20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

GEOTECHNICAL EXPLORATION

SUBMITTED TO
Mr. Todd Deutscher
Catalyst Development Partners
18 Crow Canyon Court, Suite 190
San Ramon, CA 94583

PREPARED BY
ENGEO Incorporated

March 22, 2017

PROJECT NO.
13255.000.000

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Mr. Todd Deutscher
Catalyst Development Partners
18 Crow Canyon Court, Suite 190
San Ramon, CA 94583

Subject: 20785 and 20957 Baker Road
Castro Valley, California

GEOTECHNICAL EXPLORATION

Dear Mr. Deutscher:

As requested, we completed this geotechnical exploration for the proposed Baker Road residential development in Castro Valley, California. The accompanying report presents our field exploration and laboratory testing with our conclusions and recommendations regarding development at the site.

Our findings indicate that the project site is suitable for the proposed residential structure provided the recommendations and guidelines provided in this report are implemented during project planning and construction. We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses.

Sincerely,

ENGEO Incorporated

Teresa Klotzback, EIT

Jeff Fippin, GE

REGISTERED PROFESSIONAL ENGINEER
JEFFREY A. FIPPIN
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GEOTECHNICAL
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1.0 INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

We prepared this geotechnical exploration report for the proposed new Baker Road residential project located at the 20785 and 20957 Baker Road in Castro Valley, California (Figure 1). The project site is identified by APN 84A-16-11-1 and 84A-16-5-9 and measures 1.1 acres in area. The site is bound to the west by Rutledge Road and to the east by Baker Road. A former equipment storage yard is located to the south of the property. Multi-family housing is present to the north and south of the property. An automotive shop is present to the west, and multi-family housing occupies the properties to the east of Baker Road.

1.2 FORMER AND CURRENT USE OF PROPERTY

According to aerial photographs, the property was previously used for dry farming. In 2004, AEI Consultants (AEI) removed two 1,000-gallon tanks from below the site under the observation of an inspector from Alameda County Environmental Health Services. The historic aerial photographs indicate that the aboveground structure previously occupied the south end of the site from approximately the 1980s until removal in 2004.

Currently, a fence traversing the east-west direction is present on the property. The northwestern portion of the property is overgrown with vegetation, and a remnant concrete building is present. The northeastern portion is occupied with a home and detached garage. The southern portion of the site is mostly covered with asphalt concrete pavement. The site is generally flat.

1.3 PROPOSED DEVELOPMENT

Based on the site plans prepared by William Hezmalhalch Architects Inc., dated July 19, 2016, the proposed development will include construction of new approximately 1.1-acre, three-story townhome structures to provide 20 units with at-grade garage space. Associated access roadways, landscaping areas, and new underground utilities are expected. Structural loads were not available at the time of writing this report but based on the building type, we anticipate relatively light to moderate loads.

1.4 SCOPE OF SERVICES

We prepared this report as outlined in our agreement dated January 27, 2017. Our scope of services included the following:

- Perform field exploration and laboratory testing of soil samples collected during exploration.
- Analysis of the geological and geotechnical data.
- Provide recommendations on mitigation measures for identified geotechnical constraints.
- Preparation of this report summarizing our findings and recommendations for site development.

This report was prepared for the exclusive use of Catalyst Development Partners and its consultants for design of this project. In the event that changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to determine whether modifications are necessary.

1.5 PREVIOUS SITE EXPLORATIONS

AEI previously drilled eight exploratory borings at the property on May 18, 2005, with the purpose of determining the extent of soil contamination and its impact on groundwater. Soil borings were advanced to depths ranging from 14 to 18 feet below ground surface using a Geoprobe direct-push drilling rig. Locations are shown on Figure 2 in 2005 and the field logs are presented in Appendix A.

2.0 GEOLOGY AND SEISMICITY

2.1 GEOLOGIC SETTING AND SITE GEOLOGY

The site is located within the Coast Ranges physiographic province of California. The Coast Ranges physiographic province is typified by a system of northwest-trending, fault-bounded mountain ranges and intervening alluviated valleys. Bedrock in the Coast Ranges consists of igneous, metamorphic, and sedimentary rocks that range in age from Jurassic to Pleistocene. The present physiography and geology of the Coast Ranges are the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the area include the San Andreas, Hayward, and Calaveras faults, as well as other lesser-order faults.

According to published geologic mapping covering the site by Dibblee (2005), the project site is underlain by Quaternary Alluvial deposits consisting of alluvial gravel, sand, and clay deposits as shown on Figure 3.

2.2 FAULTING AND SEISMICITY

Because of the presence of nearby active faults, the Bay Area Region is considered seismically active. An active fault is defined by the California Geological Survey as one that has had surface displacement within Holocene time (about the last 11,000 years) (Hart, 1997). Numerous small earthquakes occur every year in the region, and large (greater than Moment Magnitude, M_W 7) earthquakes have been recorded and can be expected to occur in the future. The site is not located within a State of California Earthquake Fault Zone. Figure 4 shows the approximate location of active and potentially active faults and significant historic earthquakes mapped within the San Francisco Bay Region. Using the 2008 USGS Quaternary Fault and Fold Database (QFFD), we provide distances to and estimated moment magnitudes of nearby mapped active faults in Table 2.2-1.

TABLE 2.2-1: Summary of Nearby Active Faults

FAULT NAME	APPROXIMATE DISTANCE FROM SITE (MILES)	MAXIMUM MOMENT MAGNITUDE
Hayward	0.7	7.3
Calaveras	7.7	7.0
Mount Diablo Thrust	11.2	6.7
Green Valley	15.1	6.8
Greenville	18.5	7.0
San Andreas	18.9	8.1

The Uniform California Earthquake Rupture Forecast (UCERF 3, 2015) evaluated the 30-year probability of a M_W 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area, including the Hayward fault. The UCERF generated an overall probability of 72 percent for the Bay Area as whole, and a probability of 14 percent for the Hayward fault, 7 percent for the Calaveras fault, and 6 percent for the San Andreas fault.

2.3 FIELD EXPLORATION

We conducted our field exploration on February 28, 2017. Our exploration included drilling five 4-inch diameter solid-flight auger borings with a truck-mounted drill rig. The five borings extended to depths of approximately 8½ to 18½ feet below existing grade at the locations shown on Figure 2; each of our borings terminated in refusal conditions in bedrock. An engineer from our firm logged the borings in the field and collected soil samples using either a 2½-inch-inside-diameter (I.D.) California-type split-spoon sampler fitted with 6-inch-long brass liners or a 2-inch-outside-diameter (O.D.) Standard Penetration Test (SPT) split-spoon sampler. The split-spoon samplers were driven with a 140-pound hammer falling a distance of 30 inches. The hammer was lifted with a rope and cathead system. The penetration of the samplers into the soil materials was field recorded as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows required for the last 1 foot of penetration, and the blow counts reported on the logs have not been converted using any correction factors. The field logs were used to develop the report boring logs presented in Appendix A.

The logs of the borings depict subsurface conditions at the time the exploration was conducted. Subsurface conditions at other locations may differ from conditions occurring at these locations. Stratification lines represent the approximate boundaries between soil types and the transition may be gradual. We backfilled all of the borings on the day of drilling with cement grout under the observation and approval by a representative from the Alameda County Public Works.

2.4 SUBSURFACE STRATIGRAPHY

Based on information obtained from our exploration program and review of AEI's exploratory borings, the near-surface material consists of a layer of aggregate base followed by a layer of dark gray moderately plastic clay material extending to a depth of 3 to 6 feet below ground surface (bgs). Test results for this near surface clay indicate a Plasticity Index (PI) of 26 to 30, which is considered moderately expansive. Due to the known history of the site and the consistency of the material, this clay has likely been re-worked for agricultural purposes. On the eastern side of the property, shallow weathered claystone was encountered below this clay at 6 to 7 feet bgs. On the western side of the property, the soil encountered beneath the dark gray clay material consists of medium stiff to very stiff clays with inter-bedded layers of clayey to silty sand between approximately 7 and 15 feet bgs. The sandy layers are loose to very dense. Weathered claystone was encountered at approximately 11 to 15 bgs.

2.5 GROUNDWATER

Groundwater was encountered at a depth of between 7 to 9 feet bgs after completion of drilling. Fluctuations in groundwater levels will occur seasonally and over a period of years because of precipitation, temperature, tidal effects, changes in drainage patterns, pumping, and/or irrigation. Based on the historically highest groundwater levels in the project area, the groundwater level at the site is mapped as less than 10 feet deep.

2.6 LABORATORY TESTING

Following drilling, we re-examined the samples in our laboratory to confirm field classifications. We tested representative driven samples for the following physical characteristics:

TABLE 2.6-1: Summary of Laboratory Tests

TEST	DESIGNATION
Moisture Content/Dry Density	ASTM D-2216
Gradation	ASTM D-422
Atterberg Limits	ASTM D-4318
Unconfined Compression	ASTM D-2166
Sulfate Testing	CT-417

Laboratory test results from samples recovered are included on the associated boring logs in Appendix A and on the laboratory test data in Appendix B.

3.0 DISCUSSION

Based on a review of the findings of the subsurface exploration and laboratory test results, we conclude that the proposed residential development and associated improvements are feasible from a geotechnical standpoint, provided that the recommendations included in this report, along with other sound engineering practices, are incorporated in the design and construction of the project.

The primary geotechnical considerations to address during site development are the presence of:

- Expansive near-surface soil.
- Potentially liquefiable material and subsequent post liquefaction settlement.
- High seismic loads due to the proximity to the Hayward fault.
- Undocumented fill underlying existing and remnant structures.

3.1 EXPANSIVE SOIL

We performed sampling and testing of the site soil. The results indicate a plasticity index (PI) range of 26 to 30 within the area of potential foundation soil indicating a moderate to high expansion potential. Expansive soil shrinks and swells as a result of moisture changes. This can cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations.

Successful construction on expansive soil requires special attention during grading. It is imperative to keep exposed soil moist by occasional sprinkling. If the soil dries, it is extremely difficult to remoisturize the soil (because of its clayey nature) without excavation, moisture conditioning, and recompaction.

Conventional grading operations, incorporating fill placement specifications tailored to the expansive characteristics of the soil, and use of a mat foundation (either post-tensioned or conventionally reinforced) and deepen footings are common, generally cost-effective measures to address the expansive potential of the foundation soils.

3.2 SEISMIC HAZARDS

Seismic hazards can generally be classified as primary and secondary. The potential primary seismic hazard resulting from a nearby moderate to major earthquake is ground rupture, also called surface faulting. Common secondary seismic hazards include ground shaking, soil liquefaction, liquefaction-induced settlement, dynamic densification, lateral spreading, earthquake-induced landslides, regional subsidence or uplift, and tsunamis and seiches. The site is not located in a mapped liquefaction or landslide hazard zone as per the California Geologic Survey.

