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July 6, 2010
BCI File 1873.1

Mr. Merritt Perry
Winzler & Kelly, Consulting Engineers
633 Third Street
Eureka, CA 95501-0417

Subject: **GEOTECHNICAL REPORT**
Arcata Rail with Trail Connectivity Project
Arcata, California

Dear Mr. Perry:

Blackburn Consulting (BCI) prepared this Geotechnical Report for the subject project. This report supplements our previous Draft Geotechnical Report, dated February 17, 2010, that presented preliminary data for pre-design. This report incorporates the data from the earlier draft and includes geotechnical criteria for final project design.

Please call if you have questions on this report or require additional information. We appreciate this opportunity to serve you.

Sincerely,

BLACKBURN CONSULTING

Rob Pickard, P.G., C.E.G.
Project Engineering Geologist

Reviewed by:

Rick Sowers, P.E., C.E.G.
Senior Project Manager, Principal

GEOTECHNICAL REPORT
Arcata Rail with Trail Connectivity Project
Arcata, California

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INTRODUCTION

Blackburn Consulting (BCI) prepared this Geotechnical Report for the proposed Arcata Rail with Trail Connectivity Project. This report includes data submitted in our previous draft report, dated February 17, 2010, for use in preliminary design.

The recommendations in this report are based on the permanent trail alignment as described in Winzler and Kelly's (W&K) 75% submittal plans, dated May 2010. This report also addresses a temporary alignment on top of the existing rail prism within the southern portion of the project.

SCOPE OF SERVICES

To prepare this report, BCI:

- Discussed the project with Winzler & Kelly (W&K) project engineers, and reviewed preliminary project plans (75% submittals, dated May 2010).
- Reviewed the project alignment with representatives of W&K.
- Reviewed published geologic, topographic and seismic mapping of the alignment corridor.
- Reviewed As-Built Log of Test Boring drawings for the existing Caltrans Highway 101 bridges at Jacoby Creek and Gannon Slough.
- Sampled and logged eleven test borings along the proposed trail alignment and 25 hand probes in areas of soft ground inaccessible to a drill rig.
- Conducted laboratory testing on samples obtained from the borings.
- Performed engineering analysis for design and construction of the trail segments and associated foundation elements within the project.

SITE DESCRIPTION

The trail alignment generally follows the existing North Coast Railroad Authority (NCRA) right-of-way between Eureka and Arcata in Humboldt County, California. The south end of the project is near Bracut Industrial Park and the north end at Larson Park in Arcata. Total alignment distance is approximately 4.2 miles.

The southern and central portions of the alignment are adjacent to the east side of the Humboldt Bay National Wildlife Refuge and the Arcata Marsh and Wildlife Sanctuary. Trail objectives include multi-use (bicycle and pedestrian) public access between Eureka and Arcata and access to the natural resources along the bay and marshlands. The trail alignment is relatively flat to gently sloping with elevations ranging from approximately 10 feet, along Humboldt Bay, to 60 feet at Larson Park. Portions of the alignment cross, or are adjacent to, several sloughs, marshlands, drainages, and tidal estuaries. We show the approximate project alignment on Figures 1 and 2.

PROJECT DESCRIPTION

The proposed project is a Class 1 trail that will generally be within existing NCRA or City of Arcata right-of-way. The trail will typically consist of a 10 foot paved section with 2 foot wide shoulders, for a total width of 14 ft, although some sections may be slightly narrower. Typical cut/fill sections are shown on the preliminary plans to be less than 6 feet in height and constructed at maximum slope gradients of 2H:1V. Import fill will be required for the project but the sources are not identified.

The permanent trail will generally parallel the Northwest Pacific Railroad (NWPR) and is described below. Within the southern portion of the project, the NWPR is parallel to, and approximately 50 ft west of, Highway 101. The railroad is presently not in use and is in various states of disrepair; a temporary trail may utilize the existing NWPR grade until such time that rail service is restored.

The permanent alignment contains the following sections:

Station 10+00 (Bracut) to 82+47 (track crossing north of Gannon Slough)

This trail section will be located on the east side of the NWPR and involve low cut/fill of about 3 ft or less. The fill will encroach onto the existing ditch between the NWPR and Highway 101. The ditch will be shifted further east, toward the highway.

At about Station 24+50 the alignment crosses Brainard's Slough that is drained under the highway with a 6'x8' reinforced concrete box (RCB) culvert and under the NWPR by two corrugated metal pipe (CMP) culverts, approximate 36" in diameter. The CMP's are severely corroded and large voids (sinkholes) have opened within the railroad ballast over the pipes, collapsing some of the rail ties. W&K proposes to span this drainage with an 80 ft long, 10 ft wide pre-manufactured steel bridge, supported on driven piles and located between the NWPR and Highway 101. The preliminary plans show 25-ft long approach spans consisting of pre-cast deck units supported on concrete spread footings. For the temporary trail along the existing NWPR grade, the bridge may consist of a similar 80-ft long span with abutments supported on spread footings established within the embankment fill.

North of Brainard's Slough, other areas of erosion and/or cavities are present within the railroad embankment to about Station 31+00, primarily along the west (bay) side of the tracks.

At about Station 58+20 the alignment crosses Old Jacoby Creek that is drained similar to Brainard's Slough (RCB under the highway and two CMP's under the NWPR). The CMP's are similarly corroded and sinkholes have developed over the pipes. An 80 ft long pre-manufactured steel bridge is also proposed here, spanning the drainage over the CMP's between the railroad and the highway, supported on driven piles with pre-cast approach spans supported on spread footings. A temporary alignment along the top of the rail prism, similar to Brainard's Slough, is also proposed here.

At about Station 69+50 the alignment crosses Jacoby Creek. Highway 101 (south-bound) crosses the creek with a 3-span, reinforced concrete bridge, approximately 90 ft long, supported on multi-column bents and concrete abutments with driven, pre-cast concrete pile foundations. The NWPR crosses the creek with a 4-span, timber bridge, approximately 55 ft long, supported on timber pilings that have largely deteriorated. The preliminary plans show the permanent trail on a new bridge along the west side of the Highway 101 bridge. We understand Caltrans plans to replace this bridge in the future and the permanent trail may therefore be incorporated into the new structure. The temporary trail may include an 80 ft long replacement bridge along the existing rail prism similar to that proposed at Brainard's Slough and Old Jacoby Creek.

At about Station 80+00 the alignment crosses Gannon Slough. Highway 101 (south-bound) crosses this slough with a 400 ft long, multi-span, reinforced concrete, flat-slab bridge with multi-column, concrete pile extensions at the bents. The NWPR bridge across this slough is a 195 ft long, multi-span, timber bridge supported on timber piles. W&K proposes to span this drainage with a 180 ft long, 10 ft wide pre-manufactured steel bridge, located immediately east of the railroad bridge. Several pre-cast concrete approach spans, each 25 ft long, are shown at each end, supported on piles or concrete footings. The existing NWPR bridge appears to be in good condition and the temporary trail may utilize this bridge, assuming satisfactory assessment of the timber piling.

Station 82+47 (north of Gannon Slough) to 170+00 (Samoa Boulevard)

At Station 82+47 the trail crosses to the west side of the NWPR tracks and parallels the tracks along the edge of the tidal estuary, then along the west side of South G Street to the City of Arcata Waste Water Treatment Plant (WWTP). Past the WWTP, the trail crosses Butcher Slough and follows an existing trail/dirt road to I Street, then atop an existing levee section through Arcata Marsh to Samoa Boulevard. Most of the trail in this segment will be constructed at-grade with little new cut/fill. Some minor "sliver fills" may be required to achieve the full trail width and may, locally, encroach onto soft, tidal estuary ground.

At Station 125+80 the trail crosses Butcher Slough. An existing footbridge crosses the slough, comprised of a 50-ft long, clear-span concrete bridge, about 6 ft wide, with concrete abutments. The existing bridge is constructed over a large diameter sewer line. Several other exposed utility lines cross the slough on the south side of the bridge. The W&K plans show a new, 75 ft long, 10 ft wide pre-manufactured steel bridge, supported on driven piles, located adjacent to the existing bridge. The existing utilities are to remain and be protected. This bridge may be supported on spread footings, similar to the temporary crossings at Brainard's Slough and Old Jacoby Creek.

At about Station 160+00 the trail crosses a drainage basin controlled (in part) by tidal flows. The plans show this area to be crossed on four, precast concrete bridge deck panels, each 20 ft long and 10 ft wide, supported by spread footing foundations. These panels, elevated about 3 ft above the ground surface, will be "hinged" at the deck to accommodate anticipated differential settlement.

Approaching Samoa Boulevard (north from about Stations 162+00) the alignment crosses an old industrial area with scattered piles of rubble and debris.

Station 170+00 (Samoa Boulevard) to Station 238 (Sunset Avenue) or 24 (Larson Park)

This segment follows L Street, along the west side of the City of Arcata, then follows Alliance around the west side of Arcata High School and through an area of previous logging operations. The alignment then connects with a future extension of Foster Avenue and continues to Sunset Avenue. The project may continue east from Sunset Avenue to Larson Park, approximately an additional 600 ft.

The section along L Street from Station 170+00 to about Station 179+00 is a flat, unpaved area west of the NWPR tracks that follows an old rail spur; this area will receive a new trail pavement section. From Station 179+00 to about Station 192+00, the trail crosses to the east side of L Street where the existing asphalt pavement will be replaced. North of Station 192 to about Station 212+50 the alignment follows existing street sections and/or old street/rail grades, and follows the east side of Alliance Road to Jolly Giant Creek; minor fills (up to about 3 ft in height) will be constructed along portions of this segment. Some low retaining walls may be required along Alliance Road below the high school.

At about Station 212+50 the trail crosses Jolly Giant Creek. The creek is carried under Alliance Road by an oval culvert with a concrete headwall. Upstream of Alliance Road, a concrete diversion structure is located in the creek. Plans show a 20 ft long, precast concrete bridge deck across this creek, with concrete spread footings, located just downstream of the diversion structure.

North of Jolly Giant Creek the trail will follow an old berm across an area formerly occupied by a log pond. This area will be cleared, brushed and leveled, requiring a few feet of cut/fill. No major structures or grading is anticipated in this area. The alignment is obscured by heavy brush and trees, and there is potential for buried logs, debris and other logging remnants in this area. At about Station 223+00, the trail will merge with the future extension of Foster Avenue; this is a separate City project and the trail from here to Sunset Avenue (Station 238) will be designed as part of the future City of Arcata roadway.

From Sunset Avenue to Larson Park the trail will be cut into an existing slope on the north side of the existing NWPR tracks. Low retaining walls may be required in this area, depending on right-of-way limits and profile grades. The trail project ends at Larson Park.

SITE GEOLOGY AND FAULTING

Published geologic mapping (Kelly, 1984) shows the project alignment underlain predominately by Holocene age alluvium consisting of marshland (bay mud), clay, sand and gravel. Older Pleistocene-age alluvial sediments, mapped as the Hookton Formation, underlie the alluvium and are comprised of nonmarine sandstone with some clay and gravel. At the north end of the project, Quaternary marine terrace deposits (mostly silts, sands and gravels) form the slopes directly below Arcata High School and Larson Park.

We did not observe evidence of significant geologic hazards such as landslides, subsidence, springs or active faults, as part of this study. However, the location along the margin of Humboldt Bay is an active seismic area and subject to numerous seismic hazards, including strong ground motions, seismic settlement, soil liquefaction and tsunamis.

Kelly (1984) shows the Freshwater fault to cross the alignment at several locations from Jacoby Creek to Samoa Boulevard; this fault, however, is not mapped by the California Geologic Survey (CGS) or Caltrans as an active seismic source. The nearest "active" fault, per CGS, is the Fickle Hill Fault System, shown to cross the alignment near 10th Street in Arcata and along Alliance Road near the base of slope below Arcata High School. Other active faults in the area include the Mad River and McKinleyville faults, located approximately 2.5 and 3.5 miles, respectively, north of the north end of the project.

SUBSURFACE CONDITIONS

We drilled and logged 10 truck-mounted test borings (B1 through B10) to depths of 41-65 feet at locations shown on Figure 2. Our drilling contractor, Clearheart Drilling, used hollow-stem auger drilling method and obtained soil samples with a 3.0-inch OD "California Modified" sampler. Additionally, we completed one hand augered boring at Larson Park (HA-1) to a depth of 7.5 feet.

We divide the subsurface soils into three primary units, as follows:

- Unit 1- Soft clay and sandy clay from ground surface to depths of generally 18-22 ft, but as shallow as 11 ft (B2). This unit was not encountered on the higher terrace at Larson Park (B-10 and HA-1). This unit is comprised of young (Holocene) alluvium and bay mud. These soils are predominately clay with high plasticity and abundant organic matter. These soils have a characteristic blue-gray color and are interbedded with thin layers of loose, clayey sand. These soils generally underlie a variable depth of fill, including the railroad/highway embankment and levee fill, that ranges from about 2-6 ft deep. In B-9 (Jolly Giant Creek, near the high school), abundant wood debris was encountered between depths of 8-12 ft (possibly related to the previous log pond).
- Unit 2- Medium dense to dense silty sand and gravel, and stiff to very stiff sandy clay, extending to depths of 41-53 ft. The upper portion of this unit is generally granular (silty sand and gravel) and the lower portion generally cohesive (sandy clay), although B-3, B-4 and B-5 (Jacoby Creek and Gannon Slough areas) contain abundant clay interbedded with lesser sand. These soils, typically blue-gray in color with organics, are considered consistent with late Quaternary alluvium. At Larson Park (B-10, HA-1), these soils are mottled gray and orange brown, consistent with Pleistocene-age marine terrace deposits.
- Unit 3 – Dense sandy and clayey gravel, encountered below depths of 41-53 ft and extending to the maximum depth explored (65.5 feet). This unit is typically weakly cemented and poorly graded, with interbedded layers of medium dense sand and stiff clay. We associate this unit with the Pleistocene-age Hookton formation.

See Appendix A for detailed logs of each boring.

In addition to the sampled borings we completed 25 hand probes to evaluate the depth of very soft ("bay mud") soils along the marsh/estuary areas. We were generally able to "push" the probes to a depth of 1-3 ft. Probes P2 through P8 were driven an additional depth (up to 10 ft) with a 10 lb drop-hammer. Further details of probe locations and depths are provided in Appendix A.

GROUNDWATER

We encountered groundwater in the borings ranging from depth 1 ft to 13 ft. South of Samoa Boulevard, these levels vary between about elevation -1 and +8. Brackish groundwater is present throughout the southern portion of the project alignment and is influenced by tidal flows in Humboldt Bay.

At Jolly Giant Creek, we encountered groundwater in B-9 at depth 4 feet (about elevation +20), approximately at creek level. At Larson Park, we encountered groundwater at depth 10 feet in B-10 and 2.5 ft in HA-1 (about elevation 44-47 ft).

We consider all soils below groundwater levels to be saturated and capable of yielding water freely to open excavations.

LABORATORY TESTS

We performed the following laboratory tests on representative soil samples:

- Moisture/Density, Sieve Analysis and Plasticity Index for material characterization
- Unconfined Compression tests for strength parameters
- Consolidation tests for settlement analysis
- Soil corrosivity tests for corrosion evaluation

Results of the lab tests show the Unit 1 (organic clay) to range in moisture content from 37-52% with dry densities of 68-82 pcf and a Plasticity Index of 27. Sieve analysis show greater than 79% passing No. 200 mesh sieve. These soils classify as "CH" (fat clay) per Unified Soils Classification System (USCS). Unconfined compressive strengths range from 0.2-0.6 tsf. Consolidation tests show high compressibility under light to moderate loading conditions.

The Unit 2 soils range in moisture content from 10-30% and in dry density from 92-132 pcf. The percent passing No. 200 sieve ranges from 5% to 92%, reflecting the interbedded sand and clay layers. Unconfined compressive strengths of the cohesive soils range from 0.3-2.6 tsf.

We did not conduct laboratory tests on the deep Unit 3 soils due to their dense nature and abundant gravel. We consider these soils to be very strong relative to the Units 1 and 2 soils and low in compressibility.

