the Project site and its vicinity. A Geologic Map covering the general Project area is shown on Plate No. 2. Descriptions of the main geologic units are as follows:

Qa - Alluvial gravel, sand and clay including alluvial fan deposits.
Qac - Alluvial clay soil; including bay mud.

4.0 GROUNDWATER

Seismic Hazard Zone Report 051 for the Milpitas 7.5-Minute Quadrangle, Alameda and Santa Clara Counties, California (2001), shows that the groundwater depth at the subject site is around

5 to 10 feet (see Plate No. 3). The groundwater level is anticipated to vary with time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, and other factors that may not be present at the time of investigation. Groundwater conditions within the Project limits should be verified during the PS&E phase.

5.0 SEISMIC CONSIDERATIONS

Regional Seismicity

The regional seismic context is an important consideration because the forces that affect the Project area are regional in nature: that is, they are generated off-site, outside the immediate area, or outside the Santa Clara County. However, the effects of these forces must be accommodated within the limits of the Project, in compliance with regulations and guidelines established by the State and County.

Santa Clara County and the Bay Area are in one of the most active seismic regions in the United States. Each year, low- and moderate-magnitude earthquakes occurring within or near the Bay Area are felt by residents. Since the mid-nineteenth century, hundreds of earthquakes have been felt in Santa Clara County. In 1868, the Hayward Fault ruptured the ground surface, producing several feet of right lateral displacement at the ground surface and causing an earthquake that damaged many structures in the Bay region. The Loma Prieta Earthquake of October 17, 1989, originated within the San Andreas Fault Zone and caused severe damage throughout much of the Bay Area. The major fault zones of the San Andreas Fault System (including the Hayward and Calaveras faults) have been the source of other earthquakes, and are expected to be the source of future earthquakes.

Site Faulting and Seismicity

The Project site is located in a seismically active part of northern California. Many faults exist in the region. These faults are capable of producing earthquakes and may cause strong ground shaking at the site. The Caltrans Fault Database (V2b, 2012) and Acceleration Response Spectrum

(ARS) Online tool (V2, 2012) contain known active faults (if there is evidence of surface displacement in the past 700,000 years) in the State. With use of the Caltrans ARS Online tool (V2, 2012) and the proposed overcrossing at I-880 as a reference point (Latitude 37.3877˚ N, Longitude -121.9057˚ W [Google Earth, 2016]), some of active faults in the close vicinity of the Project site are obtained and summarized in Table 5.1. The maximum moment magnitudes represent the largest earthquake that a fault is capable of generating and is related to the seismic moment. The attached Caltrans ARS Online Map, Plate No. 4, shows the location of the fault system relative to the Project site.

TABLE 5.1 - CALTRANS ARS ONLINE DATA

Fault Name	Fault ID	Max. Moment Magnitude (M_{max})	Fault Type	Approx. Distance R_{rup}/R_x (miles)
Calaveras (No) 2011 CFM	130	6.9	SS	7.07/6.27
Hayward (South)	137	7.3	SS	6.70/2.61
Silver Creek	148	6.9	SS	0.59/0.63
Hayward (Southern extension)	149	6.7	SS	3.93/3.93
Calaveras (Central) 2011 CFM	151	6.9	SS	6.75/6.74
Cascade fault	153	6.7	R	7.13/7.13
Monte Vista-Shannon	154	6.4	R	9.45/9.43

R_{rup} = Closest distance to fault rupture plane
R_x = Horizontal distance to the fault trace or surface projection of the top of rupture plane
SS = Strike-slip fault
R = Reverse fault

Seismic Hazards

Primary seismic hazards include ground shaking and surface fault rupture. Secondary seismic effects resulting from soil responses to ground shaking includes liquefaction. These hazards may cause deformation of man-made structures. These hazards are discussed in the following paragraphs.

Ground Shaking Earthquake-induced ground-shaking is a seismic hazard that can result in liquefaction and landslides of soil and rock as well as dynamic oscillation of man-made structures.