3.2.1 Ground Rupture

No known active faults have been mapped at the location of the proposed improvements. We therefore conclude that the potential for ground rupture is low.

3.2.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, all structures should be designed using sound engineering judgment and the current California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.2.3 Soil Liquefaction

Soil liquefaction is a phenomenon where saturated, cohesionless, loose soil experience a temporary, but essentially total, loss of shear strength when subjected to the reversing cyclic shear stresses caused by earthquake ground shaking.

We have reviewed the map for Seismic Hazard Zones of the project area (USGS, 2003) and we have found no historical evidence of ground failure, earthquake-induced settlement or liquefaction at this site or in the general vicinity of the site. Additionally, according to the California Geologic Survey, Earthquake Zones of Required Investigation map (CGS, 2012), the project site is not located within a mapped liquefaction hazard zone. We have performed a liquefaction analysis based on the findings from the subsurface exploration assuming the groundwater level at a depth of 8 feet, a peak ground acceleration (PGA) of 0.93g and a Moment Magnitude (Mw) of 7.3 contributed by the Hayward fault; these values are based on the 2013 California Building Code and the commonly accepted potential earthquake magnitude of the closest faults. In general, our analysis indicates that the majority of the material encountered in our borings has sufficient fines content that is characteristic of soils that are not susceptible to liquefaction. An exception to this is the presence of a silty/clayey sand layer encountered at borings 1-B4 and 1-B5 between a depth of 8 feet and 15 feet. Based on blow counts and limited thickness of the layer, the estimated liquefaction-induced settlement ranges from ½ inch to 1 inch in this area; this amount of liquefaction-induced settlement, should it occur, would be nominal in the building performance. The results of our analysis can be found in Appendix C.

3.2.4 Lateral Spreading

Lateral spreading involves lateral ground movement caused by seismic shaking. This lateral ground movement is often associated with a weakening or failure of an embankment or soil mass overlying a layer of liquefied or weak soils. The effects of lateral spreading are often amplified by a "free face". Since the site is essentially flat and not near any free face, the risk of lateral spreading is negligible.

3.3 2016 CBC SEISMIC DESIGN PARAMETERS

In accordance with Chapter 16A of the 2016 CBC, the building shall be assigned to Seismic Design Category D.

TABLE 3.3-1: Seismic Design Parameters
Latitude: 37.6941, Longitude: -122.0843

PARAMETER	DESIGN VALUE
Site Class	D
0.2 second Spectral Response Acceleration, S_S	2.40
1.0 second Spectral Response Acceleration, S_1	1.00
Site Coefficient, F_A	1.0
Site Coefficient, F_V	1.5
Maximum considered earthquake spectral response accelerations for short periods, S_{MS}	2.40
Maximum considered earthquake spectral response accelerations for 1-second periods, S_{M1}	1.50
Design spectral response acceleration at short periods, S_{DS}	1.60
Design spectral response acceleration at 1-second periods, S_{D1}	1.00
Mapped MCE Geometric Mean Peak Ground Acceleration, PGA (g)	0.93
Site Coefficient, F_{PGA}	1.0
MCE Geometric mean Peak Ground Acceleration, PGA_M (g)	0.93
Long period transition-period, T_L	8

3.4 EXISTING NON-ENGINEERED FILL

Due to site access issues and the presence of existing structures, we did not advance any explorations in or near the existing structures. However, we anticipate the presence of some amount of existing fill underlying these structures from previous site development activities. Due to the age of the structures, any existing fill would not be engineered in accordance with current practices. Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. Without proper documentation of existing fill placed on the site, we recommend complete removal and recompaction of any existing fill. A field representative of our firm should be present during foundation removal and grading activities to determine the depth and extent of fill material. We present fill treatment recommendations in Section 4.0.

3.5 SOIL CORROSION POTENTIAL

As part of this study, we obtained a representative soil sample and submitted to a qualified analytical lab for determination of pH, resistivity, sulfate, and chloride. The results are included in Appendix B and summarized in the table below.

TABLE 3.5-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH (FEET)	PH	RESISTIVITY (OHMS-CM)	CHLORIDE (PPM)	SULFATE (PPM)
1-B4	3.5	6.56	1.90	3.8	42.9

* pH and Min. Resistivity CA DOT Test #643 Mod. (Sm. Cell) Sulfate CA DOT Test #417, Chloride CA DOT Test #422 Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

The 2013 CBC references the 2011 American Concrete Institute Manual, ACI 318-11, Chapter 4, Sections 4.2.1 for structural concrete requirements.

In accordance with the criteria presented in ACI 318, the soil tested is categorized as Not Applicable, and are within the F0 freeze-thaw class, S0 sulfate exposure class, P0 exposure class and C0 corrosion class. Cement type, water-cement ratio, and concrete strength, are not specified for these ranges.

Considering a 'Not Applicable' sulfate exposure, there is no requirement for cement type or water-cement ratio, however, a minimum concrete compressive strength of 2,500 psi is specified by the building code. For this sulfate range, we recommend Type II cement and a concrete mix design for foundations and building slabs-on-grade that incorporates a maximum water-cement ratio of 0.50. It should be noted, however, that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

Based on the resistivity measurements, the soil is considered moderately corrosive to buried metal piping. The resulting value of chloride does not pose a significant impact to metals or concrete.

If desired to investigate this further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project.

4.0 RECOMMENDATIONS AND CONCLUSIONS

The proposed project is feasible from a geotechnical engineering viewpoint provided the geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

If there are significant changes to the Baker Road residential development including layout and grading, the recommendations presented herein may need to be refined and modified, as deemed appropriate by us. Geotechnical engineering recommendations contained in this report include site preparation and grading, foundation design criteria, pavements, underground utilities, and drainage.

4.1 GRADING

Grading should begin with the removal of existing structures and associated foundations, pavement, buried pipes, irrigation lines, water well systems, and any other deleterious materials. Underground pipelines and structures that will be abandoned or are expected to extend below proposed finished grades should be removed from the project site. Any organically contaminated materials should not be used in proposed building pads or pavement areas. Strip and stockpile the organics for use in landscape areas subject to the approval of the Landscape Architect or off haul. Remove any debris found within any areas to be graded.

A representative of our firm should determine the actual removal depth in the field based on conditions encountered during the site grading. Excavations resulting from demolition and stripping below design grades should be cleaned to a firm undisturbed, non-yielding soil surface as determined by our representative. Following clearing and grubbing, scarify, moisture condition and backfill all depressions with compacted engineered fill. The requirements for backfill materials and placement procedures are the same as those for engineered fill as described in the “Fill Placement” section.

The contractor should remove all existing non-engineered fill, vegetation and loose or compressible soils in areas to be graded, as necessary, for project requirements. A qualified representative of our firm should determine the material removal depth in the field at the time of grading. Evaluation of unsuitable deposits should be performed during grading and may include sampling and laboratory analyses.

After the site has been properly cleared and stripped, and necessary excavations have been made, scarify the surface at least 12 inches, moisture condition, and compact in accordance with the recommendations presented below in the “Fill Placement” section, prior to replacing and recompacting overlying soils as engineered fill. The compaction requirements for existing soil used for fill placement are the same as those for engineered fill, as described in a subsequent section of this report.

4.2 ACCEPTABLE FILL

Onsite soil is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 4 inches in maximum dimension.

Imported fill material should be approved by a qualified representative of our firm, meet the above requirements and have a plasticity index less than 20. Allow ENGEO to sample and test proposed imported fill materials at least 72 hours prior to delivery to the site.

4.3 FILL PLACEMENT

We anticipate that site grade will remain similar to that of the existing elevation. Minor fill placement to achieve level building pads for the proposed townhomes may be performed. Areas to receive fill placement should be scarified to a minimum depth of 12 inches, moisture conditioned, and recompacted to provide adequate bonding with the initial lift of fill. All fills should be placed in thin lifts, with the lift thickness not to exceed 10 inches or the depth of penetration of the compaction equipment used, whichever is less.

The following compaction control requirements should be applied to onsite expansive materials (PI≥20):

Test Procedures:	ASTM D-1557.
Required Moisture Content:	Not less than 4 percentage points above optimum moisture content.
Required Relative Compaction:	Not less than 87 to 92 percent.

The following compaction control requirements should be applied to low-expansive (PI less than 20) import or chemically treated site soil:

Test Procedures:	ASTM D-1557.
Required Moisture Content:	Not less than 2 percentage points above optimum moisture.
Minimum Relative Compaction:	Not less than 90 percent.

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material. Additional compaction recommendations may be developed during construction.

4.4 SUBGRADE TREATMENT

We anticipate that a shallow foundation with post-tensioned mat foundation system will be used for the proposed residential structure. According to our exploration data, the shallow clay material has variable consistency. We recommend that the building pad and an area extending 5 feet out from the building perimeter be scarified and recompacted a minimum of 12 inches below proposed foundation elements. All processed material should be moisture conditioned and recompacted in accordance with the specifications presented above.

4.5 BUILDING FOUNDATION

This section provides recommendations for a shallow foundation system. It is our opinion that the proposed building can be supported on post-tensioned mat foundation system. The final foundation plans should be provided to us for review before submittal to the local authority.

4.5.1 Post-Tensioned Mat Foundation System

We recommend that the proposed residential structure be supported on post-tensioned (PT) mat foundations bearing on prepared native soil or engineered fill.

We recommend that PT mats be approximately 10 inches thick or greater. The Structural Engineer should determine the actual PT mat thickness using the geotechnical recommendations in this report; we defer to the professional judgment of the Structural Engineer on the necessary mat thickness.

PT mats may be designed for an average allowable bearing pressure of up to 1,500 pounds per square foot (psf) for dead-plus-live loads with maximum localized bearing pressures of 2,000 psf at column or wall loads. Allowable bearing pressures can be increased by one-third for wind or seismic loads. PT mats should be designed using the criteria presented in Table 4.5-1 below.

TABLE 4.5-1: Post-Tensioned Mat Design Recommendations

CONDITION	CENTER LIFT	EDGE LIFT
Edge Moisture Variation Distance, e_m (feet)	7.7	4.1
Differential Soil Movement, y_m (inches)	1.1	1.7

The above values are based on the procedure presented by the Post-Tensioning Institute "Design of Post-Tensioned Slabs-on-Ground" Third Edition, including appropriate addenda (2004).

The subgrade material under the PT mat should be made uniform in regard to moisture content. The upper 12 inches of pad subgrade should be soaked to achieve a moisture content as described in Section 4.3 prior to placing the concrete in order to reduce the swell potential of the subgrade soils. The subgrade should not be allowed to dry prior to concrete placement.