We show the test results on the boring logs and in Appendix B.

CORROSION EVALUATION

We summarize the corrosivity test results in Table 1:

Table 1

Corrosion Testing Summary					
	B3-3	**B5-3**	**B6-4**	**B-9-3B**	**B-10 Bag A**
pH	7.4	8.2	8.2	4.7	4.3
Minimum Resistivity (ohm-cm)	230	90	270	8,040	22,780
Chloride (ppm)	1115	4228	1088	14.1	12.9
Sulfate (ppm)	114	248	19	1.9	0.6

Caltrans considers soils corrosive to foundation elements if one or more of the following conditions exist:

- Chloride concentration is 500 parts per million (ppm) or greater,
- Sulfate concentration is 2000 ppm or greater,
- pH is 5.5 or less.

Based on the laboratory test results, the soils along the project alignment are classified as corrosive according to the Caltrans Corrosion Guidelines (Version 1.0, Sept 2003). The low resistivity values and high chloride concentrations, generally present along the bay/marsh areas south of Samoa Boulevard, indicate a high corrosion potential to unprotected steel. The corroded steel pipes under the NWPR at Brainard's Slough and Old Jacoby Creek confirm this condition. Protective coating is likely required within the zone of oxidation for all metal pipes and steel piling in this (brackish) environment.

Test result on marine terrace soils generally north of Samoa Boulevard (B-9, B-10) are not corrosive to steel, however, are acidic (pH $\leq$5.5) and may be reactive to concrete.

SEISMIC GROUND MOTIONS

BCI used seismic design procedures outlined in the Caltrans 'Geotechnical Services Manual' (Version 1.0, August 2009) to develop the preliminary Acceleration Response Spectrum (ARS) Curve for design of new bridge structures.

Based on the 2007 Caltrans Deterministic PGA Map and 2007 Fault Database, the controlling deterministic seismic sources are the Little Salmon fault (Onshore Section) and Mad River fault zone (Trinidad fault). Using distances to the Jacoby Creek bridge site, each fault is assigned the following parameters:

Table 2

Fault Parameters	Little Salmon fault	Mad River fault zone
Fault Identification Number (FID)	11	89
Maximum Moment Magnitude (M_{max})	7.2	7.2
Site-to-Fault (R_{RUP}) Distance (km)	7.85	2.40
Style of Faulting	Reverse	Reverse
Fault Dip (degrees)	30	35

Based on our boring data, SPT N_{60} blow count values, and correlations outlined in the Caltrans "Geotechnical Services Design Manual," we assign the site an average small strain shear wave velocity (V_{S30}) equal to 210 meters per second for the upper 100 feet of the soil profile. Since the site is located less than 15.5 miles from the causative faults, we also apply an adjustment factor for near-fault effects consistent with Caltrans procedures.

We used the above information to develop deterministic response spectra for the site and compared that to the Caltrans minimum deterministic response spectrum that assumes a maximum moment magnitude 6.5, vertical strike-slip event occurring at a distance of 7.5 miles. We then compared the deterministic results with the probabilistic response spectrum based on data from the 2008 United States Geological Survey (USGS) National Seismic Hazard Map for a 5% in 50 year probability of exceedance (975 year return period). We also compared our results with response spectra based on the Caltrans ARS Online tool.

The probabilistic response spectrum controls over all periods. Therefore, we recommend a preliminary design spectrum based on the probabilistic curve across the period spectrum from 0 to 5 seconds. Based on the Preliminary Design ARS Curve, we assign the site a peak ground acceleration (PGA) of 0.53g. We attach the Preliminary Design ARS Curve as Figure 5.

The bridge sites classify as "Site Class F" per Caltrans procedures and, if designed to Caltrans criteria, would require further (site specific) ARS analysis. Site-to-fault distance is less for the Butcher Slough bridge and will result in a higher PGA for this bridge.

LIQUEFACTION EVALUATION

Liquefaction is a secondary effect associated with seismic loading. It can occur when relatively loose, granular (typically less than 35% fines), saturated soils, generally within about 50 feet of ground surface, are subjected to ground shaking. Based on the encountered subsurface conditions, laboratory test results, and depth to ground water, we consider the potential for detrimental soils liquefaction to be high within layers of loose, granular soils, mostly within the Unit 2 materials.

During a seismic event, ground shaking can cause seismic settlement of loose, granular soil. For reasons stated above, the potential for detrimental seismic settlement to occur at this site is high within the soft/loose bay/marsh sediments.

AS-BUILT FOUNDATION DATA

We reviewed As-Built Log of Test Borings drawings (1955) for the Jacoby Creek and Gannon Slough bridges at Highway 101. These borings were drilled in April-May, 1952, to as deep as 150 ft. The data are consistent with the borings completed for this study and generally show the upper 20 ft as soft clay, underlain by stronger material to depth 50 ft (slightly compact to compact sandy silt and soft to stiff clay), with mostly compact to very dense sand and gravel with layers of very stiff clay below depth 50 ft. Notations of "peat" and "organic material" are shown in the upper 20 ft, with "wood fragments" and "buried logs" noted occasionally throughout the underlying soils on the Caltrans logs. Groundwater is shown at depths of less than 5 ft.

We attach copies of the As-Built LOTB drawings in Appendix C.

CONCLUSIONS

We develop the following conclusions based on the above data:

- The proposed trail project is feasible but subject to significant geologic risks common to the general Humboldt Bay region. These include strong seismic ground motions, soil liquefaction, settlement and tsunami hazard.
- The soft (bay mud) soils within the upper 20 ft are subject to consolidation under increased loading and may experience differential settlement based on load distribution.
- Groundwater within the bay/marsh sediments is shallow, brackish, and creates a corrosive soil environment within the zone of oxidation.
- Support for new bridge foundations is available on driven, pre-cast concrete piles. Except as noted otherwise, steel piles (H-piles or pipe piles) are not recommended due to the corrosive soil conditions and limited lateral capacity. Cast-in-Drilled Hole (CIDH) piles are not recommended due to the shallow groundwater and caving/squeezing soil conditions.
- Spread footings are not generally appropriate for bridge foundations due to the soft, compressible soils in the upper 20 ft, however, may be acceptable for light-loaded approach slabs and/or precast panels at elevated trail sections. Spread footings may also be appropriate for temporary bridges located along the existing rail prism, but would be subject to long-term settlement, liquefaction and limited lateral resistance in the transverse direction.
- "Standard" (Caltrans) loading to 45 or 70 tons per pile is available within the lowermost (Unit 3) soils. Design (axial) loads to about 20 tons could be achieved within the Unit 2 soils, however, the interbedded soft/loose soils within this unit are subject to consolidation and/or liquefaction; permanent foundation support is therefore recommended within the underlying Unit 3 soils.
- A composite pile has been proposed, comprised of a precast concrete section in the upper pile to mitigate corrosion and steel pipe in the lower pile to facilitate driving. The pipe pile would be partially driven, then field-welded to a steel plate attached to the base of the precast pile, then driven below the oxidization zone and into the lowermost Unit 3 soils. This is an acceptable alternative and would also reduce the size of the crane equipment next to US 101.

- Support for short approach slabs (e.g., 20-25 ft long, precast panels) can be achieved on shallow spread footings established in undisturbed soils and/or a prism of select material, assuming that differential settlement of several inches can be tolerated. Settlement can be reduced with increased depth of select material and/or use of geotextiles (e.g., geogrid and/or geofabric).
- Support for the proposed new embankment fills is generally available on native, undisturbed soils below the vegetation layer. Some areas, however, may require removal of soft subgrade soils and replacement with select, granular material or geogrid.

RECOMMENDATIONS

Trail Section

Subgrade Preparation

Strip and dispose all surficial vegetation and any disturbed soils or debris. We estimate this depth at approximately four inches below ground surface. These materials are not suitable for use in engineered fill but, less any debris, may be used as topsoil over finished slopes.

In areas of new fill foundations, scarify the exposed surface to a minimum depth of 6 inches, moisture-condition, and compact to at least 90% relative compaction per CTM 216. If very soft ("bay mud") or organics are present at this level, or where compaction is unachievable due to pumping soils, treat the subgrade by subexcavating an additional 12 inches, place a layer of geogrid and backfill with select granular fill (e.g., Class 2 AB) compacted to 90% relative compaction. Use Tensar TX160, or equivalent, for geogrid mats to distribute new fill loads. Use Class-2 Aggregate Sub-base (or similar) for granular fill.

Based on the data developed for this study, we estimate that approximately 25% of the area between the south end of the project (Station 10+00) and Samoa Boulevard (Station 170+00) will encounter soft soils requiring supplemental treatment.

Fill Sections

New embankment fills will be constructed using imported borrow, presumably from sources in the project vicinity. Import material should meet the specification for Class 3 Aggregate Sub-base (ASB), placed to at least 90% relative compaction (per CTM 216). The source of fill material is not known at this time, however, we expect slopes constructed at gradients of 2:1 (horizontal:vertical) or flatter to be grossly stable when constructed with approved materials and in accordance with typical Caltrans Standard Earthwork Specifications.

For fills of 6 ft or less and constructed on a prepared subgrade surface per above, we consider the potential settlement will be in the range of 1-2 inches. Where the fill is against existing railroad or highway fills, settlement will likely be negligible due to small surcharges over fill that has been in-place for many years. Bench the new fill into existing embankments in accordance with typical Caltrans earthwork specifications.

Cuts and Excavations

Significant cut slopes are not anticipated for this project. Temporary slopes may be required for certain installations. Slope and/or shore temporary excavations in accordance with current Cal OSHA requirements. Where the use of excavation sloping and/or shoring is required, a competent person must classify each soil deposit as Type A, Type B, or Type C in accordance with OSHA procedures. We expect most native soils to be classified as Type C, which requires a temporary slope gradient of 1.5:1 or flatter.

Structural Section

Typically, structural sections for trails similar to this can follow Caltrans guidelines (per Highway Design Manual), using a Traffic Index of 5.0 and assuming light loads (e.g., occasional maintenance vehicles but no heavy truck loads). Assuming a structural section established on firm, native soils (compacted to minimum 90% per above), or on a reconstructed subgrade utilizing geogrid and granular fill, we consider a minimum section comprised of 0.2' AC over 0.5' Class-2 AB as acceptable. Compact the Aggregate Base section to 95% relative compaction.

Where soft soils are encountered, this office should verify the subgrade conditions during construction and develop a modified section, as needed. For a structural section established directly on soft to stiff clay, with presumed R-value of 5, a section comprised of 0.2 ft AC over 0.9' Class 2 AB would be appropriate.

Interim Alignment (Top of Rail Prism)

An interim alignment may utilize the existing rail section between the south end of the project (Station 10+00) to north of Gannon Slough (about Station 82+47). We recommend the following steps to use the existing top of rail prism:

- Remove the existing rails and underlying ties to expose the ballast section.
- Lower the grade, as possible, to achieve the necessary trail width without adding significant fill. If fill is required, fill to the highway side (east) to avoid new fill on the bay side.
- Repair existing "sinkholes" along the alignment by filling with gravel (similar to ballast gravel).
- Compact the surface to 90% relative compaction (CTM 216) and construct the structural section per above.

Bank Stability

Between about Stations 10+00 (Bracut) to Station 82+47 (Gannon Slough), the west side of the existing rail section is subject to wave attack from Humboldt Bay. Erosion protection is necessary to the extent that the permanent or interim alignments rely on the stability of this slope. Protection by rock slope protection (RSP) or heavy rip-rap is generally suitable for this purpose. Use RSP woven fabric per Section 88 of the Caltrans Standard Specifications. RSP placement by Method B (Section 72, Standard Specifications) is acceptable.

Structures

Bridge Foundations - Piles

Support for precast concrete piles with 45 ton design loads is available at approximately elev. -42 feet at each of the following structures:

- Brainard's Slough
- Old Jacoby Creek
- Jacoby Creek
- Gannon Slough
- Butcher Slough

For design loads to 70 tons per pile, specify tips to elev. -48 feet.

For the composite sections comprised of a pipe pile in the lower section and concrete pile in the upper section, specify tips to elev. -45 feet for 45 ton design loads and elev. -50 feet for 70 ton design loads.

For lateral pile capacity, use soil parameters as shown in Figure 6. These are based on a typical soil profiles developed for the Jacoby Creek, Gannon Slough and Butcher Slough bridge sites. The Jacoby Creek parameters can also be used for the Brainard's Slough and Old Jacoby Creek bridges. Use current AASHTO Bridge Design Specifications to apply an appropriate reduction in the P-Multiplier for closely spaced piles.

Bridge Foundations – Footings

For bridges located along the top of the existing rail prism (and including Butcher Slough and Jolly Giant Creek), spread footing foundations can be considered, recognizing that footings are subject to long-term settlement and the effects of seismic shaking (including liquefaction and limited passive resistance in the transverse direction). For footings approximately 4' x 12' in dimension, W&K has assigned total load soil pressures of about 2,000 psf or less. We recommend the following steps:

1. Subexcavate 2 ft below the base of the structural footing; scarify the exposed surface to a minimum depth of 6 inches, moisture-condition to near optimum moisture compact to at least 90% relative compaction per CTM 216. Inspect carefully for signs of voids or unsuitable material and fill/replace, as necessary.
2. If very soft ("bay mud") or organics are present at this level, or where compaction is unachievable due to pumping soils, place a layer of geogrid (e.g., Tensar TX160, or equivalent) before placing fill.
3. Replace the material below the footing with Class-2 AB compacted to 95% relative compaction.

We expect long-term settlement (e.g., from decomposition of the underlying organic bay muds) of a few inches. This can be mitigated by providing the means to re-level the abutment footings

(e.g., jacking at the footing corners), as needed. If additional seismic restraint is necessary, options such as helical anchors might be considered to increase lateral/uplift capacity.

Approach Sections (precast slabs)

W&K indicates that the pre-cast slab approach sections to the permanent bridges will be short (20-25 ft), lightly loaded (approximately 1000 psf for typical 2-3 ft wide strip footings), and hinged at the ends to tolerate several inches of long-term, differential settlement. Considering the soft soil conditions at the bridge approaches, we recommend constructing the strip footings on a 2 ft thick gravel pad that extends at least 2 ft beyond the footprint of the footing. If conditions at this level are too soft/wet to achieve a stable gravel pad, place geogrid (e.g., Tensar TX160, or equivalent)at the base of the gravel section for tensile support. We recommend a minimum 3 ft wide footing to distribute the loads and reduce differential settlement. We estimate total settlement on the order of 2 inches; about half will be differential, and the full 2 inches may be differential to pile-supported bridge abutment.

Elevated Walkways and Minor Structures

Elevated walkways (e.g., precast deck panels across the drainage basin at Station 160) and minor bridge or headwalls (e.g., precast bridge deck across Jolly Giant Creek at Station 212+50) can be supported on spread footings constructed similar to the approach slab sections. This includes subexcavating about 2 ft below the base of footing and replacing with a compacted gravel pad extended to at least 2 ft beyond the footing footprint. Soil bearing to 1500 psf is generally allowable with this preparation, conditioned on observations of the footing excavations by BCI.

If conditions at the base of the footing excavations are too soft/wet to achieve a stable gravel pad, use geogrid for tensile support. We recommend a minimum 3 ft wide footing to distribute the loads and reduce differential settlement. We estimate total settlement at these locations to be 2 inches or less; about half of which will be differential.

CONSTRUCTION CONSIDERATIONS

Excavation and Shoring

We expect that all excavations can be achieved using typical construction equipment without difficulty. We expect that a construction backslopes of 1.5:1 (horizontal:vertical distance) will be generally stable for short-term construction periods during the dry-season (summer/early fall), however, excavations within soft “bay mud” soils and/or below groundwater will require shoring. The contractor is responsible for design and construction of excavation sloping and shoring in accordance with Cal OSHA requirements and the Caltrans “Trenching and Shoring Manual.”

Piles

Consistent with Section 49-1.08 of Caltrans “Standard Specifications” (May 2006), all piles should be driven to or below specified tip and should have required bearing as indicated by the following formula at final penetration.