Differential settlement can occur at the ground surface due to subsurface liquefaction and densification caused by strong ground-shaking.

Based on the Earthquake Shaking Potential Map for the San Francisco Bay Region (CGS, 2003), Plate No. 5, the earthquake shaking potential along the Project alignment is considered high and the entire Project area is subject to seismically-induced ground-shaking. Structures have to be designed in accordance with current AASHTO and Caltrans seismic design criteria.

Faulting The Project site is located outside the designated State of California Earthquake Fault Zones for active faulting and no mapped evidence of active or potentially active faulting was found for the site. The potential for fault rupture at the subject site appears to be low.

Liquefaction Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclical shear stresses associated with earthquake shaking. Saturated cohesionless sands and silts of low relative density are the type of soils that are usually susceptible to liquefaction. Clays are generally not susceptible to liquefaction. Gravels tend to drain well and are not usually susceptible to liquefaction. The extent to which any of the soils underlying the Project area may be prone to liquefy is a function of their grain-size distribution, plasticity, density, and level of saturation. According to the AASHTO BDS guidelines (2012), sand and non-plastic silt with corrected SPT blow count $(N_1)_{60}$ less than or equal to 25 are susceptible to liquefaction.

The Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California (2006), by Witter, R.C.; Knudsen K.L.; Sowers, J.M.; Wentworth, C.M.; Koehler, R.D.; and Randolph, C.E. were referred to in evaluation of the liquefaction potential along the Project alignment. According to these maps, the liquefaction susceptibility is classified as high for the Latest Holocene alluvial fan deposits and very high for the Modern stream channel deposit. The liquefaction susceptibility is classified as very low to low for the Early Quaternary deposits and Late Pleistocene deposits, and moderate for the Late Pleistocene deposits and Holocene deposits. It appears that the Project site is situated in a zone having moderate to very high liquefaction susceptibility. A Liquefaction Susceptibility Map, part of the publication pertinent to

the site, is attached on Plate No. 6.

Site-specific investigation using geotechnical borings or cone penetration tests (CPT) should be conducted during the PS&E phase to evaluate the liquefaction potential conditions at the Project site. Down drag forces due to post-liquefaction settlement may have to be considered in the vertical pile capacity analysis if liquefaction is found to be an issue. Post-liquefaction settlement may need to be accounted for when planning and design for earth retaining structures. For roadway pavement, there is no need to implement a mitigation program, and the aerial type of post-liquefaction settlement can be repaired in a routine maintenance program, if necessary.

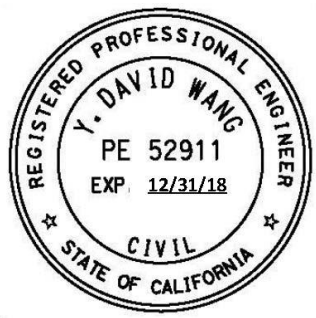
Landslides The entire Project area is located in flat terrain and there are no hillsides with active or historical landslides adjacent to the Project site.

6.0 LIMITATIONS

Please be advised that we are performing a professional service and that our conclusions are professional opinions only. All work done and all recommendations made are in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