When buildings are constructed with concrete slab-on-grade, such as PT mats, water vapor from beneath the slab will migrate through the slab and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the slab would be undesirable, we recommend the following to reduce, but not stop, water vapor transmission upward through the slab-on-grade.

1. Install a vapor retarder membrane directly beneath the slab. Seal the vapor retarder at all seams and pipe penetrations. Vapor retarders shall conform to Class A vapor retarder in accordance with ASTM E 1745, latest edition, "Standard Specification for Plastic Water Vapor Retarders used in Contact with Soil or Granular Fill under Concrete Slabs."

2. Concrete shall have a concrete water-cement ratio of no more than 0.50.

3. Provide inspection and testing during concrete placement to check that the proper concrete and water cement ratio are used.

The structural engineer should be consulted as to the use of a layer of clean sand or pea gravel (less than 5 percent passing the U.S. Standard No. 200 Sieve) placed on top of the vapor retarder membrane to assist in concrete curing. If a layer of sand is used, we recommend the PT mat have a thickened edge to reduce water infiltration between the vapor retarder membrane and the bottom of the mat. The edge of the mat should be thickened by the thickness of the sand layer to provide this cutoff; the thickened edge, if used, should be 12 inches wide, at least.

4.5.2 Secondary Slab-on-Grade Construction

This section provides recommendations for secondary slabs such as exterior slabs, walkways, and steps. Secondary slabs-on-grade should be constructed structurally independent of the foundation system. This allows slab movement to occur with a reduced potential for foundation distress. Where slab-on-grade construction is anticipated, care must be exercised in attaining a near-saturation condition of the subgrade soil before concrete placement.

Slabs-on-grade should be designed specifically for their intended use and loading requirements. As the site soil has a high expansion potential, cracking of conventional slabs should be expected. Secondary slabs-on-grade should be reinforced for control of cracking.

Reinforcement should be designed by the Structural Engineer. In our experience, welded wire mesh may not be sufficient to control slab cracking. As a minimum, secondary slabs-on-grade should be reinforced with No. 3 bars spaced 18 inches on center each way.

Slabs-on-grade should have a minimum thickness of 4 inches. A 4-inch-thick layer of compacted aggregate base should be placed under slabs. Exterior slabs should be constructed with thickened edges extending at least 6 inches into compacted soil to reduce water infiltration. Slabs should slope away from the building at a slope of at least 2 percent to prevent water from flowing toward the building. Frequent control joints should be provided to control the cracking.

4.6 PRELIMINARY PAVEMENT DESIGN

The following pavement sections have been determined based on a Traffic Index of 5 and 6 and an assumed R-value of 5, and according to the method contained in Chapter 630 of the Highway Design Manual by Caltrans.

TABLE 4.6-1: Pavement Sections

TRAFFIC INDEX	HMA (INCHES)	CLASS 2 AB (INCHES)
5.0	3.0	10.0
6.0	3.5	13.0

Note: HMA – Hot Mix Asphalt
AB – Caltrans Class 2 aggregate base (R-value of 78)

The Traffic Index should be determined by the Civil Engineer or appropriate public agency. These sections are for estimating purposes only. Actual sections to be used should be based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading. Pavement construction and all materials should comply with the requirements of the Standard Specifications of the State of California Department of Transportation, and City of Castro Valley requirements.

4.7 DRAINAGE

The site must be positively graded at all times to provide for rapid removal of surface water runoff from the foundation systems and to prevent ponding of water under floors or seepage toward the foundation systems at any time during or after construction. Ponded water will cause undesirable soil swell and loss of strength.

Ponding of stormwater must not be permitted on the site during prolonged periods of inclement weather. As a minimum requirement, finished grades should have slopes of at least 3 to 5 percent (2 percent for paved areas) within 7 feet of the exterior building walls and at right angles to them to allow surface water to drain positively away from the structure. All surface water should be collected and discharged into the storm drain system. Landscape mounds must not interfere with this requirement.

All roof stormwater should be collected and directed to downspouts. Stormwater from roof downspouts should be directed to a solid pipe that discharges to the street or approved drainage structure.

4.8 UTILITIES

We recommend that utility trench backfilling be done under our observation. Pipe zone backfill (i.e. material beneath and immediately surrounding the pipe) may consist of a well-graded import or native material less than ¾ inch in maximum dimension compacted in accordance with recommendations provided above for engineered fill. Trench zone backfill (i.e. material placed between the pipe zone backfill and the ground surface) may consist of native soil compacted in accordance with recommendations for engineered fill.

Where import material is used for pipe zone backfill, we recommend it consist of fine- to medium-grained sand or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish grades. In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of: (1) soil into the relatively large void spaces present in this type of material, and (2) water along trenches backfilled with this type of material. All utility trenches entering buildings and paved areas must be provided with an impervious seal consisting of native materials or concrete where the trenches pass under the building perimeter or curb lines. The impervious plug should extend at least 3 feet to each side of the crossing. This is to prevent surface water percolation into the sands under foundations and pavements where such water would remain trapped in a perched condition, allowing clays to develop to their full expansion potential.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees.

Utility trenches in areas to be paved should be constructed in accordance with City of Castro Valley requirements. Compaction of trench backfill by jetting should not be allowed at this site. If there appears to be a conflict between City or other agency requirements and the recommendations contained in this report, this should be brought to the Owner's attention for resolution prior to submitting bids.

5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is issued with the understanding that it is the responsibility of the owner to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, and designers for the project so that the necessary steps can be taken by the contractors and subcontractors to carry out such recommendations in the field. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO strives to perform its services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions available at the time of preparation of ENGEO's report. This document must not be subject to unauthorized reuse, that is, reuse without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time. If actual field or other conditions necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

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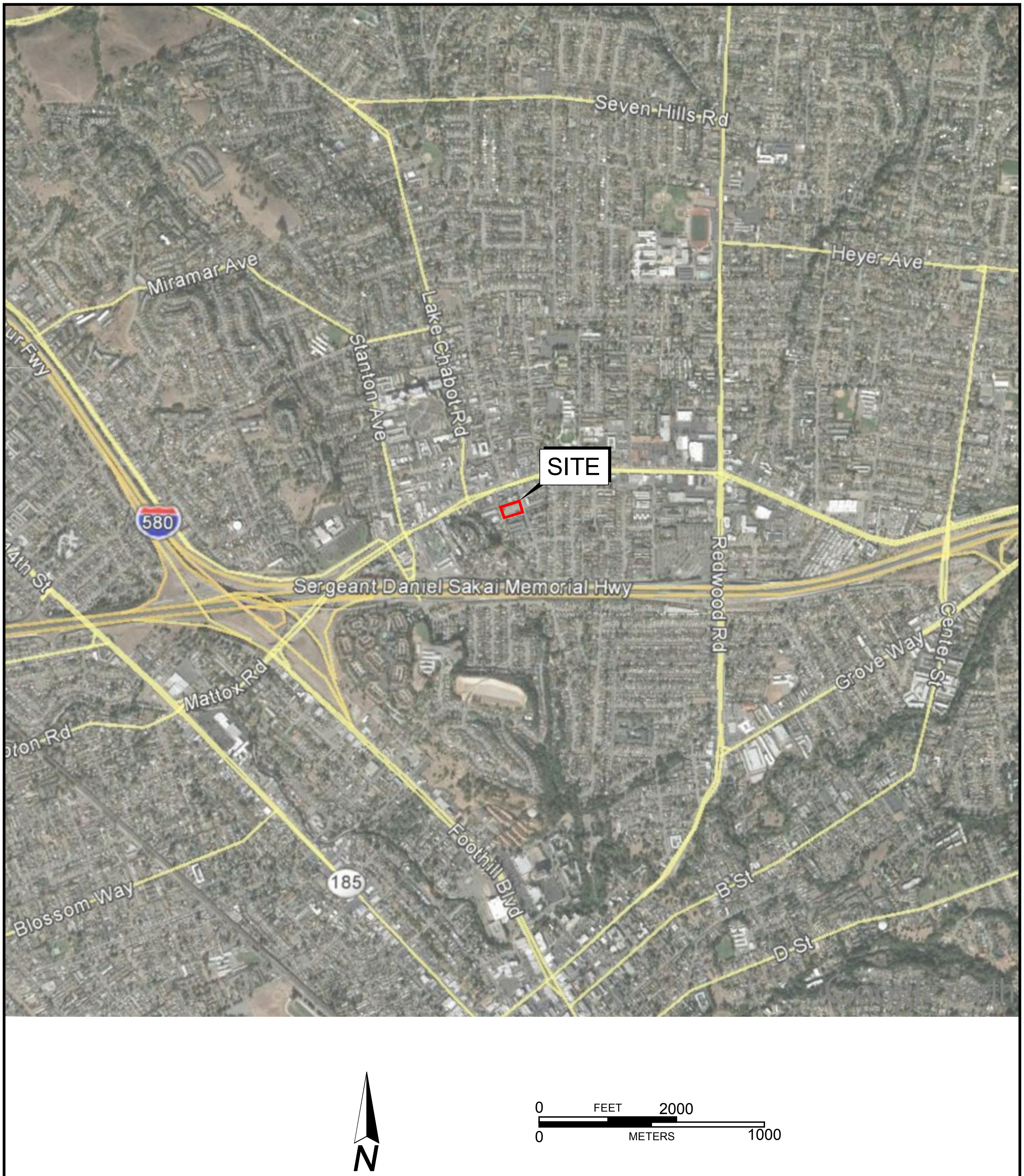
FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Geologic Map
FIGURE 4: Regional Faulting and Seismicity Map



BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

VICINITY MAP
20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

PROJECT NO.: 13255.000.000	FIGURE NO. 1
SCALE: AS SHOWN	
DRAWN BY: JCS	CHECKED BY: TTB

G:\Drafting\DRAFTING2_Dwg_13000 Plus\13255\GEX\13255000000-GEX-1VicinityMap-0317.dwg Plot Date: 3-07-17 JStephenson