$R_u = [1.83*(E_r)^{0.5} \log_{10}(0.83*N)] - 124$

where,

R_u = nominal resistance (kips)

E_r = manufacturer's rated hammer energy (foot-pounds) at the field observed ram stroke

N = number of hammer blows in the last foot of pile penetration (maximum N = 100)

Since the existing highway and railroad bridges are pile supported, we do not expect that vibrations due to pile driving will adversely affect the existing structures.

Spread Footings

Pour footing concrete "neat" (without forming), against trimmed, intact bearing material within clean and dry excavations. If forming is necessary, backfill excavations outside footing limits with lean concrete or suitable granular backfill (i.e. "Structure Backfill" per Caltrans "Standard Specifications") compacted to at least 95% relative compaction (per CTM 216).

If it is necessary to deepen footing excavations to engage suitable bearing materials, it is acceptable to backfill with plain concrete to plan footing grade, up to a depth of 3 feet below the footing, with BCI approval. Where very soft soils and/or shallow groundwater is present at the base of footings, use geogrid and gravel pad to support the footings, as discussed above.

Dewatering

Shallow groundwater (<5 ft depth) is expected throughout most of the project alignment. Groundwater control will be required for open excavations below these levels. In general, the soils are cohesive with low permeability, although granular layers may be highly permeable. We expect that diking, diversion and/or sump pumps will be adequate to control inflow into shallow excavations (e.g., for structure footings). Along the bay, tidal fluctuations may impact the required groundwater control.

Storm Water Quality

This project involves relatively little earthwork. We expect that construction term erosion control will be available by means of typical good construction practices (e.g., use of erosion barriers, synthetic slope covers, hydro-seeding, etc.). If necessary, the contractor should develop a Storm Water Pollution Prevention Plan consistent with current construction standards.

RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, BCI should be retained to:

- Review and provide written comments on the civil/structural plans and specifications prior to construction.
- Monitor construction to check and document our report assumptions. At a minimum, we should review any shoring plans submitted by the contractor, observe pile driving, review spread footing excavations, and review areas of soft fill foundation that require supplemental treatment.
- Update this report if design changes occur, two years or more lapse between this report and construction, and/or site conditions change

If BCI is not retained to perform the above applicable services, we are not responsible for any other parties' interpretation of our report, and subsequent addendum's, letters, and discussions.

LIMITATIONS

BCI performed services in accordance with the generally accepted geotechnical standard of practice currently used in this area. Where referenced, we used CTM and ASTM standards as a general (not strict) *guideline* only. We do not warranty our services.

BCI based this report on the current site and project conditions. We assumed the soil and ground water conditions encountered in our exploratory borings are representative of the subsurface conditions along the project alignment. Actual conditions between borings could be different and ground water may be higher in other locations than measured in the borings.

The interface between soil types on the logs is approximate and may be abrupt or gradual. We based our recommendations on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions.

Our scope did not include evaluation of flooding or on-site hazardous materials. A hazardous materials assessment was completed by others. This Report should only be used for design and construction of the Arcata Rail with Trail Connectivity Project, as described herein.

Modern design and construction are complex, with many regulatory sources, restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

REFERENCES

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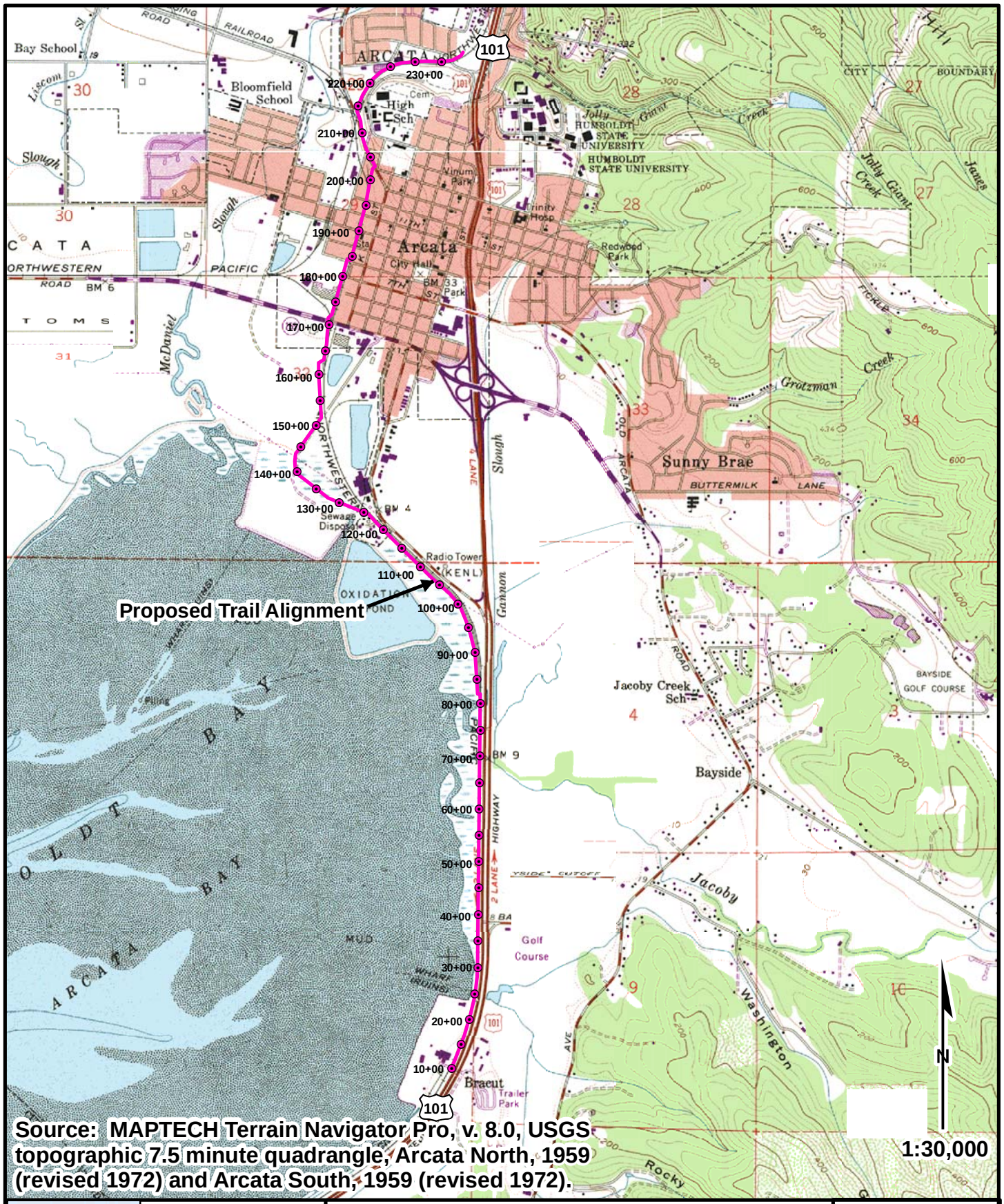
Kelley, Frederic R., 1984, *Geology and Geomorphic Features Related to Landsliding, Arcata North 7.5-Minute Quadrangle, Humboldt County, California,* California Division of Mines and Geology, Open-File Report 84-38.

Kelley, Frederic R., 1984, *Geology and Geomorphic Features Related to Landsliding, Arcata South 7.5-Minute Quadrangle, Humboldt County, California,* California Division of Mines and Geology, Open-File Report 84-39.

Mualchin, L., 1996, *California Seismic Hazard Map*; State of California, Department of Transportation.

Toppozada, T., et. al, 2000, *Epicenters of and Areas Damaged by M ≥ 5 California Earthquakes, 1800-1999*, California Division of Mines and Geology, Map Sheet 49.

FIGURES



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Arcata North, 1959 (revised 1972) and Arcata South, 1959 (revised 1972).

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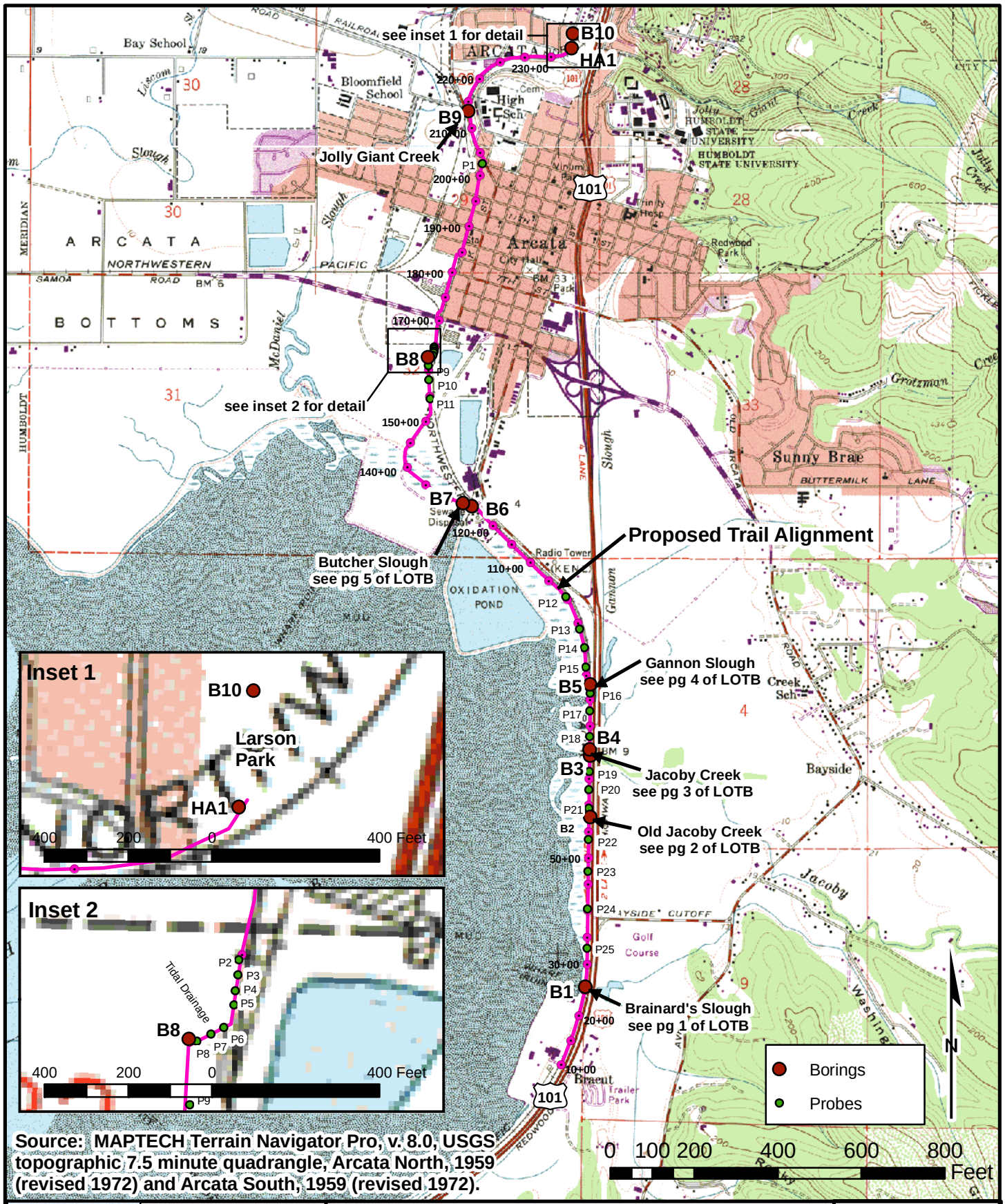
VICINITY MAP

Arcata Rail with Trail Connectivity Project
Arcata, California

File No. 1873.1

July 2010

Figure 1



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Arcata North, 1959 (revised 1972) and Arcata South, 1959 (revised 1972).

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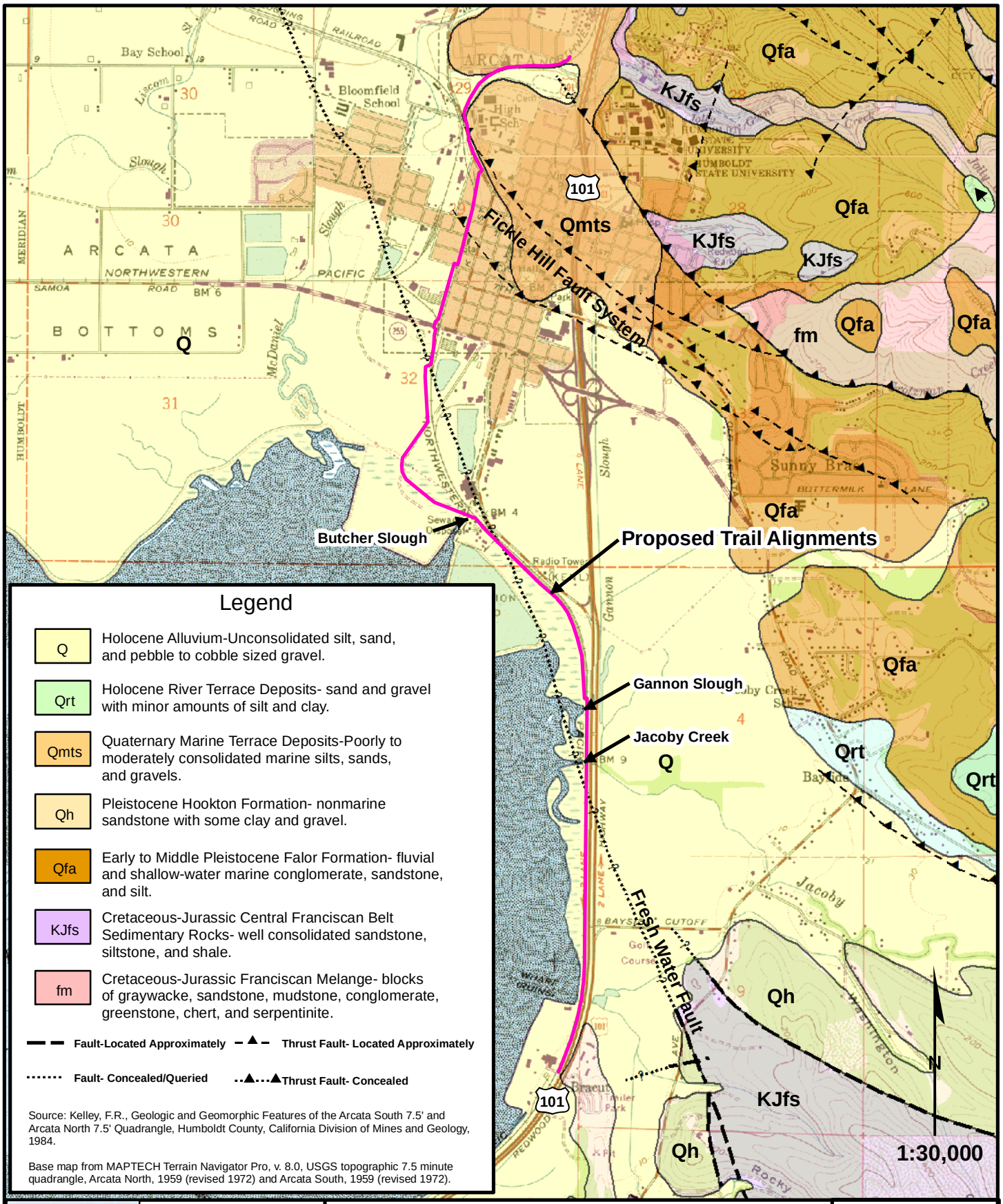
SITE MAP

Arcata Rail with Trail Connectivity Project
Arcata, California

File No. 1873.1

July 2010

Figure 2



Legend

Q	Holocene Alluvium-Unconsolidated silt, sand, and pebble to cobble sized gravel.
Qrt	Holocene River Terrace Deposits- sand and gravel with minor amounts of silt and clay.
Qmts	Quaternary Marine Terrace Deposits-Poorly to moderately consolidated marine silts, sands, and gravels.
Qh	Pleistocene Hookton Formation- nonmarine sandstone with some clay and gravel.
Qfa	Early to Middle Pleistocene Falor Formation- fluvial and shallow-water marine conglomerate, sandstone, and silt.
KJfs	Cretaceous-Jurassic Central Franciscan Belt Sedimentary Rocks- well consolidated sandstone, siltstone, and shale.
fm	Cretaceous-Jurassic Franciscan Melange- blocks of graywacke, sandstone, mudstone, conglomerate, greenstone, chert, and serpentinite.