Peter Wei, PE, GE 2922
Sr. Project Engineer



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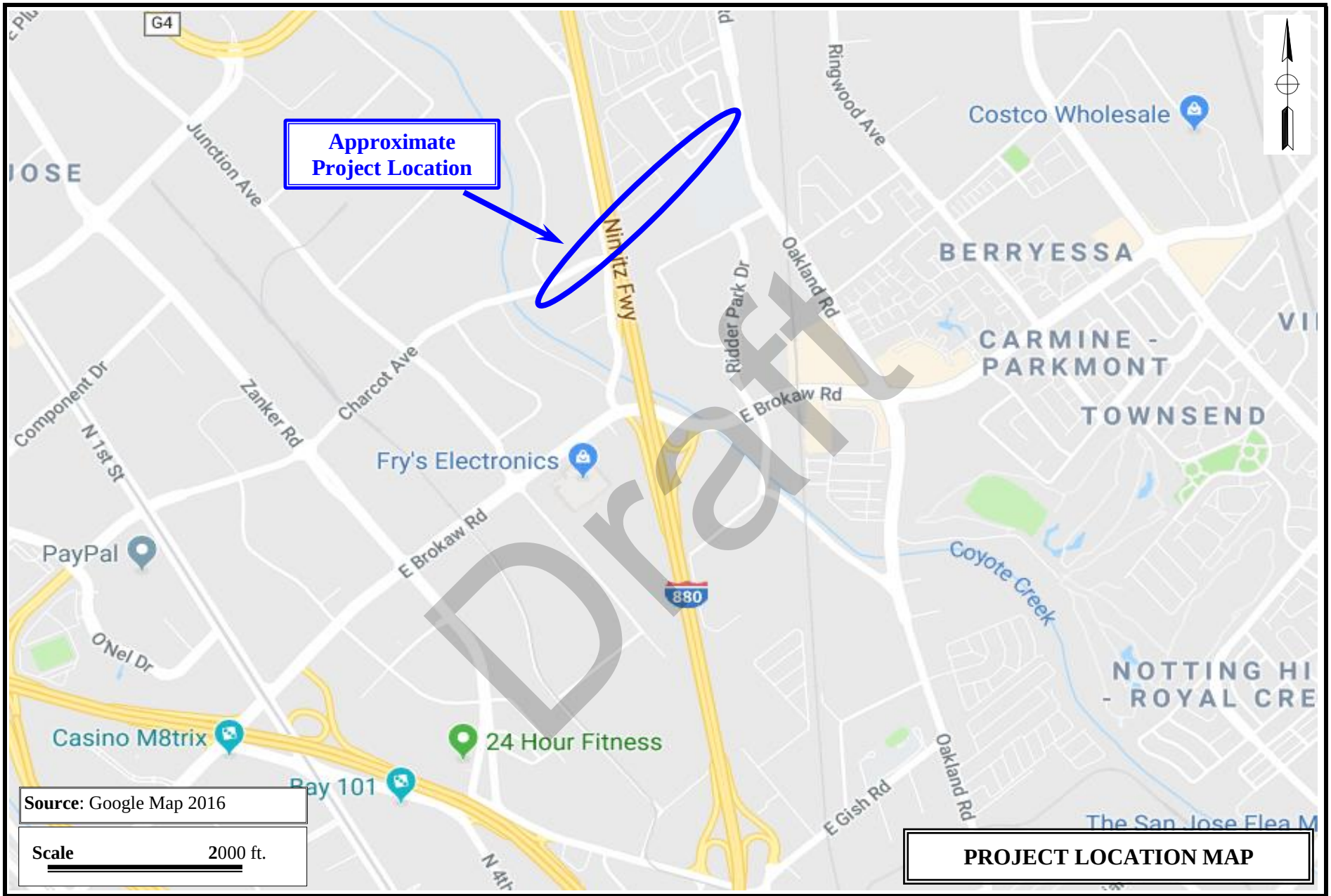