ORIGINAL FIGURE PRINTED IN COLOR

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

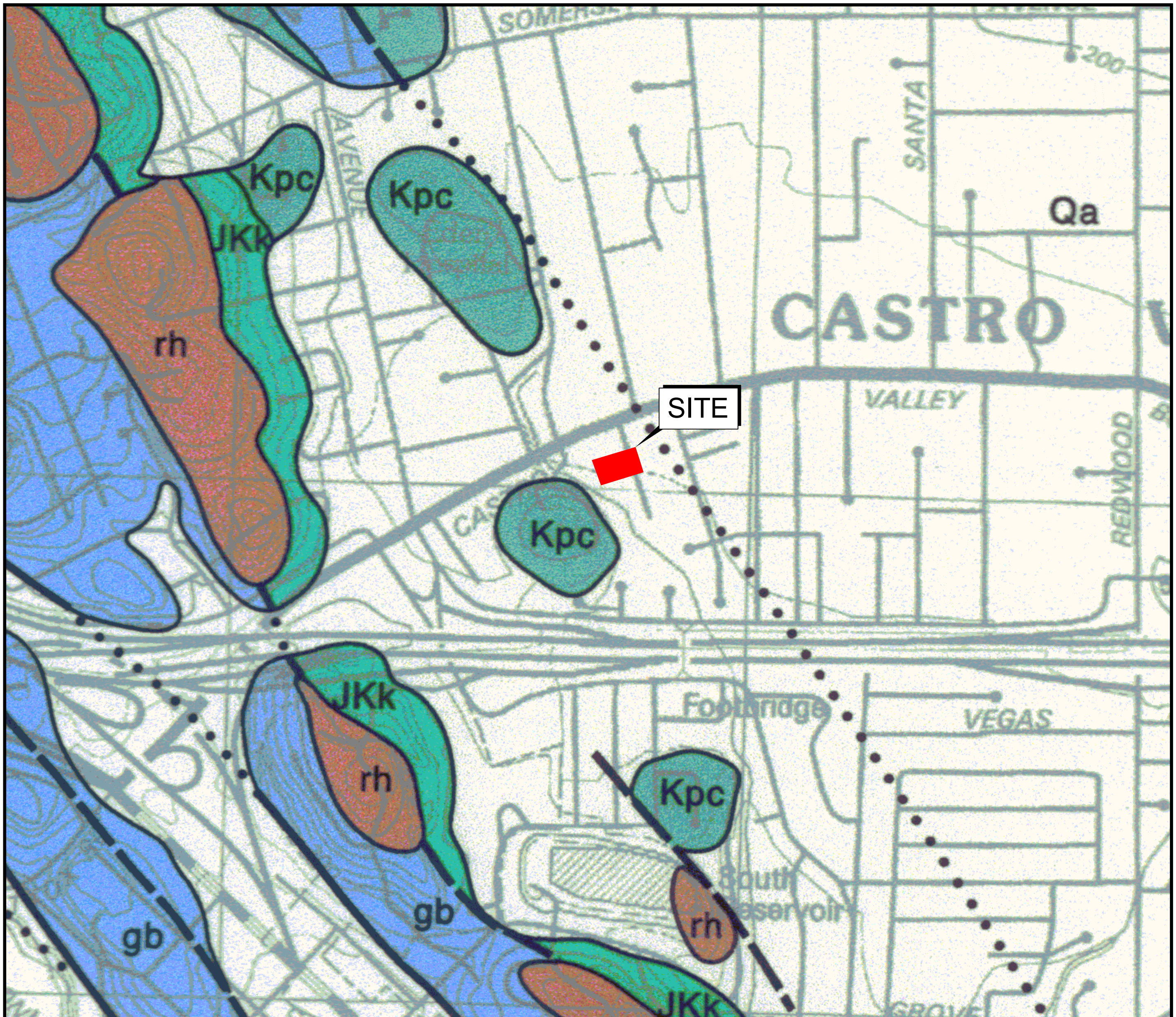
- **1-B5** BORING (ENGEO, 2017)
- **SB-8** BORING (AEI CONSULTANTS, 2005)

N

0 FEET 30
0 METERS 15

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	SITE PLAN 20785 AND 20957 BAKER ROAD CASTRO VALLEY, CALIFORNIA	PROJECT NO.: 13255.000.000 SCALE: AS SHOWN DRAWN BY: JCS CHECKED BY: TTB	FIGURE NO. 2



EXPLANATION

GEOLOGIC CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED

FAULT-DASHED WHERE INFERRED, DOTTED WHERE CONCEALED, QUERIED WHERE EXISTENCE IS DOUBTFUL. SAWTEETH ARE ON UPPER PLATE OF LOW ANGLE THRUST FAULT

DIRECTION OF LANDSLIDE MOVEMENT

AXIS OF FOLD

ANTICLINE SYNCLINE

STRIKE AND DIP OF STRATA

INCLINED VERTICAL OVERTURNED

Qa	SURFICIAL SEDIMENTS
Kpc	CONGLOMERATE
JKk	CLAY SHALE
rh	LEONA RHYOLITE
gb	GABBRO-DIABASE

N

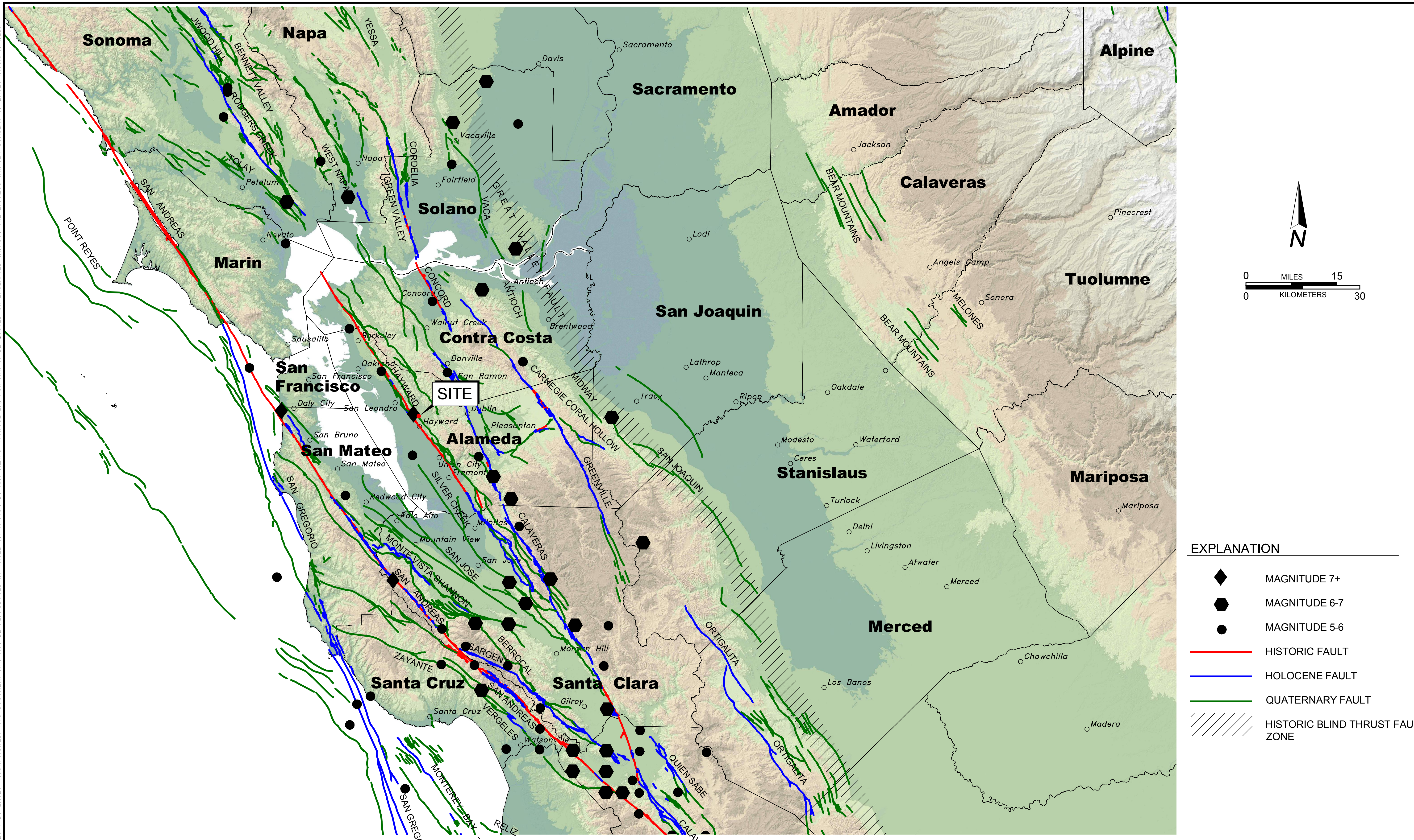
0 FEET 1000
0 METERS 500

BASE MAP SOURCE: DIBBLEE, 2005

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP
20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

PROJECT NO.: 13255.000.000
SCALE: AS SHOWN
DRAWN BY: JCS
CHECKED BY: TTB
FIGURE NO. 3



BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-2000)

ENGEO
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REGIONAL FAULTING AND SEISMICITY
20785 AND 20957 BAKER ROAD
CASTRO VALLEY, CALIFORNIA

PROJECT NO.: 13255.000.000	
SCALE: AS SHOWN	
DRAWN BY: JCS	CHECKED BY: TTB

FIGURE NO.
4

APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

ENGEO, February 28, 2017
AEI Consultants, May 18, 2005

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE: 200, 40, 10, 4 — CLEAR SQUARE SIEVE OPENINGS: 3/4 ", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

Dry	Dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible freewater

LINE TYPES

- Solid - Layer Break
- Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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ENGEO INCORPORATED

LOG OF BORING 1-B1

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 8.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			AGGREGATE BASE (AB)												
			LEAN CLAY (CL), dark gray, stiff, moist												
	155		LEAN CLAY (CL), yellowish brown mottled with orange, very stiff, moist			20	42	16	26		20	106.9	1296*	1.5-2*	UC, PP
5						65									
	150		CLAYSTONE, light gray, very weak (R1), completely weathered (WC), up to 1/2" stones present			50/3"									
			End of boring at 8.5', terminated at refusal in bedrock No groundwater encountered												

ENGEO INCORPORATED

LOG OF BORING 1-B2

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 9 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			AGGREGATE BASE (AB)												
	155		LEAN CLAY (CL), dark gray, very stiff, moist			20					22.6	101		2.0*	PP
5			LEAN CLAY (CL), yellowish brown mottled with orange, very stiff, moist, claystone inclusions			39	48	16	32					2.5*	PP
	150		CLAYSTONE, pale gray to light yellowish brown, very weak (R1), highly weathered (WH)			50/3"									
			End of boring at 9', terminated at refusal in bedrock No groundwater encountered												

ENGEO INCORPORATED

LOG OF BORING 1-B3

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 17.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet	Elevation in Feet	DESCRIPTION	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
		AGGREGATE BASE (AB)										
		LEAN CLAY (CL), dark grayish brown mottled with orange, very stiff, moist										
			37	48	18	30		22.3			2.5*	PP
	155	Less orange mottling										
5												
			41								2.5* 2.5*	PP PP
		SILTY CLAY (CL-ML), reddish brown mottled with gray, very stiff, moist										
	150											
10		CLAYEY SAND (SC), reddish yellow, very dense, moist, <1/4" to 1" gravels present	50/6"									
		CLAYSTONE, light gray, extremely weak (R0), residual soil (RS)	50/6"									
	145	Becomes highly weathered										
15			50/4"									
		End of boring at 17.5', terminated at refusal in bedrock Groundwater encountered at 7'										

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 18.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet	Elevation in Feet	DESCRIPTION	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0–1.5		AGGREGATE BASE (AB)											
1.5–5.5	155	LEAN CLAY (CL), dark gray, stiff, moist		27					23.3			2.0*	PP
5													
5.5–9	150	SILTY CLAY (CL-ML), light gray mottled with orange, stiff, moist		23								2.0*	PP
9–11		LEAN CLAY (CL), yellowish brown, moist	▽										
10				25	34	16	18	71	19.4				
11–15	145	SILTY SAND (SM), yellowish brown, medium dense, moist			23	17	6	41	21.8				
		More gravels present											
15–18.5	140	CLAYSTONE, light gray with orange, very weak (R1), very closely fractured, highly weathered (WH)		32									
				50/5"									

End of boring at 18.5', terminated at refusal in bedrock
Groundwater encountered at 9'

LOG OF BORING 1-B5

ENGEO INCORPORATED

Geotechnical
20957 Baker Road
Castro Valley, CA
13255.000.000

DATE DRILLED: 2/28/2017
HOLE DEPTH: 18 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 158 ft.