Fault-Located Approximately — Thrust Fault- Located Approximately

Fault- Concealed/Queried — Thrust Fault- Concealed

Source: Kelley, F.R., Geologic and Geomorphic Features of the Arcata South 7.5' and Arcata North 7.5' Quadrangle, Humboldt County, California Division of Mines and Geology, 1984.

Base map from MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Arcata North, 1959 (revised 1972) and Arcata South, 1959 (revised 1972).

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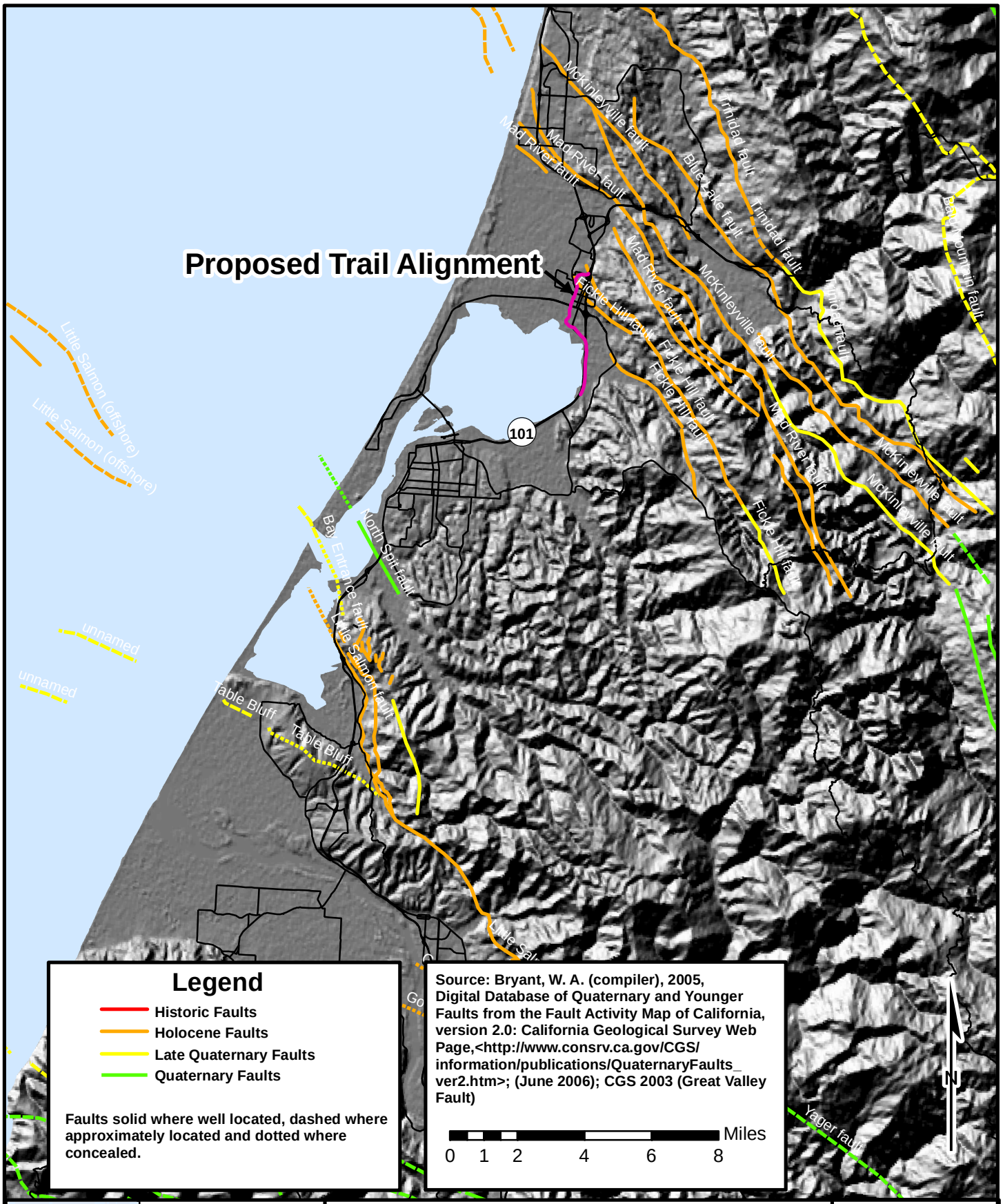
GEOLOGIC MAP

Arcata Rail with Trail Connectivity Project
Arcata, California

File No. 1873.1

July 2010

Figure 3



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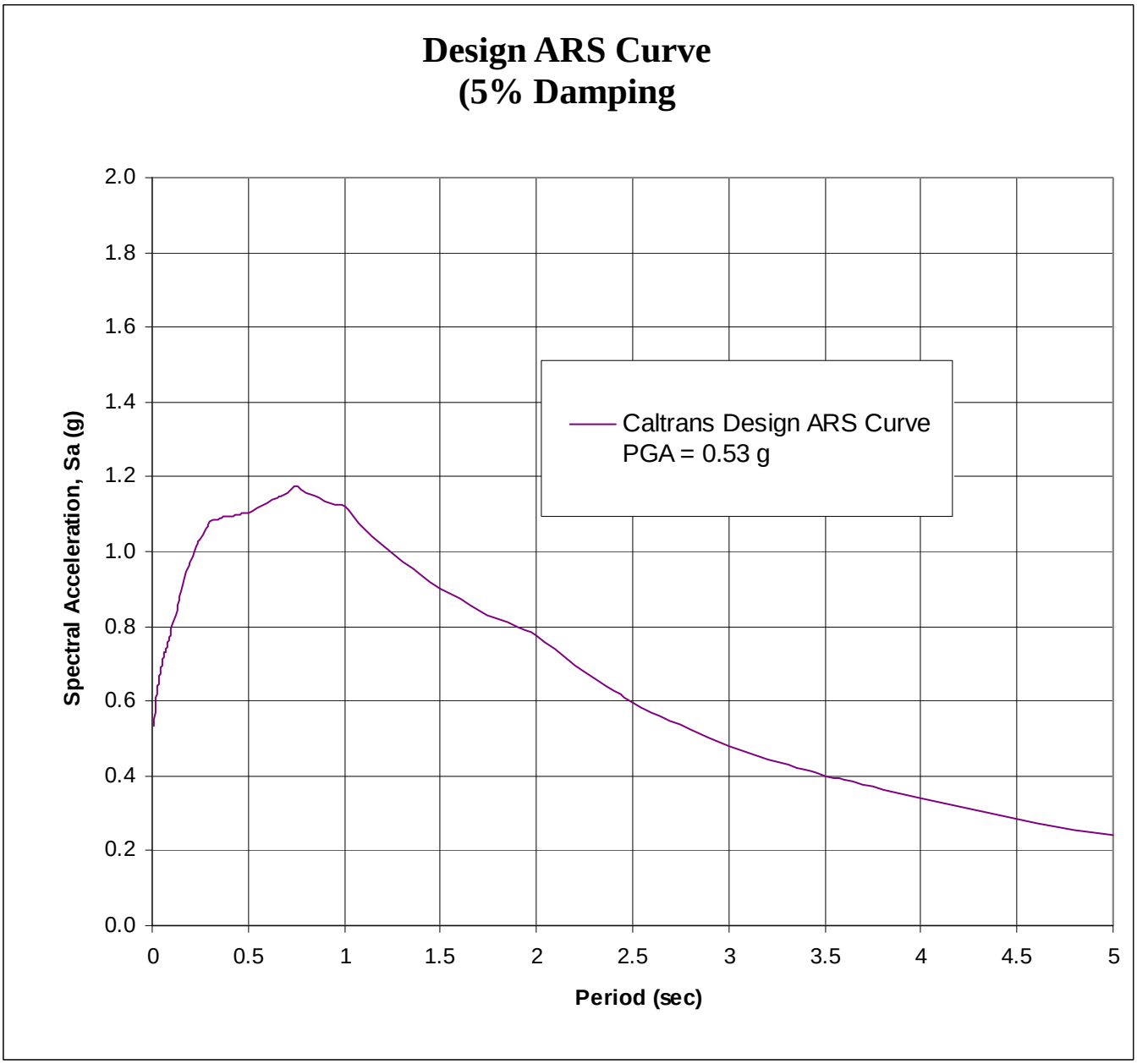
REGIONAL FAULT MAP

Arcata Rail With Trail Connectivity Project
Humboldt County, California

File No. 1873.1

July 2010

Figure 4



Reference: Geotechnical Services Design Manual (Version 1.0, August 2009) and Caltrans Seismic Design Criteria, Appendix B, updated 8/12/09.

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DESIGN ARS CURVE
Arcata Rail with Trail Connectivity Project
Arcata, California

File No. 1873.1

July 2010

Figure 5

Recommended L-Pile Soil Parameters
Arcata Trail Bridges

Jacoby Creek Bridge B-3, B-4 GW@ elev 1.5ft

Service Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
10.5	1.5	1-Soft Clay	0.061343	30	1.74		0.02
1.5	-11	1-Soft Clay	0.025463	30	1.74		0.02
-11	-23	1-Soft Clay	0.043113	35		30	0.01
-23	-37.5	4-Sand	0.039352	40	3.47		
-37.5	-49.75	4-Sand	0.041667	100		36	

Seismic Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
10.5	1.5	1-Soft Clay	0.061343	30	1.74		0.02
1.5	-2.5	1-Soft Clay	0.025463	30	1.74		0.02
-2.5	-8	10-liquefiable Sand	0.038252	30		28	
-8	-11	1-Soft Clay	0.043113	35	3.47		0.01
-11	-13	10-liquefiable Sand	0.039352	75		30	
-13	-20.75	1-Soft Clay	0.033565	50	3.47		0.01
-20.75	-23	10-liquefiable Sand	0.039352	75		30	
-23	-26	2-Stiff Clay	0.033102	500	6		0.01
-26	-28	10-liquefiable Sand	0.039352	75		30	
-28	-30.5	2-Stiff Clay	0.033565	500	6		0.01
-30.5	-49.75	4-Sand	0.041667	120		36	

Figure 6

Recommended L-Pile Soil Parameters
Arcata Trail Bridges

Gannon Slough Bridge B-5 GW@ elev 8ft

Service Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
11	8	1-Soft Clay	0.064988	30	3.47		0.01
8	-26	1-Soft Clay	0.028877	30	3.47		0.01
-26	-39.5	1-Soft Clay	0.023704	50	6.94		0.008
-39.5	-49.75	4-Sand	0.041667	125		38	

Seismic Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
11	8	1-Soft Clay	0.064988	30	3.47		0.01
8	-7.5	1-Soft Clay	0.028877	30	3.47		0.01
-7.5	-12	10-liquefiable Sand	0.039352	70		33	
-12	-38.5	1-Soft Clay	0.023704	50	6.94		0.008
-38.5	-49.75	4-Sand	0.039352	125		38	

Recommended L-Pile Soil Parameters
Arcata Trail Bridges

Butcher Slough Bridge B-6, B-7 GW@ elev -0.8ft

Service Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
12.2	5.2	4-Sand	0.064988	60		30	
5.2	-0.8	1-Soft Clay	0.064988	30	5.21		0.01
-0.8	-5.8	1-Soft Clay	0.028877	30	5.21		0.01
-5.8	-16	4-Sand	0.046516	40		30	
-16	-36	2-Stiff Clay	0.033565	25	10.42		0.007
-36	-41.2	4-Sand	0.039352	125		38	0.005

Seismic Load

top of layer elevation (ft)	bottom of layer elevation (ft)	soil type	effective unit weight (lb/in^3)	k values (lb/in^3)	undrained shear strength (c_u) (psi)	Internal Friction (ϕ)	Strain (ε_{50})
12.2	5.2	4-Sand	0.064988	60		30	
5.2	-0.8	1-Soft Clay	0.064988	30	5.21		0.01
-0.8	-5.8	1-Soft Clay	0.028877	30	5.21		0.01
-5.8	-16	10-liquefiable Sand	0.046516	40		30	
-16	-36	2-Stiff Clay	0.033565	25	10.42		0.007
-36	-41.8	10-liquefiable Sand	0.039352	125		30	0.005
-41.8	-49.2	4-Sand	0.039352	125		38	0.005

highlighted cells are estimated unit weights

unit weights are either moist unit weights above gw or buoyant unit weights below gw

Figure 6

APPENDIX A

Boring Logs

Legend to Logs

Log of Test Borings:

Brainard's Slough Crossing

Old Jacoby Creek Crossing

Jacoby Creek Bridge

Gannon Slough Bridge

Butcher Slough Bridge

Soil Legend

Summary of Hand Probes

LOG OF TEST BORING B1

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/30/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 8.5 ft
WATER DEPTH (ft): 2.5 ft
DATE OF READING: 10/30/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Clay, CL, soft, brown, moist to wet.								
						Fat Clay, CH, soft to medium stiff, blue gray, wet, with organics and strong odor.								
		1	3				69	54						C
5				0.25										
		2	5											
10														
		3	5											
15				0.25			78	43						
				0.5										
		4	5			seams of sandy lean clay								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B1

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/30/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 8.5 ft
WATER DEPTH (ft): 2.5 ft
DATE OF READING: 10/30/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
				0.5		Fat Clay, CH, soft, blue gray, wet, with organics and strong odor.	67	57					0.57	
						Poorly Graded Gravel with Clay and Sand, GP-GC, loose, blue gray, wet.								
		5	12											
25									22					
						Clayey Sand with Gravel, SC, loose, blue gray, wet.								
		6	23											
30						Poorly Graded Gravel with Clay and Sand, GP-GC, medium dense, green gray, wet, weakly cemented.	132	10						
						Sandy Lean Clay, CL, soft to stiff, blue gray, wet, with organics.								
		7	19											
35				1.5		Interbedded clayey sand, SC, medium dense, blue gray, wet, with organics from 33 to 38 feet.	91	31					0.41	
		8	10											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B1

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/30/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 8.5 ft
WATER DEPTH (ft): 2.5 ft
DATE OF READING: 10/30/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
				1.5		Sandy Lean Clay, CL, stiff, blue gray, wet, with organics.								
						Lean Clay, CL, stiff to very stiff, blue to green gray, wet, with organics.								
		9	12											
45				1.75										
				1.25										
		10	19											
50				2.25										
				2.5										
						Poorly Graded Gravel with Clay and Sand, GP, medium dense, mottled brown and green gray, wet, weakly cemented.								
		11	39											
55														
						Total depth 55.5 feet. Groundwater encountered at approximately 2.5 feet. Grout backfilled 10/30/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B2

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 7 ft
WATER DEPTH (ft): 1 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Lean Clay, CL, very soft to soft, brown to blue gray, wet, with organics, interbedded with Clayey Sand, SC, very loose, blue gray, wet, with organics. ▽							
5		1	4	0.5										
10		2	25			Poorly Graded Gravel with Sand, GP, medium dense, blue gray, wet.	116	19					0.2	
						Poorly Graded Sand with Gravel, SP, medium dense, blue gray, wet.								
15		3	38			Poorly Graded Gravel with Sand, GP, dense, blue gray, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B2

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 7 ft
WATER DEPTH (ft): 1 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	58			Poorly Graded Gravel with Sand, GP, dense, blue gray, wet.	128	12						
						Poorly Graded Gravel with Sand, GP, dense, blue gray, wet interbedded with Poorly Graded Sand, SP, dense, blue gray, wet.								
25		5	67											
						Poorly Graded Gravel with Sand, GP, dense, blue gray, wet, weakly cemented.								
						Poorly Graded Sand, SP, medium dense, blue gray, wet.								
30		6	15											
						Sandy Clay, CL, very stiff, blue gray, wet, with organics, interbedded with Clayey Sand, SC, medium dense, blue gray, wet, with organics.								
35		7	22											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B2