PROJECT LOCATION MAP

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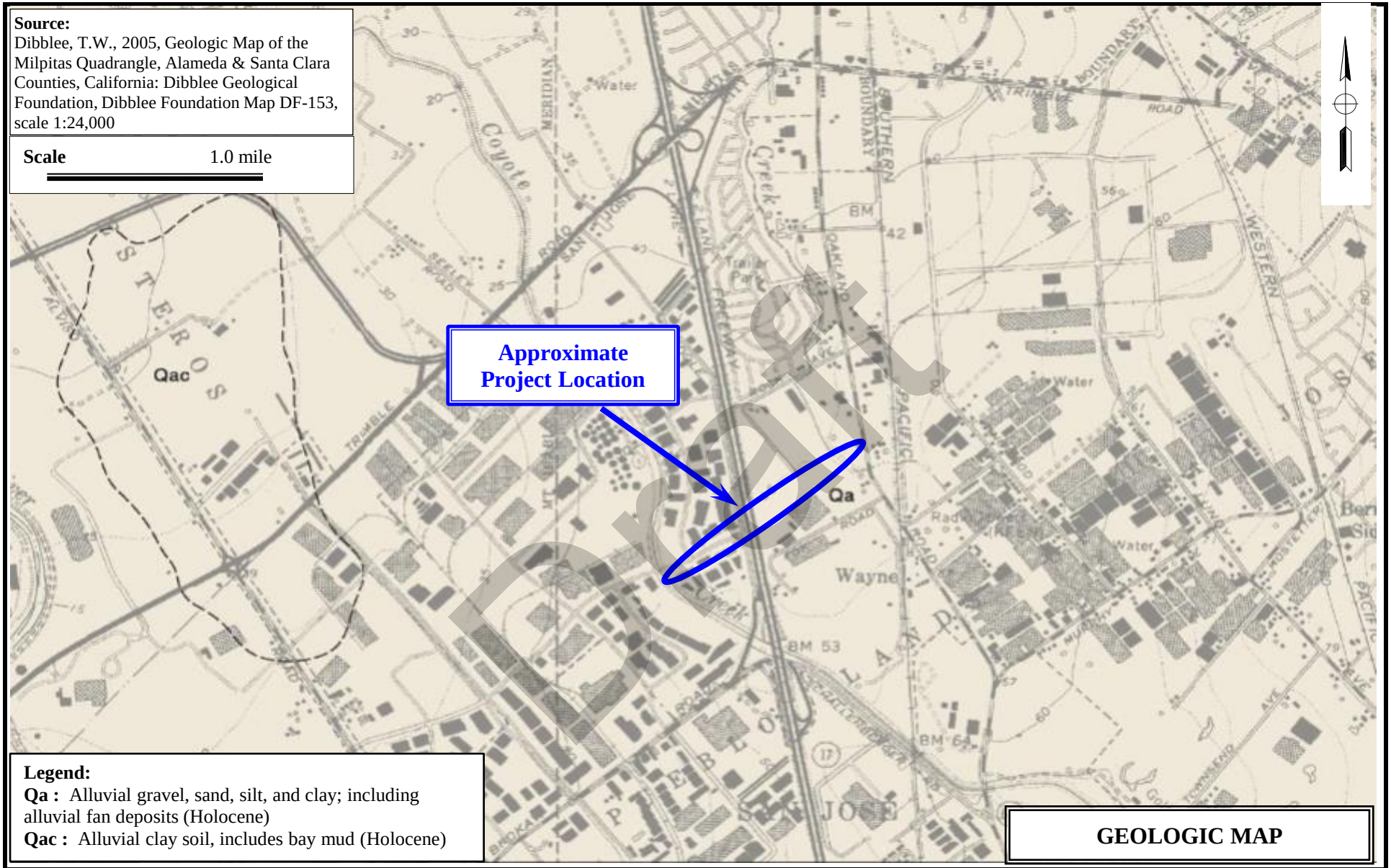