LOGGED / REVIEWED BY: T. Klotzback / JAF
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Stem Auger
HAMMER TYPE: 140 lb. rope and cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			AGGREGATE BASE (AB)												
	155		LEAN CLAY (CL), dark brown, medium stiff, moist			15							803*	1.0*	UC, PP
5			LEAN CLAY (CL), yellowish brown mottled with orange, medium stiff, moist, silt			2								1.0*	PP
	150		CLAYEY SAND (SC), reddish yellow, medium dense, moist, <1/4" gravels present		▽	17	25	15	10	34	18.6				
10			Becomes loose			16									
	145					50/3"									
15			CLAYSTONE, light gray with orange, very weak (R1), very closely fractured, highly weathered (WH)			50/3"									
	140					50/3"									
			End of boring at 18', terminated at refusal in bedrock Groundwater encountered at 8'												

Project: Piazza	Log of Boring SB-1
Project Location: 20957 Baker Road, Castro Valley, CA	Sheet 1 of 1
Project Number: 10509	

Date(s) Drilled **May 18, 2005**	Logged By **Robert F. Flory**	Checked By **Adrian Angel**
Drilling Method **Geoprobe**	Drill Bit Size/Type	Total Depth of Borehole **14 feet bgs**
Drill Rig Type **Geoprobe 5410**	Drilling Contractor **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured **8.75 feet ATD**	Sampling Method(s) **Tube**	Permit #
Borehole Backfill **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", base rock 4"		
				CL		Clay, black 10YR 2/1, firm, stiff, moist		
				CL		Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2		
		☒	SB1-3.5				0.3	
	5			CL-ML		Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling		
				SM		Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist		
		☒	SB1-7.5				0.5	
						becoming wet @ 9 feet (ATD)		
	10							
				SP		Sand, strong brown 7.5 4/6, soft, loose, wet		
		☒	SB1-11.5				0.9	Boring sealed to surface with neat cement grout.
				GC		Clayey Gravel, olive - olive brown 5y 4/4 - 2.5 4/4, firm, moist - (saprolite)		
				Claystone		Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated		
						Bottom of Boring at 14 feet bgs		
	15							
	20							

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Figure

AEI CONSULTANTS
ENVIRONMENTAL & CIVIL ENGINEERING

Project: Piazza Project Location: 20957 Baker Road, Castro Valley, CA Project Number: 10509	Log of Boring SB-2 Sheet 1 of 1

Date(s) Drilled: **May 18, 2005**	Logged By: **Robert F. Flory**	Checked By: **Adrian Angel**
Drilling Method: **Geoprobe**	Drill Bit Size/Type: **2 inch**	Total Depth of Borehole: **18 feet bgs**
Drill Rig Type: **Geoprobe 5410**	Drilling Contractor: **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured: **9.2 feet ATD**	Sampling Method(s): **Tube**	Permit #
Borehole Backfill: **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			GC		Clayey Gravel, black - dark yellow brown 10YR 2/1 - 3/4, firm, dry (FILL?)		
						No recovery		
		X	SB2-3.5				0.1	
				ML		Clayey Silt, olive gray 5Y 5/2, moderately firm, moist		
	5					becoming sandy downward		
		X	SB2-7.5				0.3	
				SM		Silty Sand, olive gray 5Y 5/2, clayey, moderately firm, moist wet @ 9.3 (ATD)		
	10							
		X	SB2-11.5	SP		Silty Sand, dark gray green 10GY 3/1, clayey, moderately firm,	175	
		X	SB2-13	SW		Gravelly Sand, dark greenish gray 10GY 4/1, firm, wet	85	Boring sealed to surface with neat cement grout
	15			CL		Sandy Gravelly Clay, olive brown - dark grayish brown 2.5Y 4/4 - 4/2, firm, slightly moist (saprolite)		
				Claystone		Sandy Gravelly Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated		
						Bottom of Boring at 18 feet bgs		
	20							

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AEI CONSULTANTS
ENVIRONMENTAL & CIVIL ENGINEERING

Figure

Project: Piazza
Project Location: 20957 Baker Road, Castro Valley, CA
Project Number: 10509

Log of Boring SB-3

Date(s) Drilled	**May 18, 2005**	Logged By	**Robert F. Flory**	Checked By	**Adrian Angel**
Drilling Method	**Geoprobe**	Drill Bit Size/Type	**2 inch**	Total Depth of Borehole	**16 feet bgs**
Drill Rig Type	**Geoprobe 5410**	Drilling Contractor	**EnProb**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**8.56 feet ATD**	Sampling Method(s)	**Tube**	Permit #	
Borehole Backfill	**Cement Slurry**	Location			

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", base rock 4"		
				CL		Clay, black 10YR 2/1, firm, stiff, moist		
		X	SB3-3.5	CL		Silty Clay, dark yellowish brown 10YR3/4 with some very dark brown 10YR 2/2 mottling, firm, slightly moist	0.5	
	5			CL-ML		Clayey Silt - Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling		
		X	SB3-7.5				1.0	
				SM		Silty Sand, strong brown 7.5 YR 5/6, firm, moist becoming wet @ 10.0 (ATD) ▽		
	10							
		X	SB3-11.5				1.2	
				SP		Clayey Sand, yellowish brown 10YR 4/6, moderately firn - moderately soft, wet		
				Claystone		Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated, slightly moist		Borings sealed to surface with neat cement grout
	15					No recovery		
						Bottom of Boring at 16 feet bgs		
	20							

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AEI CONSULTANTS
ENVIRONMENTAL & CIVIL ENGINEERING

Figure

Project: Piazza
Project Location: 20957 Baker Road, Castro Valley, CA
Project Number: 10509

Log of Boring SB-4

Sheet 1 of 1

Date(s) Drilled	**May 18, 2005**	Logged By	**Robert F. Flory**	Checked By	**Adrian Angel**
Drilling Method	**Geoprobe**	Drill Bit Size/Type	**2 inch**	Total Depth of Borehole	**13.5 feet bgs**
Drill Rig Type	**Geoprobe 5410**	Drilling Contractor	**EnProb**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**9.6 feet ATD**	Sampling Method(s)	**Tube**	Permit #	
Borehole Backfill	**Cement Slurry**	Location			

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", base rock 4"		
				CL		Clay, black 10YR 2/1, firm, stiff, moist		
		X	SB4-3.5				1.0	
	5			CL-ML		Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2 Sandy Silty Clay - Clayey Sandy Silt, dark yellowish brown 10YR 3/4 - 4/6 mottled,		
				CL-ML		Silty Clay - Clayey Silt, yellowish brown 10YR 4/6, moderately firm, moist		
		X	SB4-7.5				0.3	
						becoming wet @ 9 feet (ATD) ▽		
	10			CL		Sandy Clay grading downward to Clayey Sand, dark yellowish brown - 10YR 6/6, firm, moist		
				SC		Clayey Sand, brownish yellow - light yellowish brown 10YR 6/6 - 6/4, firm - moderately firm, very moist		
		X	SB4-11.5				0.5	
		X	SB4-12				0.5	Boring sealed to surface with neat cement grout
				SC		Clayey Sand, light olive brown 2.5Y 5/6 - strong brown 7.5 YR 5/8 mottling, moderately firm, wet		
						Refusal at 13.5 feet		
	15							
	20							

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Figure

AEI CONSULTANTS
ENVIRONMENTAL & CIVIL ENGINEERING

Project: Piazza **Project Location: 20957 Baker Road, Castro Valley, CA** **Project Number: 10509**	# Log of Boring SB-5 Sheet 1 of 1

Date(s) Drilled **May 18, 2005**	Logged By **Robert F. Flory**	Checked By **Adrian Angel**
Drilling Method **Geoprobe**	Drill Bit Size/Type **2 inch**	Total Depth of Borehole **18 feet bgs**
Drill Rig Type **Geoprobe 5410**	Drilling Contractor **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured **Dry feet ATD, 11.1 feet after 2.5 hrs**	Sampling Method(s) **Tube**	Permit #
Borehole Backfill **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", base rock 4"		
				CL		Clay, black 10YR 2/1, firm, stiff, moist		
				CL		Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2		
		X	SB5-3.5				0.1	
	5							
				CL-ML		Clayey Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling, firm,slighly moist		
		X	SB5-7.5				0.1	
				SM		Sand, yellowish brown 10YR 4/6, very fine grained, clayey, firm - moderately firm, friable, very moist		
	10			SP		Sand, yellowish brown 10YR 4/6, very fine grained - coarse grained, firm, wet ?		
						(after 2.5 hrs) ▼		
		X	SB5-11.5				0.3	
				CL		Gravelly Clay - Silty Clay, olive - olive brown 5y 4/4 - 2.5 4/4, firm - hard, slightly moist - (saprolite)		
	15	X	SB5-14	Claystone		Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated	1.0	Boring sealed to surface wit neat cement grout
						Bottom of Boring at 18 feet bgs		
	20							

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Figure

Project: Piazza **Project Location: 20957 Baker Road, Castro Valley, CA** **Project Number: 10509**	**Log of Boring SB-6** Sheet 1 of 1