FILE NO.: 1873.1
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DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 7 ft
WATER DEPTH (ft): 1 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	25			Sandy Clay, CL, very stiff, blue gray, wet, with organics, interbedded with Clayey Sand, SC, medium dense, blue gray, wet, with organics.								
						Total depth 41.5 feet. Groundwater encountered at approximately 1.0 feet. Grout backfilled 10/29/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B3

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 9.5 ft
WATER DEPTH (ft): 6 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						DESCRIPTION	LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Fat Clay, CH, soft, blue gray, wet, with organics, fill.								
						Sandy Fat Clay, CH, soft, blue gray, wet, with organics, interbedded with clayey sand, SC, very loose, blue gray, wet, with organics.								
5						▽								
10		1	4	0.5										
15						Sandy Lean Clay, CL, very soft, blue gray, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B3

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 9.5 ft
WATER DEPTH (ft): 6 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		2	9			Sandy Lean Clay, CL, stiff, blue gray, wet, with organics.								
						Clayey Sand, SC, loose, blue gray, wet, with organics.	118	17					0.18	
						Lean Clay, CL, stiff, blue gray, wet.								
25														
30		3	21											CR
				1.25		Sandy Lean Clay, CL, stiff, blue gray, wet.			55					
						Sandy Lean Clay, CL, stiff, blue gray, wet, with organics.								
35		4	14			Clayey Sand, SC, loose, blue gray, wet, with organics.	96	25						
				1		Lean Clay, CL, medium stiff to very stiff, blue gray, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B3

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 9.5 ft
WATER DEPTH (ft): 6 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		5	19	1.5		Lean Clay, CL, stiff, blue gray, wet, with organics.								
				2.5		Clayey Sand, SC, medium dense, blue gray, wet, interbedded with Sandy Clay, CL, stiff, blue gray, wet.								
45		6	19											
						Poorly Graded Sand with Clay, SP, medium dense, blue gray, wet.								
						Poorly Graded Sand, SP, medium dense, blue gray, wet.								
50		7	38											
						Clayey Gravel, GC, medium dense, blue gray, wet, un-cemented to moderately cemented.								
55		8	14											
				1.5		Lean Clay, CL, stiff, gray green, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B3

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 9.5 ft
WATER DEPTH (ft): 6 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		9	46			Lean Clay, CL, stiff, gray green, wet, with organics.								
						Clayey Gravel, GC, dense, gray green, wet, weakly to moderately cemented.								
						Total depth 61.5 feet. Groundwater encountered at approximately 6.0 feet. Grout backfilled 10/28/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B4

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 10.5 ft
WATER DEPTH (ft): 9 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Poorly Graded Gravel, GP, loose, gray, dry, fill.								
						Fat Clay, CH, soft, blue gray, moist to wet, with organics.								
5		1	6	0.5										
10		2	5	0.5 0.25					87	27				
						Silty Sand, SM, loose, blue gray, wet, with organics.								
15		3	4	0.25			108	19	42					C
						Sandy Fat Clay, CH, soft, blue gray, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B4

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 10.5 ft
WATER DEPTH (ft): 9 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	25			Sandy Fat Clay, CH, soft to stiff, blue gray, wet, with organics.								
							115	19					0.35	
						Silty Sand, SM, medium dense, blue gray, wet, with organics.								
						Fat Clay, CH, soft to medium stiff, blue gray, wet, with organics.								
25		5	11	0.5										
30		6	15	1.25		Clayey Sand, SC, medium dense, blue gray, wet.								
						Fat Clay, CH, stiff, blue gray, wet, with organics.								
35		7	25	1.5			92	30	92					
						Poorly Graded Sand, SP, medium dense, medium gray, wet.								
						Fat Clay, CH, stiff, blue gray, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B4

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 10.5 ft
WATER DEPTH (ft): 9 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	17	1.25		Fat Clay, CH, stiff, blue gray, wet, with organics.								
						Clayey Sand, SC, medium dense, blue gray, wet, weakly cemented.								
						Lean Clay, CL, very stiff, blue gray, wet, with organics.								
45		9	16	2										
				2.25		Clayey Sand with Gravel, SC, medium dense, blue gray, wet, with interbedded layers of Sandy Clay, CL, very stiff, blue gray, wet, and Clayey Gravel, GC, medium dense, blue gray, wet.								
50		10	31											
						Clayey Gravel, GC, dense, gray green, wet.								
55		11	48											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

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LOG OF TEST BORING B4

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/28/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 10.5 ft
WATER DEPTH (ft): 9 ft
DATE OF READING: 10/28/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
	⋈	12	50/3"			Clayey Gravel, GC, dense, gray green, wet.								
						Total depth 60.25 feet. Groundwater encountered at approximately 9 feet. Grout backfilled 10/29/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B5

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11 ft
WATER DEPTH (ft): 3 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD						LABORATORY								
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Fat Clay, CH, soft, brown, moist, fill.								
						Fat Clay, CH, soft to medium stiff, blue gray, wet, with organics. ▽								
		1	4											
5				0.5										
				0.75										
		2	5			scattered seams of Sandy Clay.								C
10				0.5										
		3	6											CR
				0.75										
15				1.0			82	37						
						Sandy Lean Clay, CL, soft, blue gray, wet.								
						Poorly Graded Sand with Silt, SP, medium dense, blue gray, wet.								
		4	25						5					

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B5

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11 ft
WATER DEPTH (ft): 3 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Poorly Graded Sand with Gravel, SP, medium dense, blue gray, wet.								
						Fat Clay, CH, soft to stiff, blue gray, wet, with organics.								
		5	6											
25														
		6	6											
30				0.75			68	52						
		7	11											
							64	58					0.53	
35														
		8	14											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B5

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11 ft
WATER DEPTH (ft): 3 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
				1.25 1.5		Fat Clay, CH, soft to stiff, blue gray, wet, with organics.								
		9	14											
45														
		10	36			Poorly Graded Gravel with Clay, medium dense, mottled orange brown and green gray, wet, weakly to moderately cemented.								
50														
						Clayey Gravel with Sand, GC, medium dense to very dense, mottled brown and olive brown, wet, weakly to moderately cemented.								
		11	42											
55														
		12	85/9"											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B5

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/29/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11 ft
WATER DEPTH (ft): 3 ft
DATE OF READING: 10/29/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Total depth 60.25 feet. Groundwater encountered at approximately 3 feet. Grout backfilled 10/29/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B6

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 12.2 ft
WATER DEPTH (ft): 13 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Fat Clay, CH, soft to stiff, olive gray, moist, fill.								
						Poorly Graded Gravel, loose, light gray, dry, trench backfill.								
5														
						Sandy Fat Clay, CH, medium stiff, blue gray, moist.								
10		1	7											
						Fat Clay, CH, medium stiff, blue gray, wet.								
15														
						Well Graded Sand, SW, loose, medium gray, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B6

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 12.2 ft
WATER DEPTH (ft): 13 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		2	7			Poorly Graded Sand, SP, loose, medium gray, wet.	108	20						
25														
						Fat Clay, CH, medium stiff to very stiff, blue gray, wet, with organics.								
30		3	10	1.0			72	49					0.71	
35														

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B6

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 12.2 ft
WATER DEPTH (ft): 13 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	21	1.75		Fat Clay, CH, stiff, blue gray, wet, with organics.								CR
				2.25										
45		5	16	1.5			91	32					1.26	
				1.75		Poorly Graded Sand, SP, medium dense to very dense, medium gray, wet.								
50		6	14											
55		7	87											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B6

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 12.2 ft
WATER DEPTH (ft): 13 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	96/11"			Poorly Graded Gravel, GP, very dense, blue gray, wet, weakly to moderately cemented.								
						Total depth 61.4 feet. Groundwater encountered at approximately 13 feet. Grout backfilled 10/27/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B7

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.2 ft
WATER DEPTH (ft): 11 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Fat Clay, CH, stiff, blue gray, moist.								
5		1	22	1										
10		2	5			▽			79					
				0.75		Lean Clay with Sand, CL, medium stiff, blue gray, wet, with organics.								C
15		3	11											
						Well Graded Sand with Silt, SW, medium dense, blue gray, wet, interbedded with clayey sand, SC, medium dense, blue gray, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B7

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.2 ft
WATER DEPTH (ft): 11 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	16			Well Graded Sand with Silt, SW, medium dense, blue gray, wet, interbedded with clayey sand, SC, medium dense, blue gray, wet.	121	18						
25		5	44											
						Fat Clay, CH, medium stiff, blue gray, wet, with organics.								
30		6	10	1.0			75	48					0.66	
				1.0										
35		7	6	1.0		Sandy Fat Clay, CH, very stiff, blue gray, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B7

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.2 ft
WATER DEPTH (ft): 11 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	17	3.0										
						Poorly Graded Sand, SP, very dense, blue gray, wet.								
45		9	50/11"											
						Poorly Graded Sand, SP, loose, blue gray, wet.								
50		10	4											
						Poorly Graded Sand, SP, very dense, blue gray, wet, with interbedded seams of Silty Sands, SM, very dense, blue gray, wet, weakly cemented.								
55		11	50/5"											

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B7

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/27/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.2 ft
WATER DEPTH (ft): 11 ft
DATE OF READING: 10/27/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		12	59			Poorly Graded Sand, SP, very dense, blue gray, wet, with interbedded seams of Silty Sands, SM, very dense, blue gray, wet, weakly cemented.								
65		13	23			Clayey Sand, SC, medium dense, blue gray, wet.								
						Total depth 66.5 feet. Groundwater encountered at approximately 11 feet. Grout backfilled 10/27/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B8

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/26/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.6 ft
WATER DEPTH (ft): 8 ft
DATE OF READING: 10/26/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Fat Clay, CH, very stiff to hard, olive gray, moist, fill.								
						Fat Clay, CH, very stiff to hard, olive gray, moist.								
5		1	21	4.0 2.75 4.5		▽								
						Clayey Sand, SC, very loose, blue gray, wet, with organics.								
10		2	7	0.75			100	26					0.44	
15		3	4											
						Clayey Sand, SC, stiff, blue gray, wet, with organics.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B8

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/26/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.6 ft
WATER DEPTH (ft): 8 ft
DATE OF READING: 10/26/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	24	1.5		Clayey Sand, SC, stiff, blue gray, wet, with organics.			45					
						Well Graded Sand with Silt, SW, dense, blue gray, wet.								
25		5	45				121	14						
						Silty Sand, SM, loose, blue gray, wet.								
30		6	7											
				0.5		Lean Clay, CL, soft to medium stiff, blue gray, wet.								
35		7	16											
				0.75			63	63					0.64	

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B8

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/26/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.6 ft
WATER DEPTH (ft): 8 ft
DATE OF READING: 10/26/2009
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	15	0.75										
				1.0										
45		9	50/5"			Poorly Graded Gravel with Silt, GP, very dense, green gray, wet.								
						Well Graded Sand, SW, dense to very dense, blue gray, wet.								
50		10	50/4"											
55		11	44			Poorly Graded Sand, SP, medium dense, blue gray, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B8

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 10/26/09
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 11.6 ft
WATER DEPTH (ft): 8 ft
DATE OF READING: 10/26/2009
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		12	34											
						Total depth 61.5 feet. Groundwater encountered at approximately 8 feet. Grout backfilled 10/26/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B9

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 24.4 ft
WATER DEPTH (ft): 4 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Lean Clay, CL, with interbedded Silty Sand, SM, soft/loose, gray brown to olive gray, moist to wet, fill.								
5		1	4				82	33						
						Wood fragments with minor Sandy Lean Clay and Clayey Sand, soft/loose, dark brown to blue gray, wet, fill.								
10		2	12											
						Lean Clay, CL, medium stiff to stiff, blue gray, wet.								
15		3	7	0.75 1.25			108	20		11				CR
						Lean Clay, CL, very stiff to hard, orange brown mottled light gray, moist, weakly cemented.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B9

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 24.4 ft
WATER DEPTH (ft): 4 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	31	4.0		Lean Clay, CL, very stiff to hard, orange brown mottled light gray, moist, weakly cemented.	99	26						
25		5	16	2.0 2.75			97	27					2.43	
30		6	17	3.0			96	28						
35		7	21	3.5 3.75										

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING B9

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 24.4 ft
WATER DEPTH (ft): 4 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		8	22	2.5		Lean Clay, CL, very stiff to hard, orange brown mottled light gray, moist, weakly cemented.	107	22						
						Clayey Sand, SC, medium dense, blue gray, moist.								
45		9	35				103	25						
						Total depth 46.5 feet. Groundwater encountered at approximately 4.0 feet. Grout backfilled 10/29/2009.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

LOG OF TEST BORING B10

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 54 ft
WATER DEPTH (ft): 9.8 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
						Sandy Silt, ML, soft, reddish black, moist.								
						Sandy Lean Clay, CL, very stiff to hard, orange brown mottled light gray, moist.								
		Bag A												CR
5		1	16						73					
				3.5										
				4.0										
						Clayey Sand, SC, medium dense, orange brown mottled light gray, wet.								
10		2	16				104	21	50					
							97	25					0.46	
						Silty Sand, SM, medium dense, orange brown, wet.								
15		3	22				110	22						
						Silty Gravel, GM, medium dense, orange brown, wet.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

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LOG OF TEST BORING B10

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: 8" HSA
HAMMER TYPE: automatic
LOGGED: RCP CHECKED: RDS

ELEVATION: 54 ft
WATER DEPTH (ft): 9.8 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD							LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
		4	49			Silty Gravel, GM, medium dense, orange brown, wet.	124	14						
						Silty Sand, SM, medium dense, blue gray, wet.								
25		5	32				107	21					2.65	
						Sandy Lean Clay, CL, very stiff, blue gray, wet.								
30		6	13	2.75										
						Total depth 31.5 feet. Groundwater encountered at approximately 9.8 feet. Grout backfilled 4/27/2010.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

Blackburn Consulting

LOG OF TEST BORING HA1

FILE NO.: 1873.1
PROJECT: Arcata Trail Project
LOCATION: Arcata, California
CLIENT: Winzler and Kelly

DRILLING DATE: 4/27/10
DRILLING METHOD: Hand Auger
HAMMER TYPE:
LOGGED: RCP CHECKED: RDS

ELEVATION: 49 ft
WATER DEPTH (ft): 2.5 ft
DATE OF READING: 4/27/2010
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	DIRECT SHEAR C (PSF)	DIRECT SHEAR ϕ ANGLE	UNCONFINED COMPRESSIVE STRENGTH (psi)	ADDITIONAL TESTS
0						Sandy Silt, ML, soft, dark reddish brown, moist.								
1														
2														
						▽								
3						Sandy Clay, CL, stiff, orange brown, moist to wet.								
4														
5														
6						Clayey Sand, SC, medium dense, orange brown, wet								
7						Clayey Gravel, GC, medium dense, orange brown, wet.								
						Total depth 7.5 feet. Groundwater encountered at approximately 2.5 feet. Backfilled 4/27/2010.								