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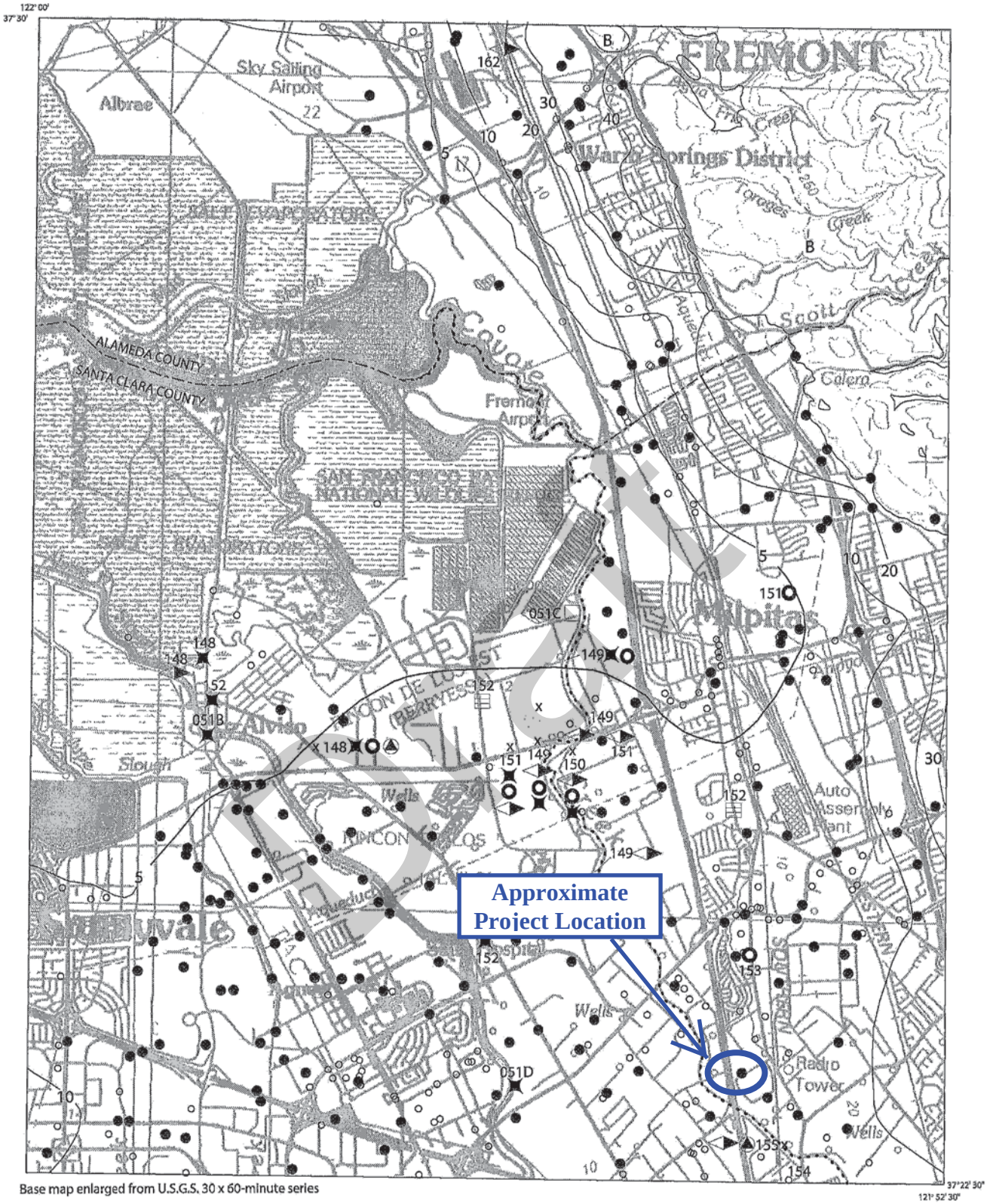
JOB NO.: 2015-141-PGR	PLATE NO.: 2



Base map enlarged from U.S.G.S. 30 x 60-minute series

Historical Ground Failures (From Knudsen and others, 2000)

- x Location of multiple ground effects. (See corresponding symbols)
- Disturbed well
- Sand boil
- Streambank landslides including rotational slump and soil fall
- Ground settlement
- Absence of ground failure noted
- Ground cracks not clearly associated with landslide, lateral spread, settlement, or primary movement