Date(s) Drilled **May 18, 2005**	Logged By **Robert F. Flory**	Checked By **Adrian Angel**
Drilling Method **Geoprobe**	Drill Bit Size/Type **2 inch**	Total Depth of Borehole **14 feet bgs**
Drill Rig Type **Geoprobe 5410**	Drilling Contractor **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured **8.62 feet ATD**	Sampling Method(s) **Tube**	Permit #
Borehole Backfill **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", clayey gravelly FILL		
				CL		Clay, black 10YR 2/1, soft, moist		
		☒	SB6-3.5	CL		Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2	1.0	
	5			CL-ML		Sandy Silty Clay - Clayey Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling, firm, moist		
				SM		Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist - wet		
		☒	SB6-7.5				0.8	
						becoming wet @ 9 feet (ATD) ▽		
	10							
		☒	SB6-10.5				1.1	
				SP		Sand, strong brown 7.5 YR 5/8 with yellowish brown 10YR 5/4, moderately soft - soft, wet		
		☒	SB6-10.5				0.9	Boring sealed to surface with neat cement grout
				GC-CL		Clayey Gravel - Gravelly Clay, olive gray - olive 4/2 - 5/3, firm, moist, (saprolite)		
						Bottom of Boring at 14 feet bgs		
	15							
	20							

Figure

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Project: Piazza **Project Location: 20957 Baker Road, Castro Valley, CA** **Project Number: 10509**	# Log of Boring SB-7 Sheet 1 of 1

Date(s) Drilled **May 18, 2005**	Logged By **Robert F. Flory**	Checked By **Adrian Angel**
Drilling Method **Geoprobe**	Drill Bit Size/Type **2 inch**	Total Depth of Borehole **16 feet bgs**
Drill Rig Type **Geoprobe 5410**	Drilling Contractor **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured **8.56 feet ATD**	Sampling Method(s) **Tube**	Permit #
Borehole Backfill **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			Asphalt		Asphalt 2", base rock 4"		
				CL		Clay, black 10YR 2/1, firm, stiff, moist		
		X	SB7-3.5	CL		Silty Clay, dark yellowish brown 10YR3/4 with some very dark brown 10YR 2/2 mottling, firm, slightly moist	0.1	
	5			CL-ML		Clayey Silt - Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling		
		X	SB7-7.5				0.4	
				SM		Silty Sand, strong brown 7.5 YR 5/6, firm, moist becoming wet @ 10.0 (ATD) ▽		
	10							
				SP				
		X	SB7-13.5				1.1	Boring sealed to surface with neat cement grout
				Claystone		Clayey Sand, yellowish brown 10YR 4/6, moderately firn - moderately soft, wet		
	15					Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated, slightly moist		
		X	SB7-11.5			No recovery	0.6	
						Bottom of Boring at 16 feet bgs		
	20							

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Figure

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Project: Piazza Project Location: 20957 Baker Road, Castro Valley, CA Project Number: 10509	# Log of Boring SB-8 Sheet 1 of 1

Date(s) Drilled **May 18, 2005**	Logged By **Robert F. Flory**	Checked By **Adrian Angel**
Drilling Method **Geoprobe**	Drill Bit Size/Type **2 inch**	Total Depth of Borehole **15 feet bgs**
Drill Rig Type **Geoprobe 5410**	Drilling Contractor **EnProb**	Approximate Surface Elevation
Groundwater Level and Date Measured **8.7 feet ATD**	Sampling Method(s) **Tube**	Permit #
Borehole Backfill **Cement Slurry**	Location	

Elevation, feet	Depth, feet	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	PID Reading, ppm	REMARKS AND OTHER TESTS
	0			GC		Base rock		
				CL		Sandy Silty Clay, reddish brown 5YR 5/4 - yellowish brown 10YR 5/6, mottled, firm slightly moist		
				CL		Clay, black 10YR 2/1, firm, moderately firm, moist		
			SB8-3.5	CL		Silty Clay, dark yellowish brown 10YR3/4 with very dark brown mottling 10YR 2/2	0.2	
	5			CL-ML		Sandy silty Clay - Clayey Sand Silt, dark yellowish brown 10YR3/4 with some 10YR 4/6 mottling		
				Sandstone		Silty Sand, yellowish brown 10YR 4/6, very fine grained, slightly clayey, firm - moderately firm, friable, very moist		
		X	SB8-7.5			Moisture content increasing downward	1.1	
						(ATD) ▽		
						becoming wet @ 9 feet		
	10			SP		Sand, strong brown 7.5 4/6, soft - moderately soft, wet		
		X	SB8-11.5				0.1	
				SP		Sand, strong brown 7.5 4/6 - yellowish brown 10YR 5/6 mottled, locally clayey, moderately soft - moderately firm, wet		
		X	SB8-13				2.3	Boring sealed with neat cement grout
				Claystone		Sandy Silty Claystone, light olive brown 2.5Y 4/4, firm - hard, indurated		
	15					Bottom of Boring at 15 feet bgs		
	20							

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Figure

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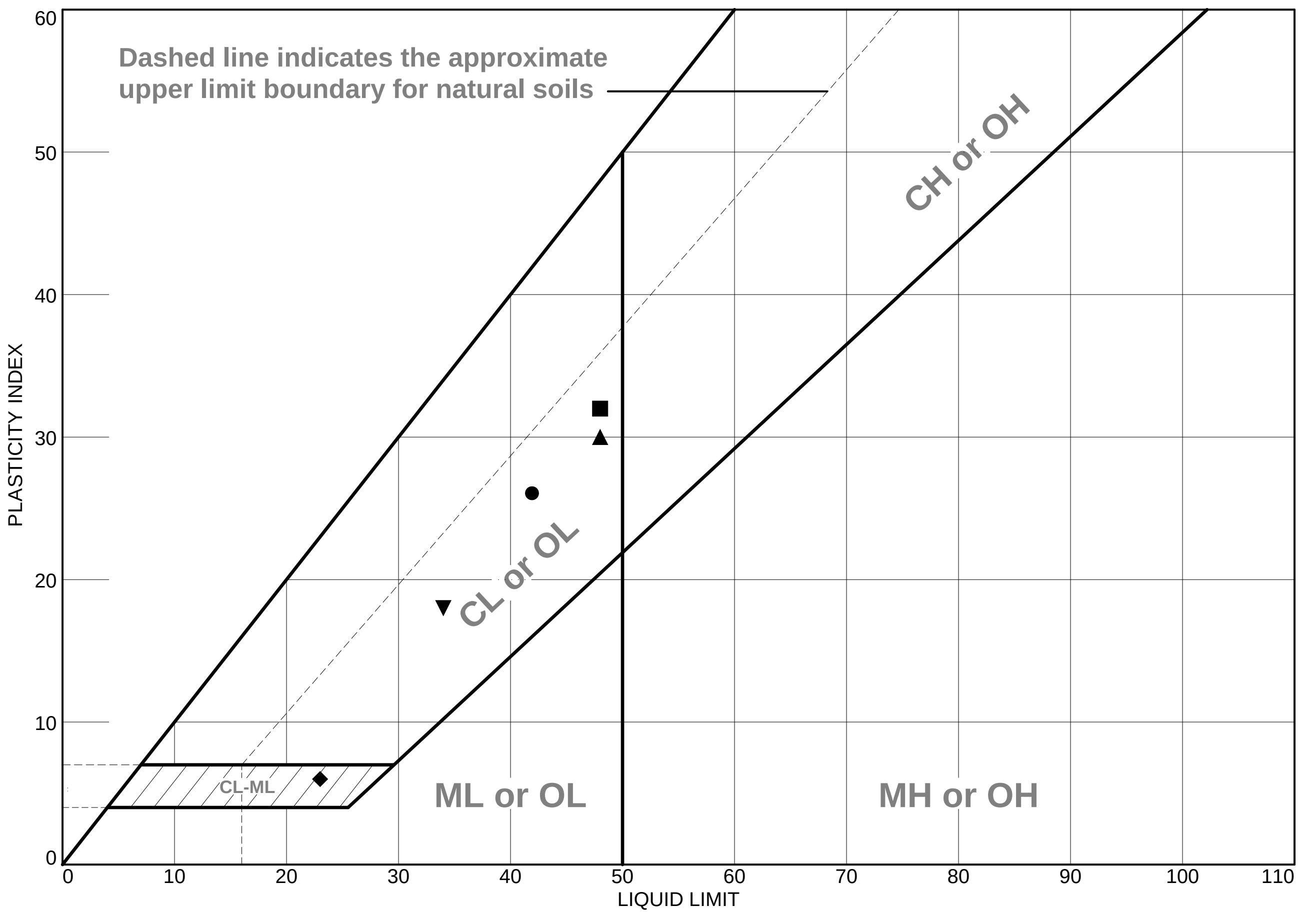
APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Particle Size Distribution Report
Unconfined Compression Test
Analytical Results of Soil Corrosion

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	42	16	26			
■	See exploration logs	48	16	32			
▲	See exploration logs	48	18	30			
◆	See exploration logs	23	17	6		40.5	
▼	See exploration logs	34	16	18		71.2	