NEW LOG OF BORING FORM 1873LOGS.GPJ BLACKBRN.GDT 6/17/10

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UNIFIED SOIL CLASSIFICATION (ASTM D 2487-06)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GRAPHIC SYMBOL	GROUP SYMBOL	SOIL GROUP NAMES
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS <5% FINES	Cu ≥ 4 AND 1 ≤ Cc ≤ 3		GW	WELL-GRADED GRAVEL
			Cu < 4 AND/OR 1 > Cc > 3		GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH		GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH		GC	CLAYEY GRAVEL
	SANDS <50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN SANDS <5% FINES	Cu ≥ 6 AND 1 ≤ Cc ≤ 3		SW	WELL-GRADED SAND
			Cu < 6 AND/OR 1 > Cc > 3		SP	POORLY-GRADED SAND
		SANDS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH		SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH		SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50	INORGANIC	PI>7 AND PLOTS ON OR ABOVE "A" LINE		CL	LEAN CLAY
			PI>4 AND PLOTS BELOW "A" LINE		ML	SILT
		ORGANIC	LL (oven dried)<0.75/LL (not dried)		OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT >50	INORGANIC	PI PLOTS ON OR ABOVE "A" LINE		CH	FAT CLAY
			PI PLOTS BELOW "A" LINE		MH	ELASTIC SILT
		ORGANIC	LL (oven dried)<0.75/LL (not dried)		OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK COLOR, ORGANIC ODOR			PT	PEAT

NOTE: $Cu = D_{60}/D_{10}$

$Cc = (D_{30})^2 / D_{10} \times D_{60}$

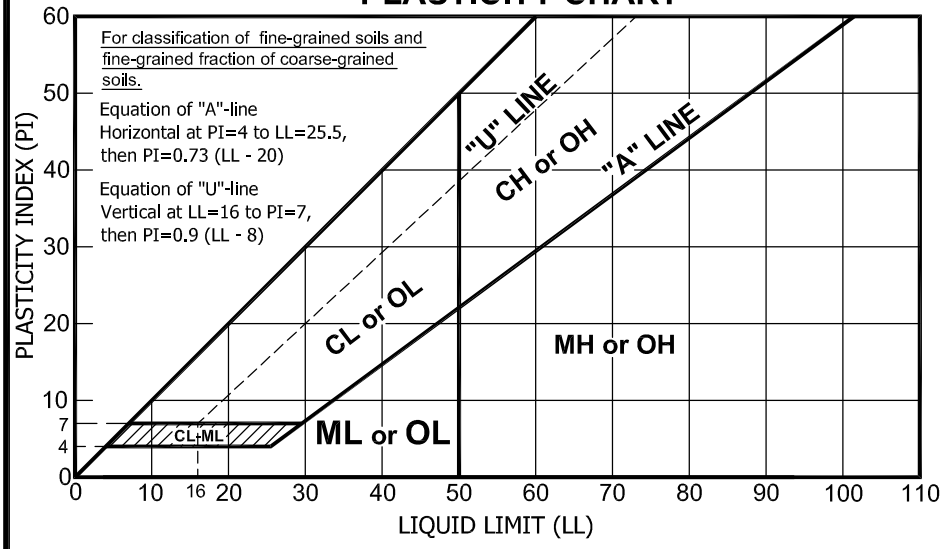
BLOW COUNT

The number of blows of a 140-lb. hammer falling 30-inches required to drive the sampler the last 12-inches of an 18-inch drive. The notation 50/4 indicates 4-inches of penetration achieved in 50 blows.

SAMPLE TYPES

- Auger or backhoe cuttings
- Modified California
- Shelby tube
- Rock core
- Standard Penetration (SPT)

PLASTICITY CHART



ADDITIONAL TESTS

- C - Consolidation
- CP - Compaction Curve
- CR - Corrosivity Testing
- CU - Consolidated Undrained Triaxial
- DS - Direct Shear
- EI - Expansion Index
- P - Permeability
- PA - Partical Size Analysis
- PI - Plasticity Index
- PP - Pocket Penetrometer
- R - R-Value
- SE - Sand Equivalent
- SG - Specific Gravity
- SL - Shrinkage Limit
- SW - Swell Potential
- TV - Pocket Torvane Shear Test
- UC - Unconfined Compression
- UU - Unconsolidated Undrained Triaxial

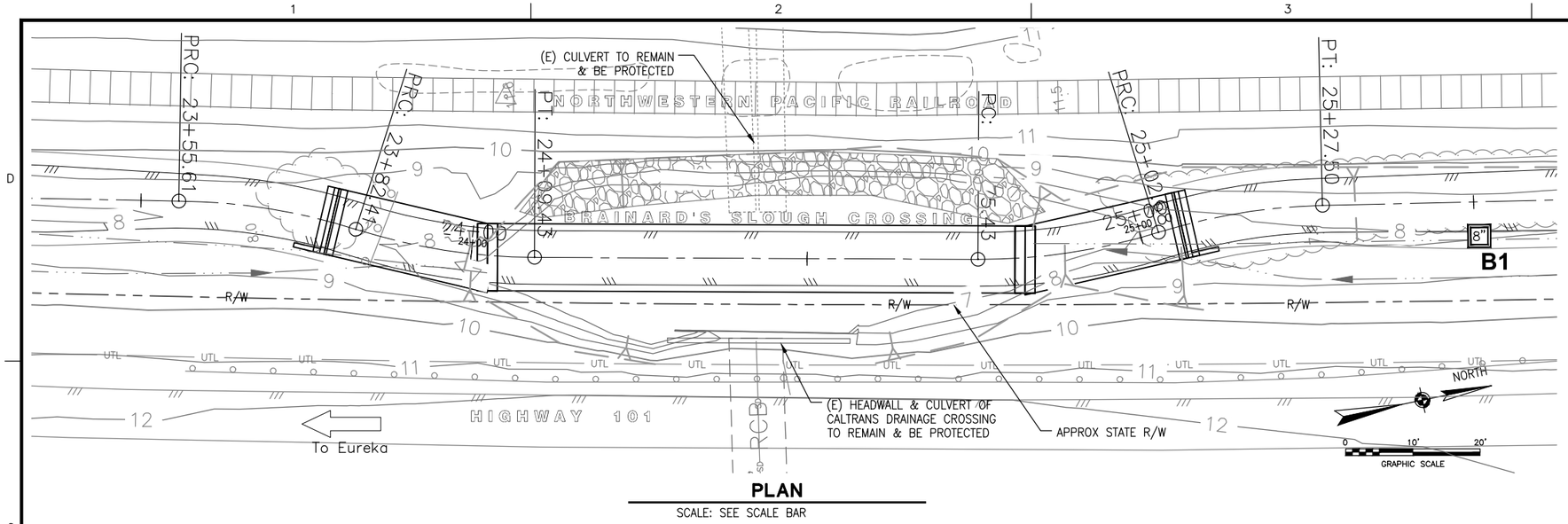
GROUND WATER LEVELS

- Later water level after drilling
- Water level at time of drilling

blackburn consulting

11521 Blocker Drive, Ste 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

BORING LOG / TEST PIT LEGEND AND SOIL DESCRIPTIONS



PLAN

SCALE: SEE SCALE BAR

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

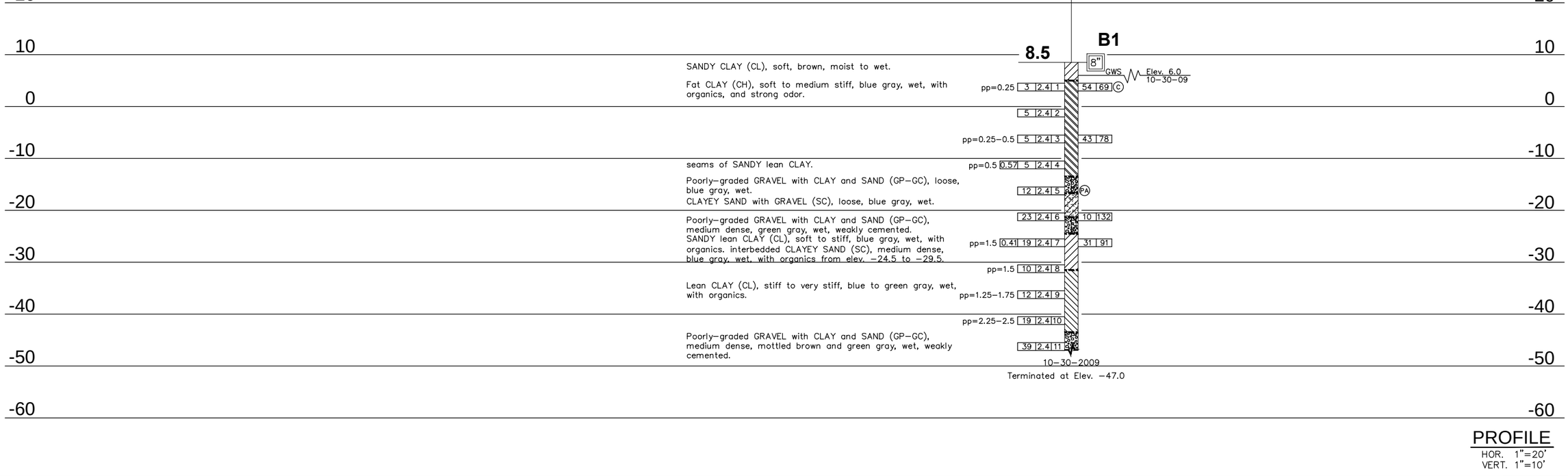
REGISTERED PROFESSIONAL ENGINEER — RICHARD D. SOWERS — No. C38788 — Exp. 03/31/11 — CIVIL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

BLACKBURN CONSULTING
11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521

NOTES:
1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586–99 using a hammer operated with an automated drop system. Drill rods were 1 5/8–inch diameter "A"–rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by Winzler & Kelly, dated 5/10/10.
10. Boring elevations are approximate and based on topography provided by Winzler & Kelly 2009.



PROFILE

HOR. 1"=20'
VERT. 1"=10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	PREPARED FOR THE		BRIDGE NO.	BRAINARD'S SLOUGH CROSSING
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	FIELD INVESTIGATION BY:	CITY OF ARCATA	PROJECT ENGINEER	POST MILE	LOG OF TEST BORINGS 1 of 6
NAME:	CHECKED BY: R. Pickard	R. Pickard	DEPARTMENT OF PUBLIC WORKS			

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

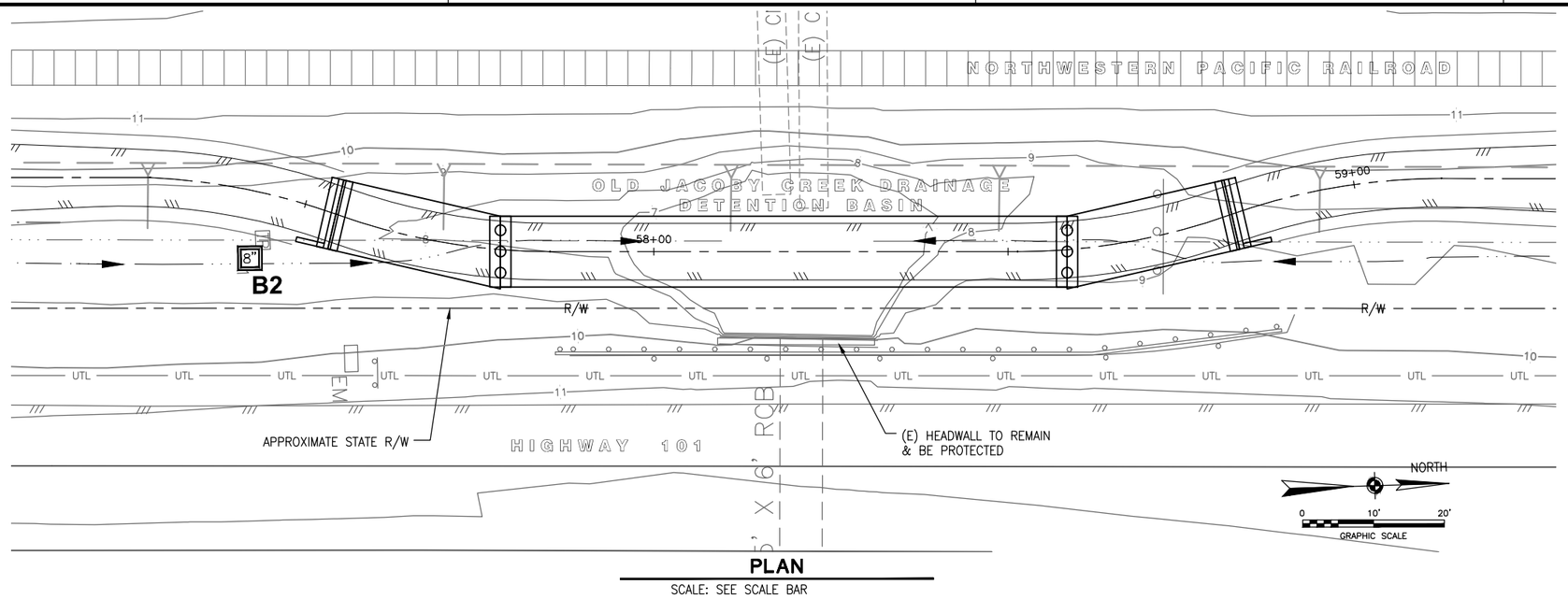
CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES					SHEET	OF

6/10/2010 12:56 PM

Y:\Projects\1873.1 Arcata Trail Project\CAD Drawings



PLAN

SCALE: SEE SCALE BAR

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
RICHARD D. SOWERS
No. C38788
Exp. 03/31/11
CIVIL
STATE OF CALIFORNIA

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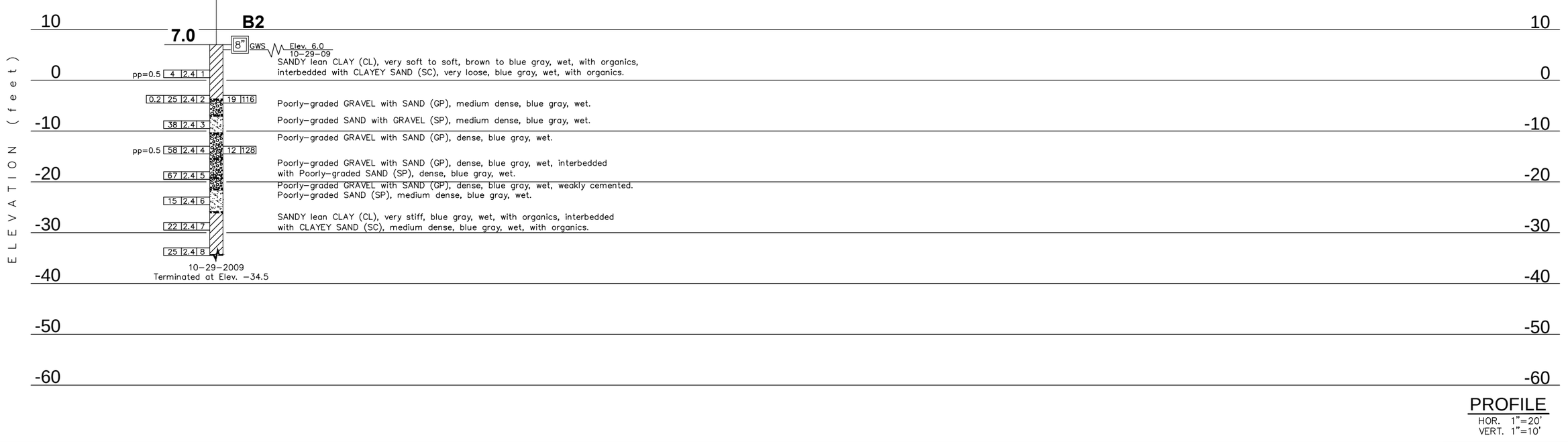
BLACKBURN CONSULTING
11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521

NOTES:
1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586–99 using a hammer operated with an automated drop system. Drill rods were 1 5/8–inch diameter "A"–rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by Winzler & Kelly, dated 5/10/10.
10. Boring elevations are approximate and based on topography provided by Winzler & Kelly 2009.