MILPITAS QUADRANGLE

SCALE

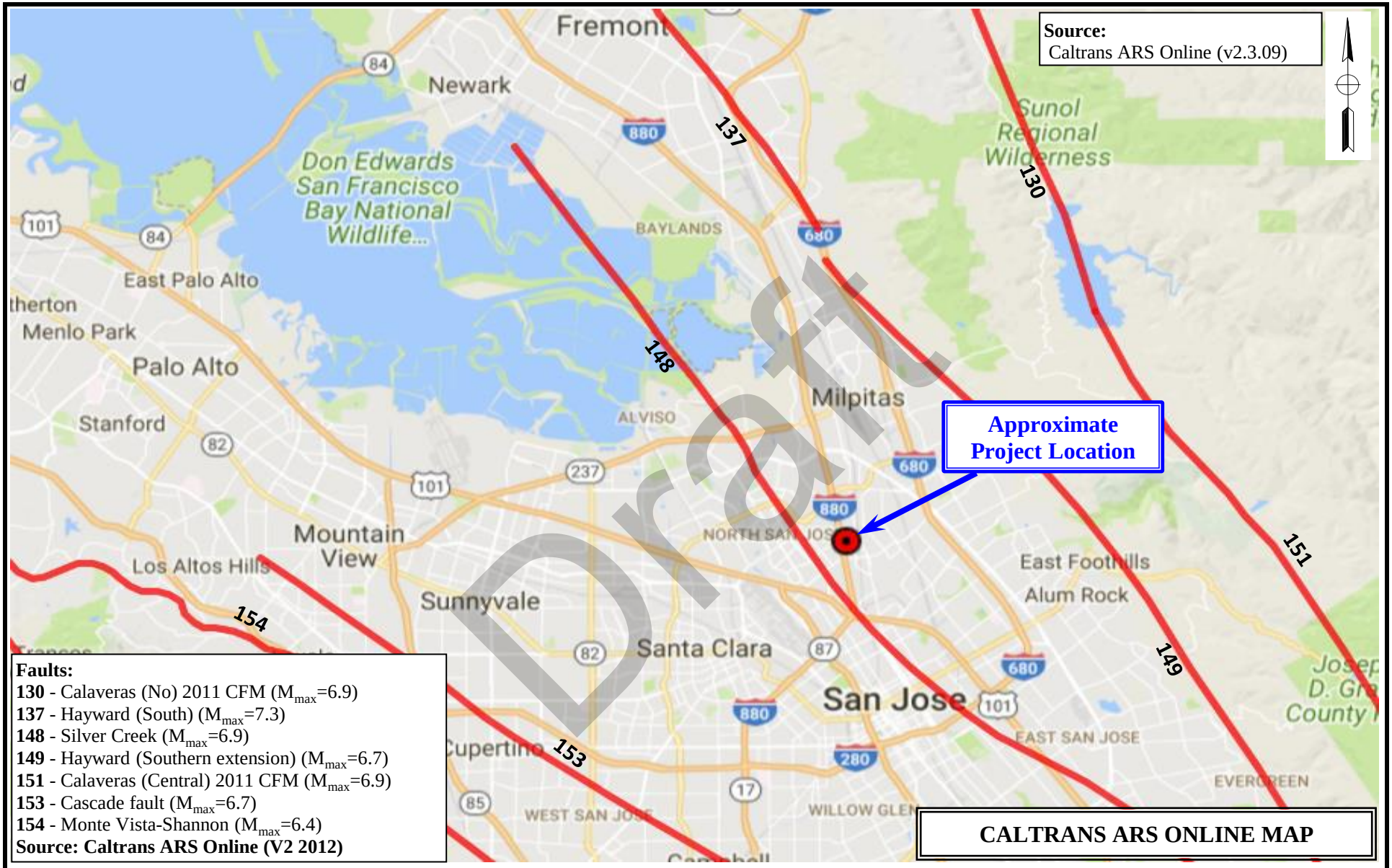
- Reach of river along which multiple failures were recorded. Symbols show failure types.
- Lateral spread
- 152 Number assigned to ground failure site (adapted from Youd and Hoose, 1978; and Tinsley and others,1998; by Knudsen and others, 2000)

N

- B Bedrock
- 10 Depth to ground water, in feet
- Geotechnical borings used in liquefaction evaluation
- Ground-water level data provided by the Santa Clara Valley Water District (Santa Clara Co.) and the Regional Water Quality Control Board (Alameda Co.)