Project No. 13255.000.000 **Client:** Catalyst Development Partners

Project: 20785 and 20957 Baker Road

●**Depth:** 3.0 feet **Sample Number:** 1-B1 @ 3

■**Depth:** 3.5 feet **Sample Number:** 1-B2 @ 3.5

▲**Depth:** 3.0 feet **Sample Number:** 1-B3 @ 3

◆**Depth:** 12.5 feet **Sample Number:** 1-B4 @ 12.5

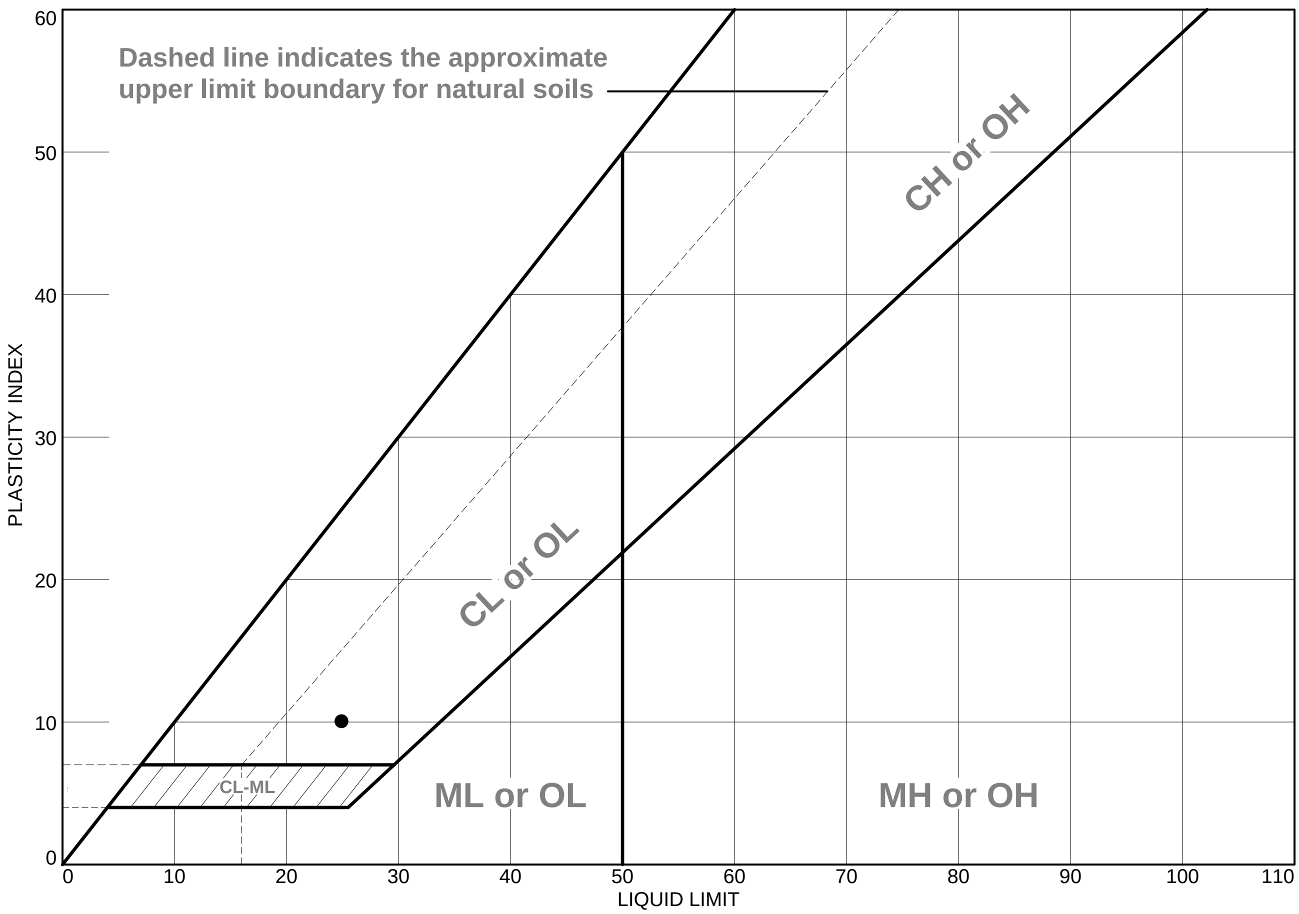
▼**Depth:** 10.0 feet **Sample Number:** 1-B4 @ 10

ENGEO
INCORPORATED

Remarks:
●ASTM D4318, Wet method
■ASTM D4318, Wet method
▲ASTM D4318, Wet method
◆PI: ASTM D4318, Wet method
GS: ASTM D1140
▼PI: ASTM D4318, Wet method
GS: ASTM D1140

Tested By: M. Quasem **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	25	15	10		33.8	

Project No. 13255.000.000 **Client:** Catalyst Development Partners

Project: 20785 and 20957 Baker Road

●**Depth:** 7.0 feet **Sample Number:** 1-B5 @ 7

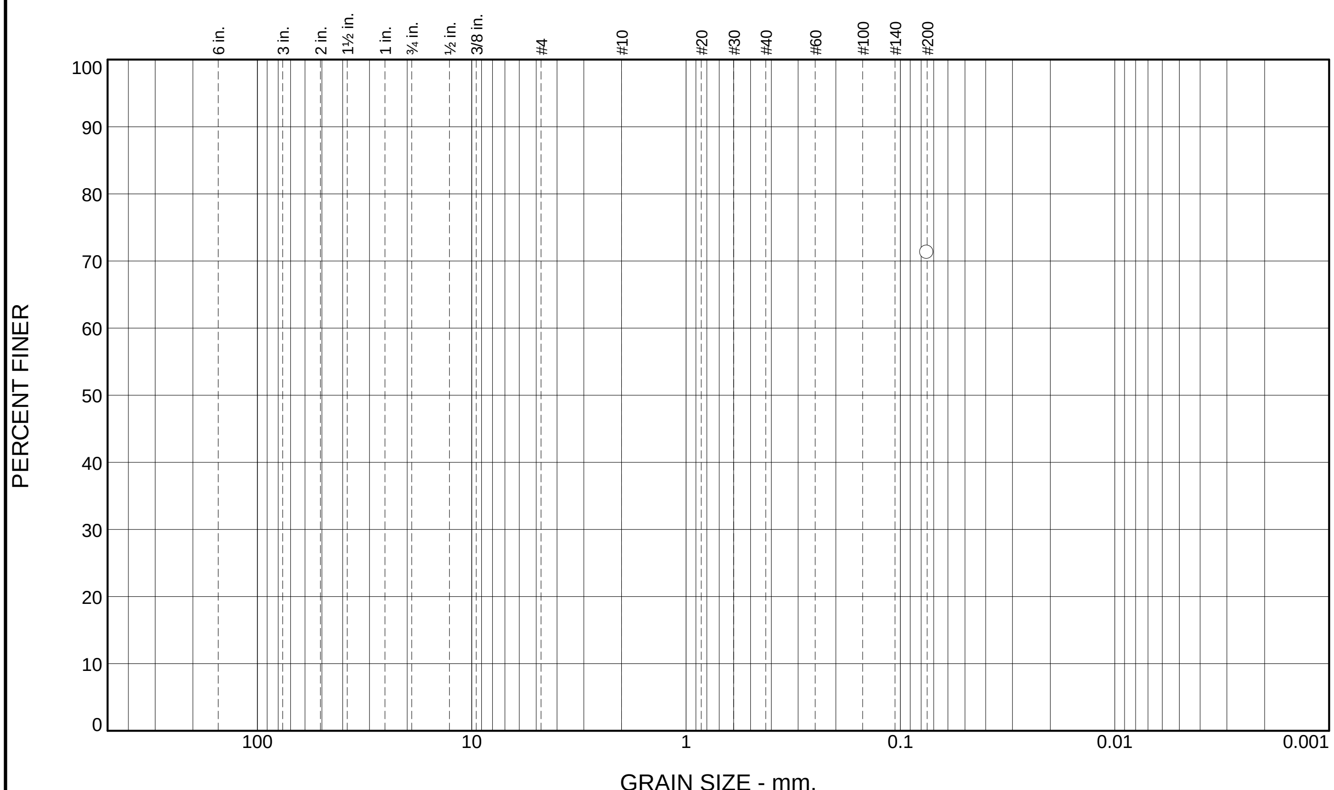
Remarks:

●PI: ASTM D4318, Wet method
GS: ASTM D1140

ENGEO INCORPORATED

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						71.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	71.2		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= 16 LL= 34 PI= 18

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140
PI: ASTM D4318, Wet method

Sample Number: 1-B4 @ 10 **Depth:** 10.0 feet

Date: 3/7/17

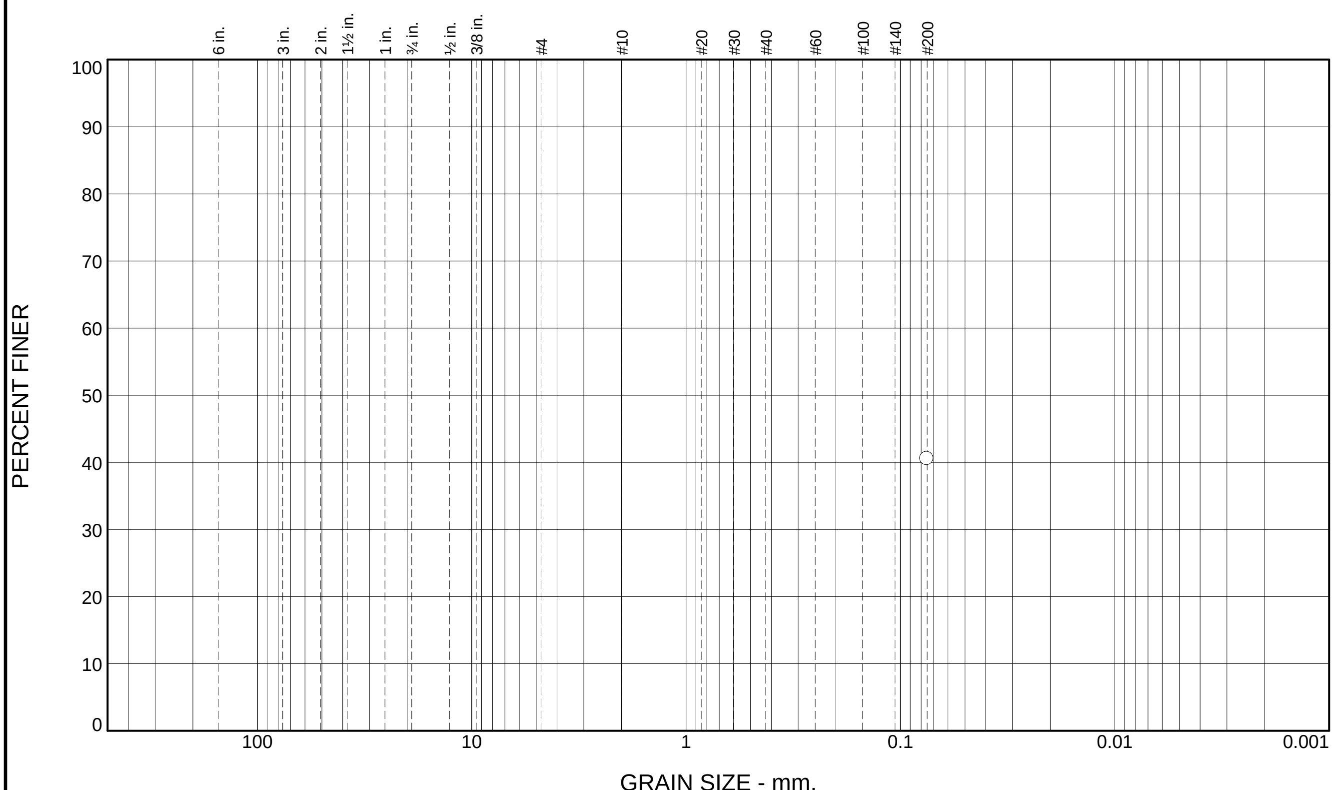
ENGEO INCORPORATED

Client: Catalyst Development Partners
Project: 20785 and 20957 Baker Road

Project No: 13255.000.000

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						40.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	40.5		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= 17 LL= 23 PI= 6

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140
PI: ASTM D4318, Wet method