PROFILE
HOR. 1"=20'
VERT. 1"=10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	PREPARED FOR THE CITY OF ARCATA DEPARTMENT OF PUBLIC WORKS		BRIDGE NO.	OLD JACOBY CREEK CROSSING
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	FIELD INVESTIGATION BY: R. Pickard		PROJECT ENGINEER	POST MILE	**LOG OF TEST BORINGS 2 of 6**
NAME:	CHECKED BY: R. Pickard					

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES					SHEET	OF

6/10/2010 12:05 PM

Y:\Projects\1873.1 Arcata Trail Project\CAD Drawings

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

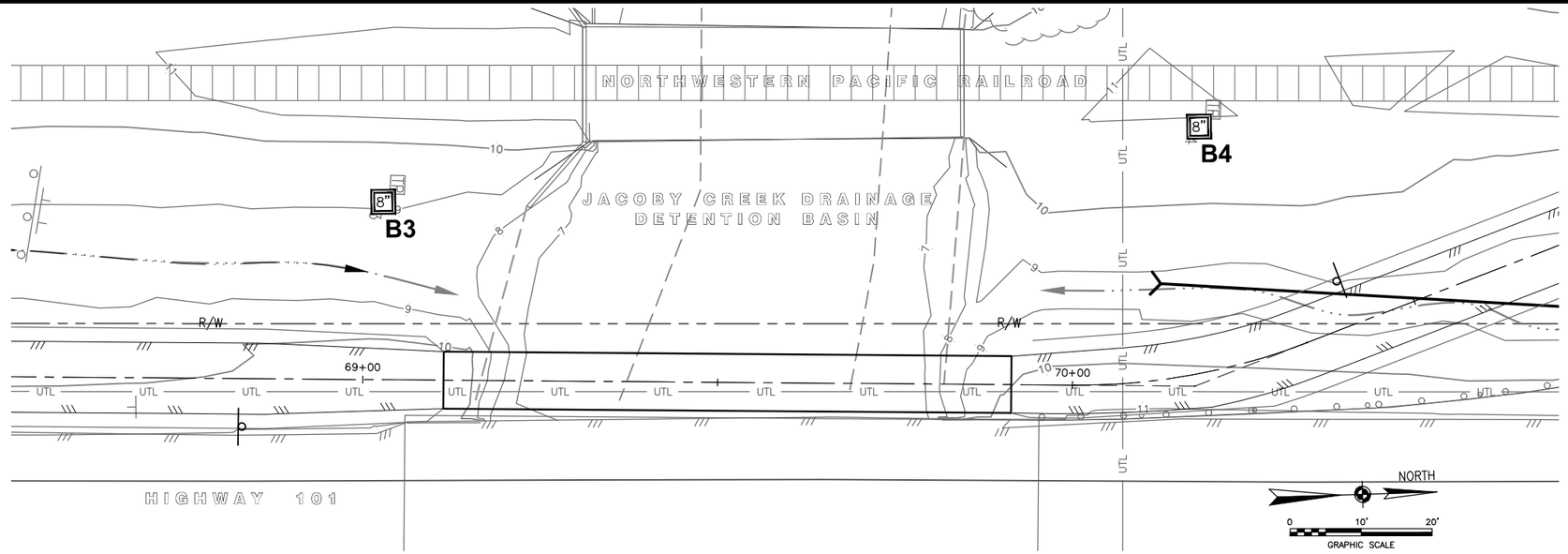
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER
RICHARD D. SOWERS
No. C38788
Exp. 03/31/11
CIVIL
STATE OF CALIFORNIA

BLACKBURN CONSULTING
11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521



PLAN

SCALE: SEE SCALE BAR

NOTES:
1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586–99 using a hammer operated with an automated drop system. Drill rods were 1 5/8–inch diameter "A"–rods; sampler was driven with brass liners.
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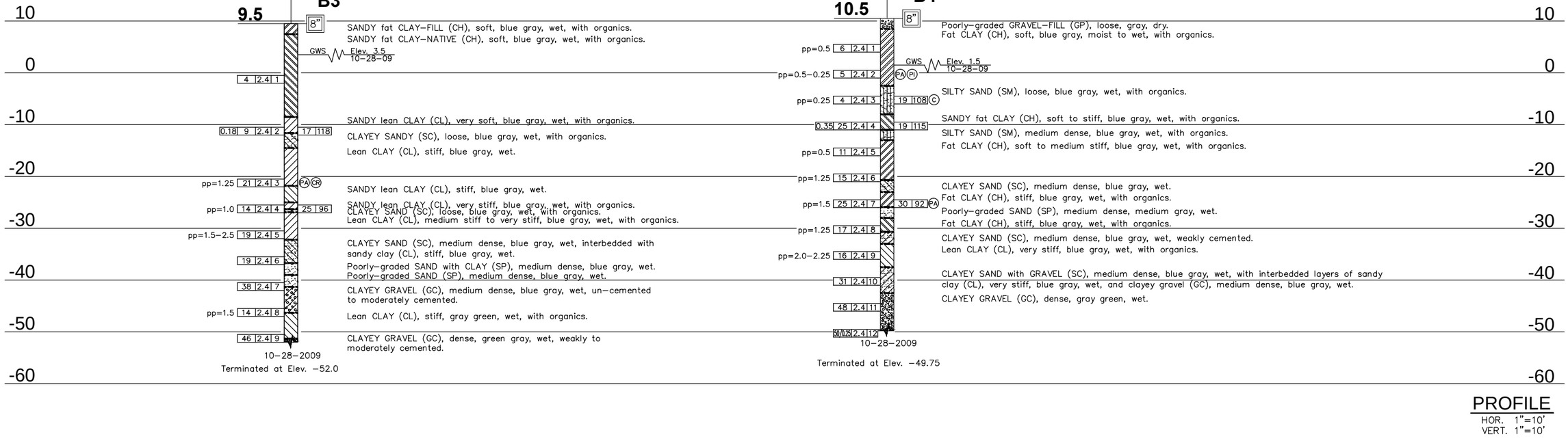
9. Electronic media for plan view provided by Winzler & Kelly, dated 5/10/10.
10. Boring elevations are approximate and based on topography provided by Winzler & Kelly 2009.



PROFILE

HOR. 1"=10'
VERT. 1"=10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	PREPARED FOR THE		BRIDGE NO.	JACOBY CREEK BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	FIELD INVESTIGATION BY:	CITY OF ARCATA	PROJECT ENGINEER	POST MILE	LOG OF TEST BORINGS 3 of 6
NAME:	CHECKED BY: R. Pickard	R. Pickard	DEPARTMENT OF PUBLIC WORKS			

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES					SHEET	OF

6/10/2010 12:06 PM

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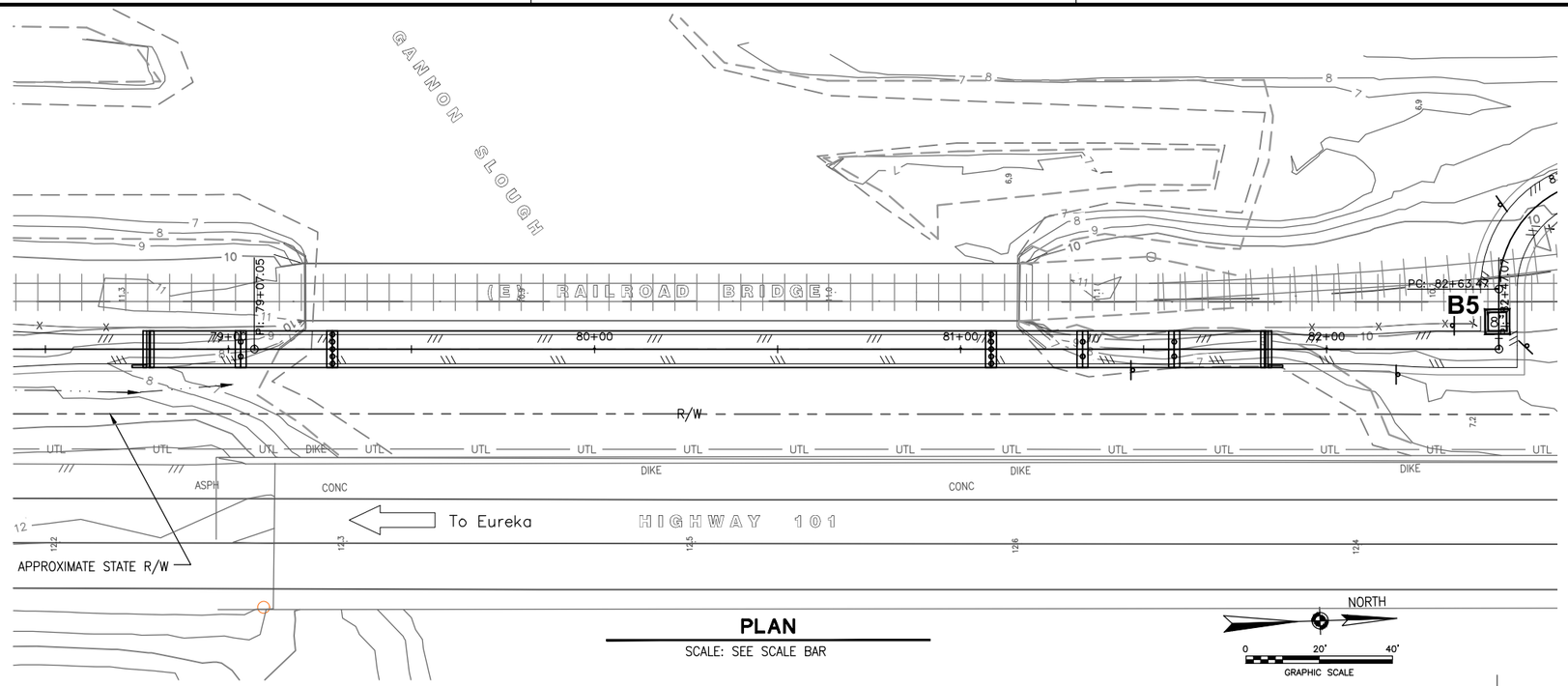

PLAN

SCALE: SEE SCALE BAR

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
RICHARD D. SOWERS
No. C38788
Exp. 03/31/11
CIVIL
STATE OF CALIFORNIA

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BLACKBURN CONSULTING
11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521

NOTES:
1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4, "Soil Legend".
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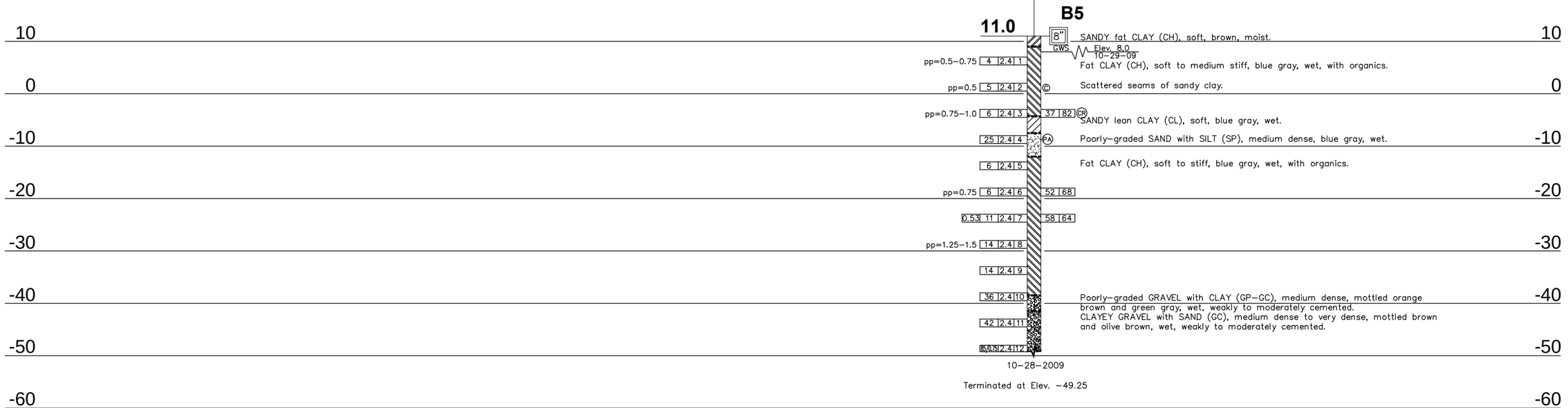

PROFILE
HOR. 1"=20'
VERT. 1"=10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	PREPARED FOR THE		BRIDGE NO.	GANNON SLOUGH BRIDGE
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	FIELD INVESTIGATION BY:	CITY OF ARCATA	PROJECT ENGINEER	POST MILE	LOG OF TEST BORINGS 4 of 6
NAME:	CHECKED BY: R. Pickard	R. Pickard	DEPARTMENT OF PUBLIC WORKS			

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES					SHEET	OF

6/10/2010 12:17 PM

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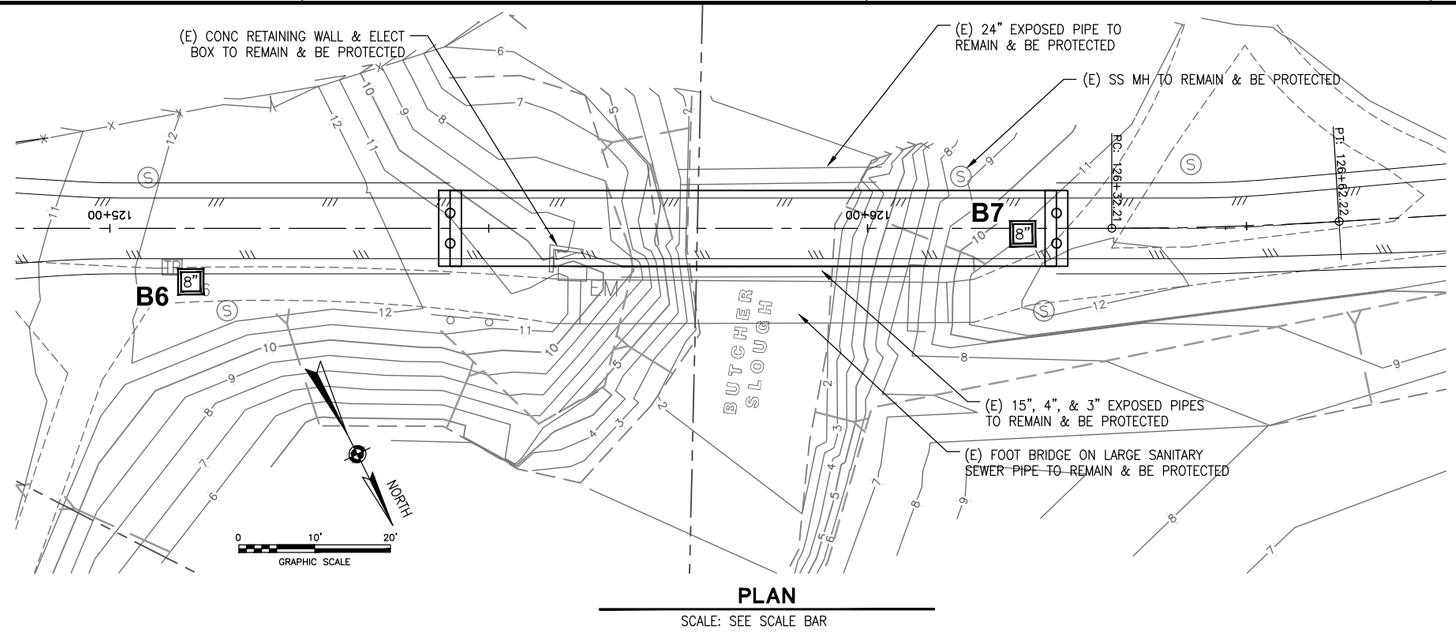

PLAN

SCALE: SEE SCALE BAR

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — RICHARD D. SOWERS — No. C38788 — Exp. 03/31/11 — CIVIL — STATE OF CALIFORNIA

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BLACKBURN CONSULTING
11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521

NOTES:
1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4, "Soil Legend".
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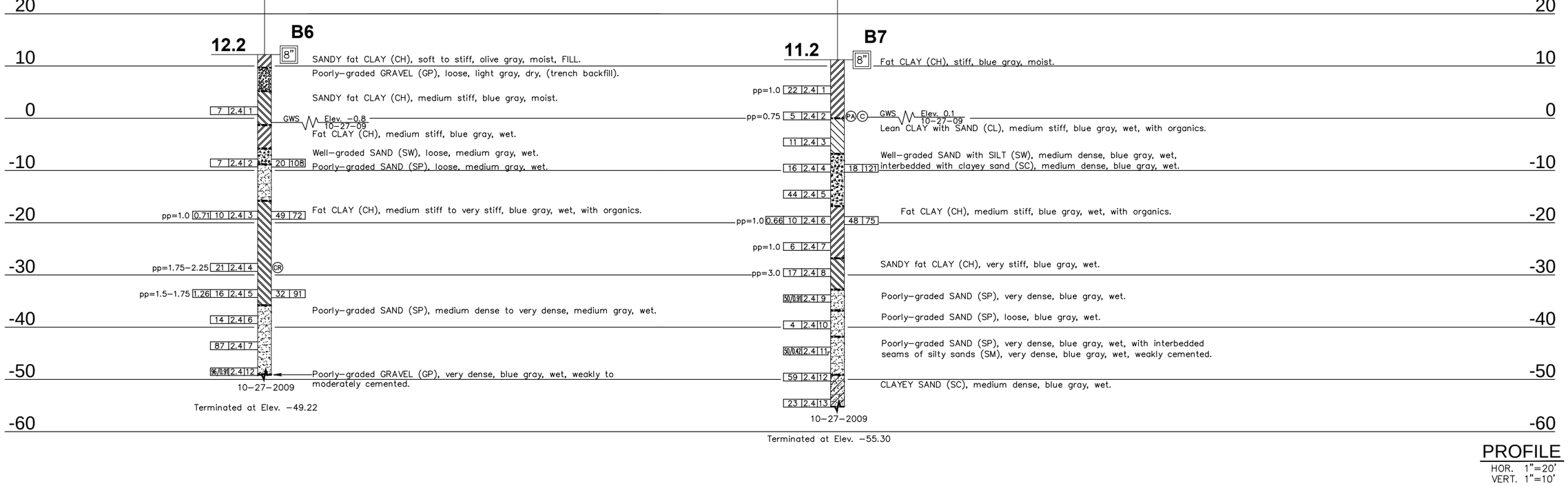

PROFILE

HOR. 1"=20'
VERT. 1"=10'

ENGINEERING SERVICES		GEOTECHNICAL SERVICES	PREPARED FOR THE
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	FIELD INVESTIGATION BY:	**CITY OF ARCATA**
NAME:	CHECKED BY: R. Pickard	R. Pickard	**DEPARTMENT OF PUBLIC WORKS**

PROJECT ENGINEER

BRIDGE NO.