Plate 1.2 Depth to historically high ground water, historical liquefaction sites, and locations of boreholes used in this study, Milpitas 7.5-Minute Quadrangle, California

PLATE NO. 3



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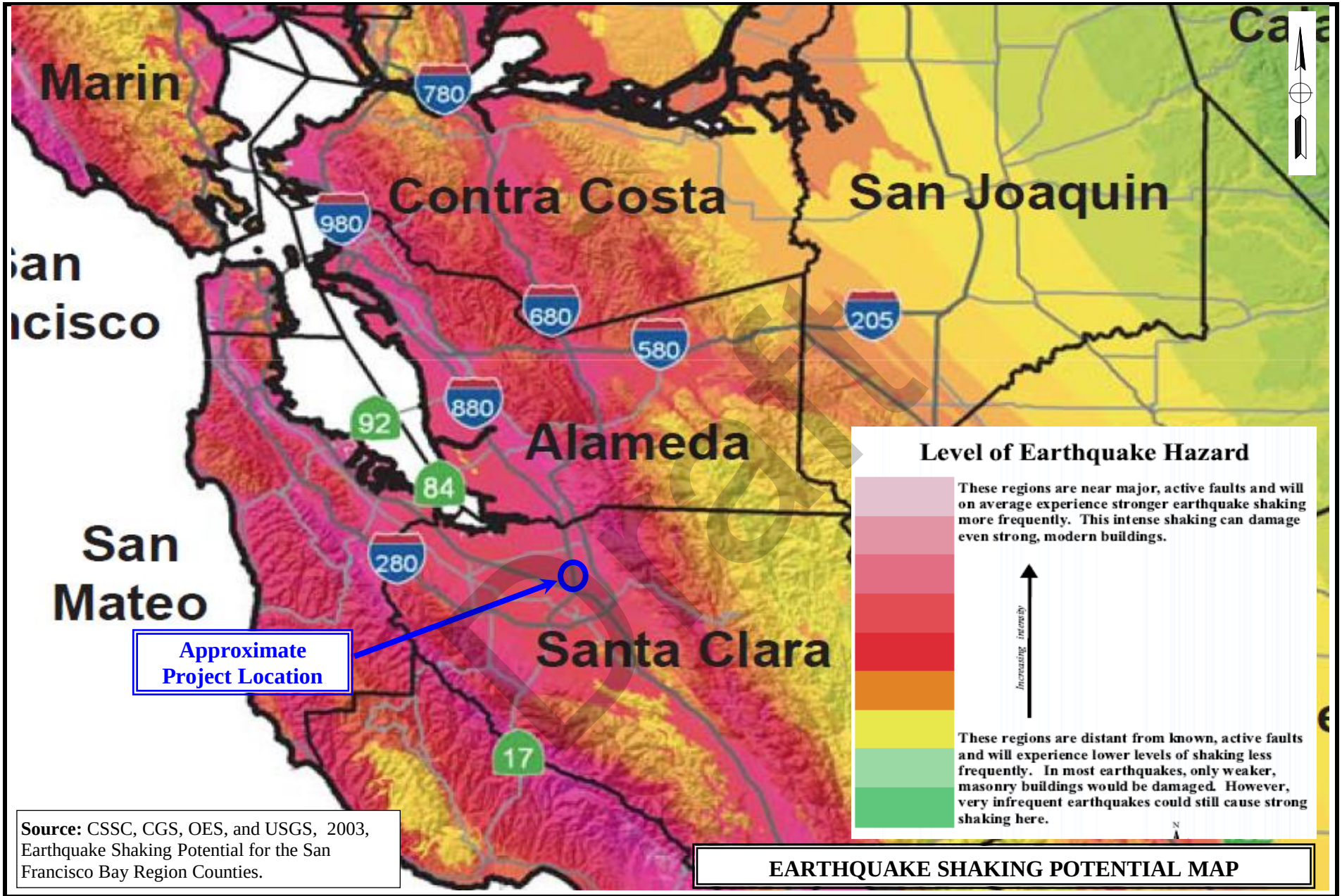

Source: CSSC, CGS, OES, and USGS, 2003, Earthquake Shaking Potential for the San Francisco Bay Region Counties.