Sample Number: 1-B4 @ 12.5 **Depth:** 12.5 feet

Date: 3/7/17

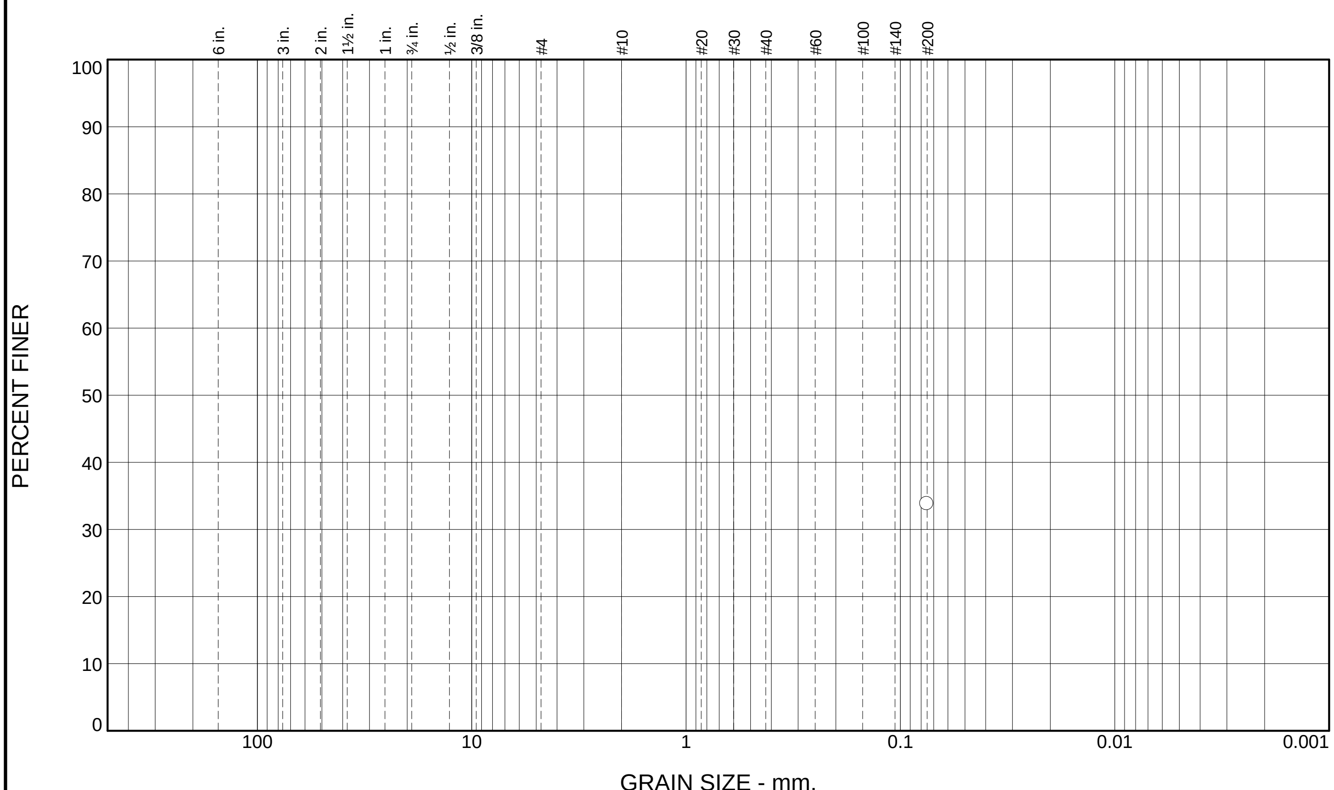
ENGEO INCORPORATED

Client: Catalyst Development Partners
Project: 20785 and 20957 Baker Road

Project No: 13255.000.000

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						33.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	33.8		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= 15 LL= 25 PI= 10

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140
PI: ASTM D4318, Wet method

Sample Number: 1-B5 @ 7 **Depth:** 7.0 feet

Date: 3/7/17

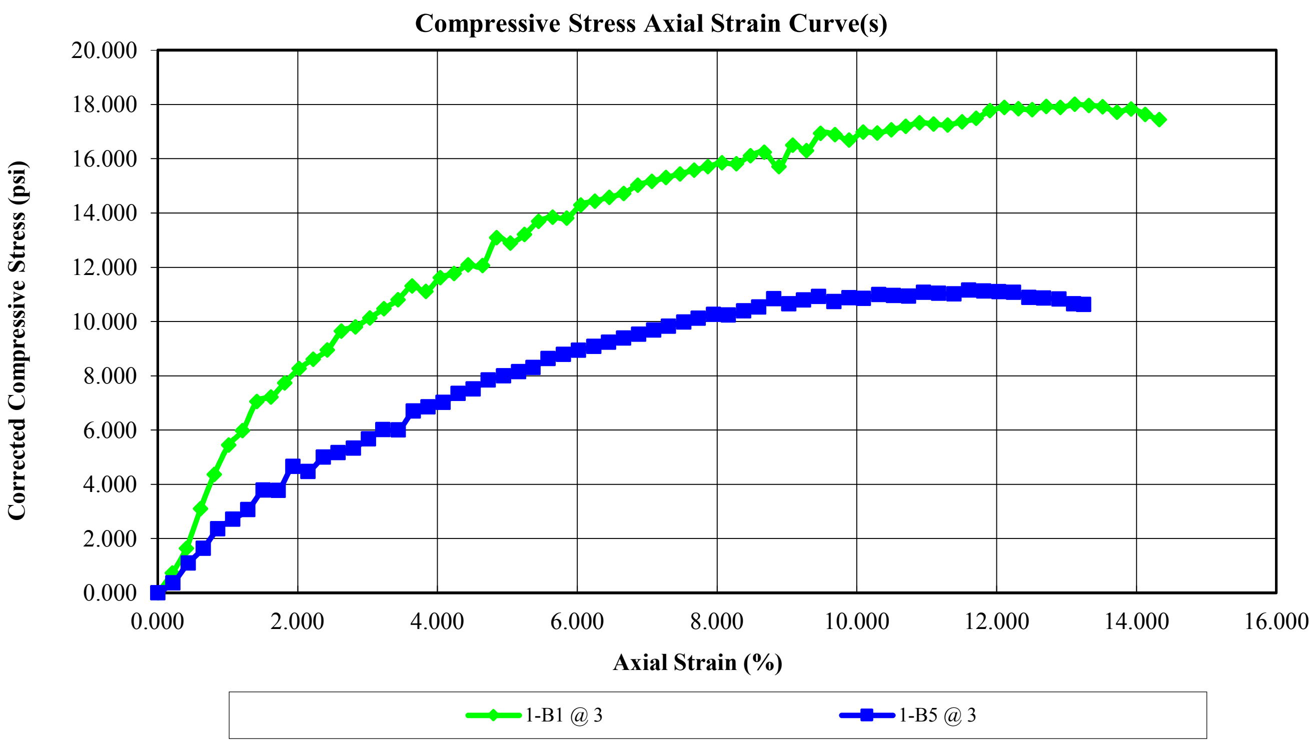
ENGEO INCORPORATED

Client: Catalyst Development Partners
Project: 20785 and 20957 Baker Road

Project No: 13255.000.000

Tested By: M. Quasem **Checked By:** G. Criste

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B1 @ 3	1-B5 @ 3
Moisture Content (%)	20.0	23.7
Dry Density (pcf)	106.9	95.6
Saturation (%)	96.52	85.89
Void Ratio	0.55	0.73
Diameter (in)	2.392	2.396
Height (in)	4.998	4.694
Height-To-Diameter Ratio	2.089	1.959
TEST DATA		
Unconfined Compressive Strength (psf)	2592.500	1605.989
Undrained Shear Strength (psf)	1296.250	802.994
Strain Rate (in./min.)	0.05	0.05
Specific Gravity (Assumed)	2.650	2.650
Strain at Failure (%)	13.12	11.60

Test Remarks

SPECIMEN	DESCRIPTION
1-B1 @ 3	See exploration logs
1-B5 @ 3	See exploration logs

PROJECT NAME: 20785 and 20957 Baker Road
PROJECT NO: 13255.000.000
CLIENT: Catalyst Development Partners
LOCATION: Castro Valley, CA
PHASE NO: 005

Test Date: 03/06/17
Tested By: M. Quasem
Reviewed By: G. Criste

ENGEO Expect Excellence

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 03/07/2017
Date Submitted 03/03/2017

To: Teresa Klotzback
Engeo, Inc.
2010 Crow Canyon PL. Ste #250
San Ramon, CA 94583

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 13255.000.000 Site ID : 1-B4@3.5FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 73720-153746.

EVALUATION FOR SOIL CORROSION

Soil pH	6.56		
Moisture	17.5 %		
Minimum Resistivity	1.90 ohm-cm (x1000)		
Chloride	3.8 ppm	00.00038	%
Sulfate	42.9 ppm	00.00429	%
Redox Potential	(+) 231 mv		
Sulfides	Presence - NEGATIVE		

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

APPENDIX C

LIQUEFACTION ANALYSIS RESULTS

Liquefaction Evaluation - Idriss and Boulanger (2008)

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw
7	7	0.93	7.33

1-B4

Results

Boring Designation	Depth [ft]	CRR	CSR	FS	Ht. of Layer (ft)	(N1)60cs	Soil Type (USCS)	Liquefiable?	Limiting Shear Strain γlim	Parameter Fα	Maximum Shear Strain γmax	ΔLDI	Volumetric Strain εv	ΔSi
1-B4	13.0	0.32	0.66	0.50	4.00	31	SM	Yes	4%	-0.14	4%	0.17	0.81%	0.39
											LDI	0.17	Settlement (in)	0.39

TDL = Too Dense to Liquefy based on blowcount criteria

Liquefaction Evaluation - Idriss and Boulanger (2008)

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw
8	7	0.93	7.33

1-B5

Results

Boring Designation	Depth [ft]	CRR	CSR	FS	Ht. of Layer (ft)	(N1)60cs	Soil Type (USCS)	Liquefiable?	Limiting Shear Strain γlim	Parameter Fα	Maximum Shear Strain γmax	ΔLDI	Volumetric Strain εv	ΔSi
1-B5	7.5	0.46	0.57	0.79	1.00	36	SC	Yes	2%	-0.48	2%	0.02	0.33%	0.04
1-B5	9.8	0.20	0.61	0.33	3.50	22	SC	Yes	13%	0.44	13%	0.47	2.17%	0.91
1-B5	12.5	THC	0.58	TDL	2.00	87	SC	N/A	0%	0.00	0%	0.00	0.00%	0.00
											LDI	0.49	Settlement (in)	0.95

TDL = Too Dense to Liquefy based on blowcount criteria

SAN RAMON

SAN FRANCISCO

SAN JOSE

OAKLAND

LATHROP

ROCKLIN

SANTA CLARITA

IRVINE

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