EARTHQUAKE SHAKING POTENTIAL MAP

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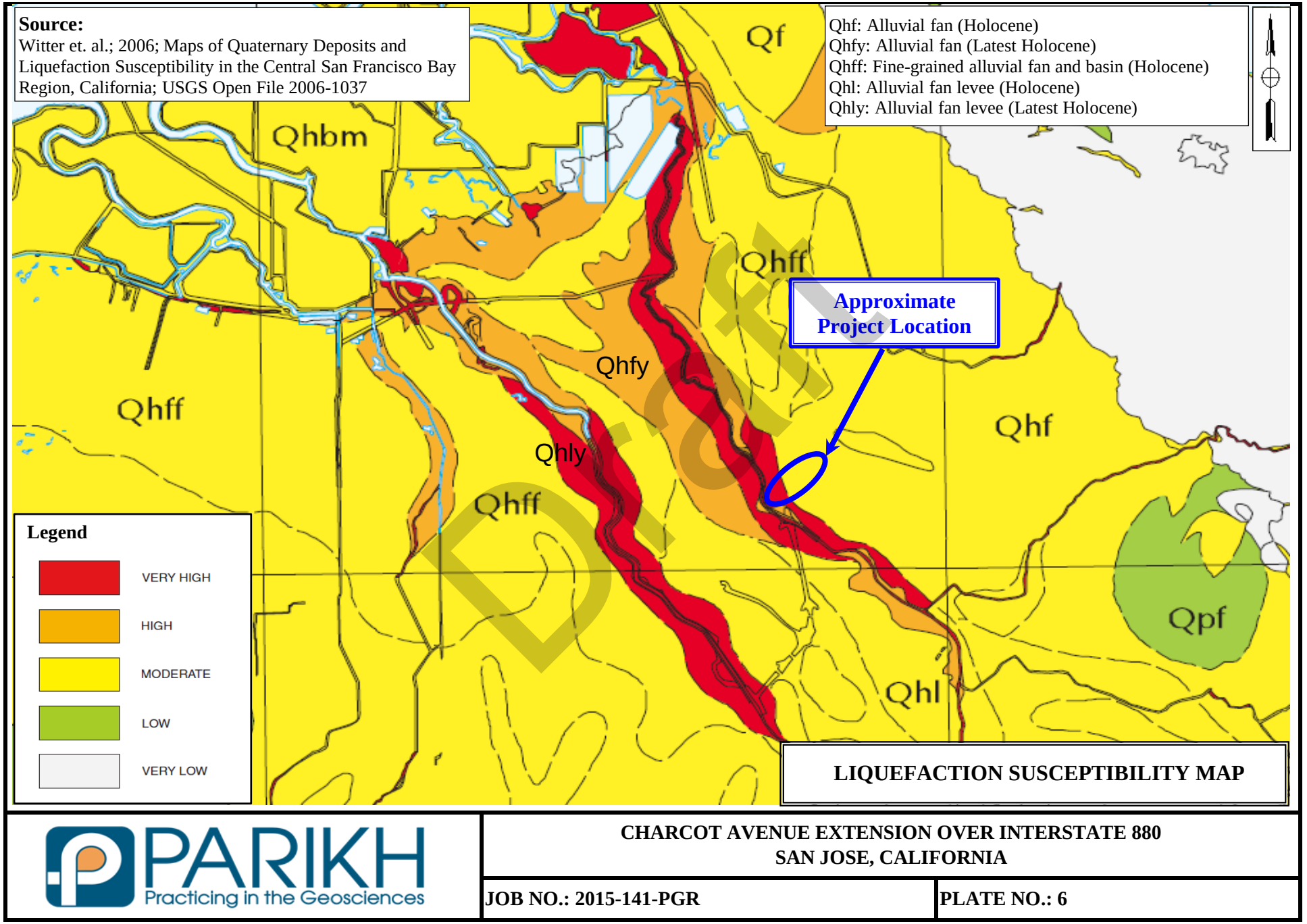

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