POST MILE

BUTCHER SLOUGH BRIDGE

LOG OF TEST BORINGS 5 of 6

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES					SHEET	OF

6/10/2010 12:20 PM

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean Clay ORGANIC lean Clay with SAND ORGANIC lean Clay with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL		
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435-04)
- (CL) Collapse Potential (ASTM D 5333-03)
- (CP) Compaction Curve (CTM 216-06)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767-04)
- (DS) Direct Shear (ASTM D 3080-04)
- (EI) Expansion Index (ASTM D 4829-03)
- (M) Moisture Content (ASTM D 2216-05)
- (OC) Organic Content-% (ASTM D 2974-07)
- (P) Permeability (CTM 220-05)
- (PA) Particle Size Analysis (ASTM D 422-63) (2002)
- (PI) Plasticity Index (AASHTO T 90-00) Liquid Limit (AASHTO T 89-02)
- (PL) Point Load Index (ASTM D 5731-05)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301-00)
- (SE) Sand Equivalent (CTM 217-99)
- (SG) Specific Gravity (AASHTO T 100-06)
- (SL) Shrinkage Limit (ASTM D 427-04)
- (SW) Swell Potential (ASTM D 4546-03)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166-06) Unconfined Compression-Rock (ASTM D 2938-95) (2002)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850-03)
- (UW) Unit Weight (ASTM D 2937-04)
- (VS) Vane Shear (AASHTO T 223-96) (2004)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}-Value (Blows / 12 in.)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		>12 in.
Cobble		3 to 12 in.
Gravel	Coarse	3/4 to 3 in.
	Fine	No. 4 to 3/4 in.
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER RICHARD D. SOWERS No. C38788 Exp. 03/31/11 CIVIL STATE OF CALIFORNIA

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11521 BLOCKER DR., SUITE 110
AUBURN, CA 95603
File No. 1873.1

WINZLER & KELLY
633 3RD STREET
EUREKA, CA 95521

CONSISTENCY OF COHESIVE SOILS

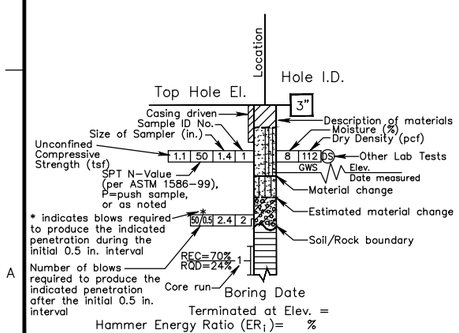
Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

PLASTICITY OF FINE-GRAINED SOILS

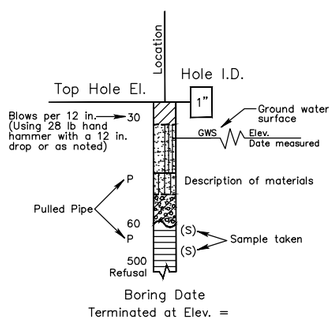
Description	Criteria
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

BOREHOLE IDENTIFICATION

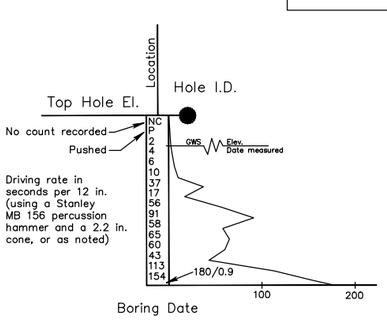
Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
□	O	Other



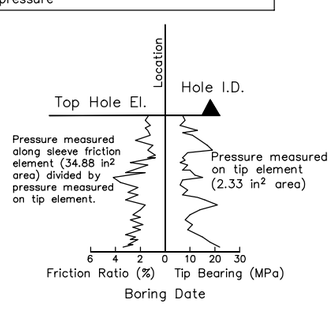
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		PREPARED FOR THE CITY OF ARCATA DEPARTMENT OF PUBLIC WORKS		BRIDGE NO.	SOIL LEGEND
FUNCTIONAL SUPERVISOR	DRAWN BY: M. Robertson	PREPARED BY	M. Robertson	FIELD INVESTIGATION BY:	PROJECT ENGINEER	POST MILE	ALL BRIDGES
NAME:	CHECKED BY: R. Pickard	CHECKED BY	R. Pickard	R. Pickard			LOG OF TEST BORINGS 6 of 6

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES						SHEET	OF

6/10/2010 12:22 PM

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Summary of Hand Probes

Probe Number	Station and Offset (ft)	Push to Depth (ft)	Total Probe Depth (ft)
P1	162+33 11L	0.5	0.5
P2	162+33 11L	1.7	11.4
P3	161+82 12L	1.5	6.3
P4	161+22 10L	1.7	8.6
P5	160+84 13L	1.2	2.2
P6	160+20	1.3	4.1
P7	159+92	1.3	3.1
P8	159+62	1.1	2.7
P9	161+82 12L	1.3	1.3
P10	161+22 10L	1.1	1.1
P11	160+84 13L	1.4	1.4
P12	95+40 10L	3.0	3.0
P13	91+60 8L	3.0	3.0
P14	90+50 10L	1.3	1.3
P15	85+30 8L	3.0	3.0
P16	78+55 8R	2.5	2.5
P17	68+50 8L	3.0	3.0
P18	67+10 10R	3.0	3.0
P19	63+75 10R	2.5	2.5
P20	61+25 9R	3.0	3.0
P21	51+35 8R	3.0	3.0
P22	46+40 10R	3.0	3.0
P23	41+50 10R	3.0	3.0
P24	35+25 8R	3.0	3.0
P25	30+25 10R	3.0	3.0

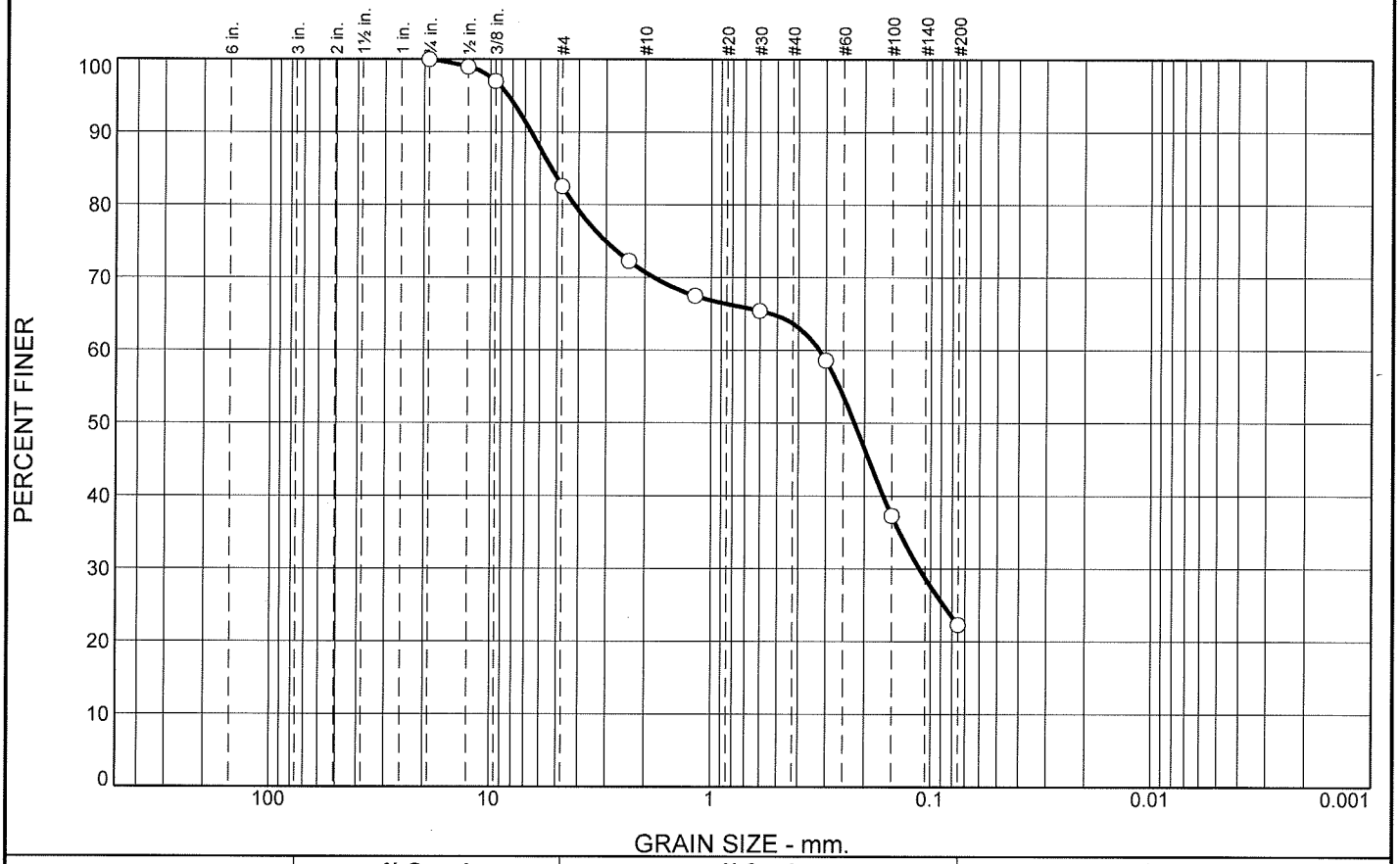
Notes:

1 Probes were pushed with a 3-foot hand probe to refusal or maximum depth
2 Where the probe depth exceeds push depth, a 1.25-inch rod was driven with a 10-lb hammer with a 18-inch drop.
3 Probes driven into the stiff clay developed high adhesion to rod.

APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	17.5	11.7	7.1	41.4	22.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	99.0		
3/8"	97.0		
#4	82.5		
#8	72.3		
#16	67.5		
#30	65.4		
#50	58.6		
#100	37.3		
#200	22.3		

* (no specification provided)

Material Description

Very Dark Greenish Gray Clayey SAND with Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.5663 D_{85}= 5.3083 D_{60}= 0.3205
D_{50}= 0.2216 D_{30}= 0.1121 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample Number: B1-5 C **Depth:** 25.0'-25.5'

Date: 11-7-09

Blackburn Consulting

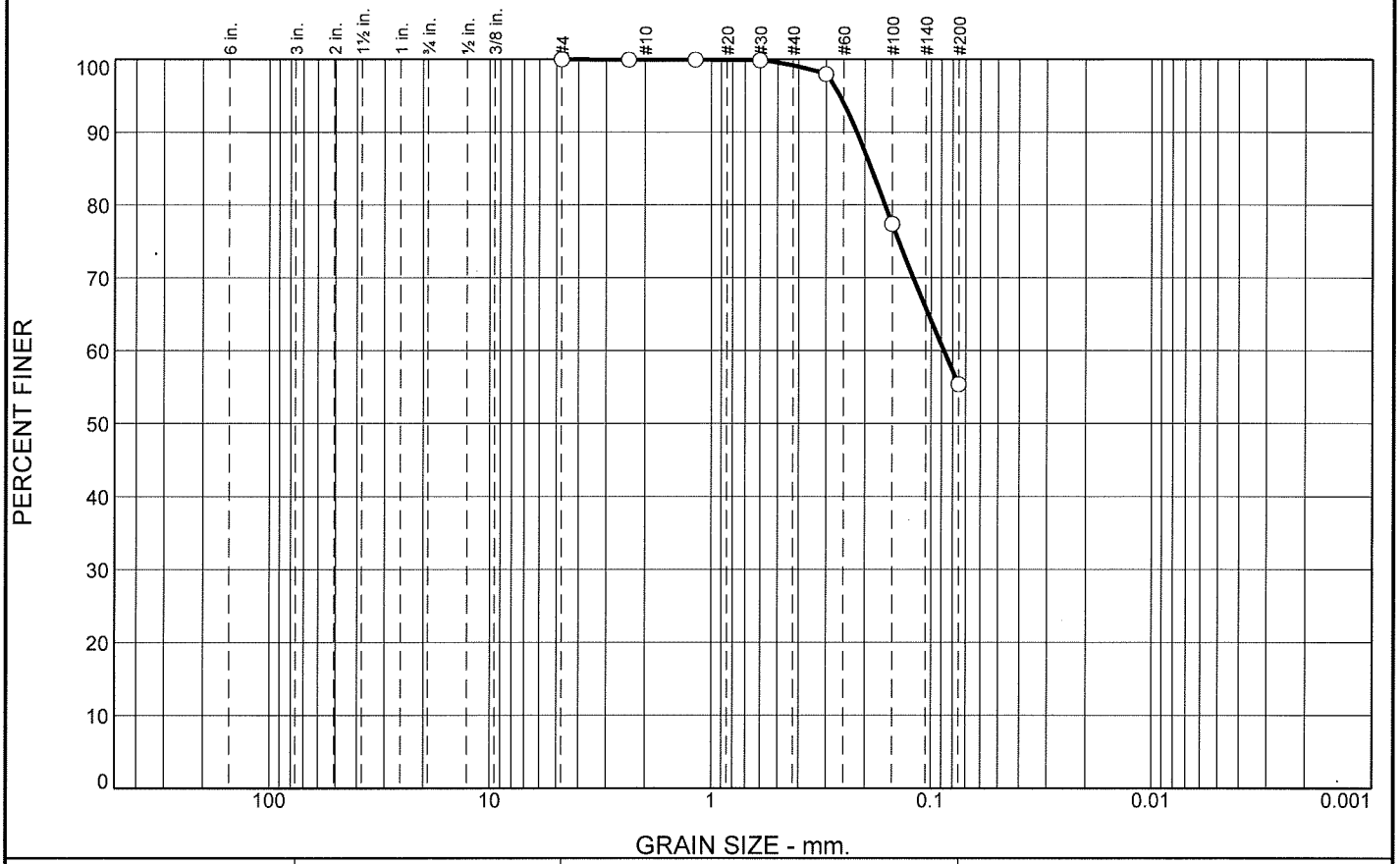
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	43.8	55.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	100.0		
#30	99.9		
#50	98.0		
#100	77.4		
#200	55.4		

* (no specification provided)

Material Description

Very Dark Greenish Gray Sandy Lean CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2171 D_{85}= 0.1866 D_{60}= 0.0872
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample Number: B3-3 C **Depth:** 31.0'-31.5'

Date: 11-7-09

Blackburn Consulting

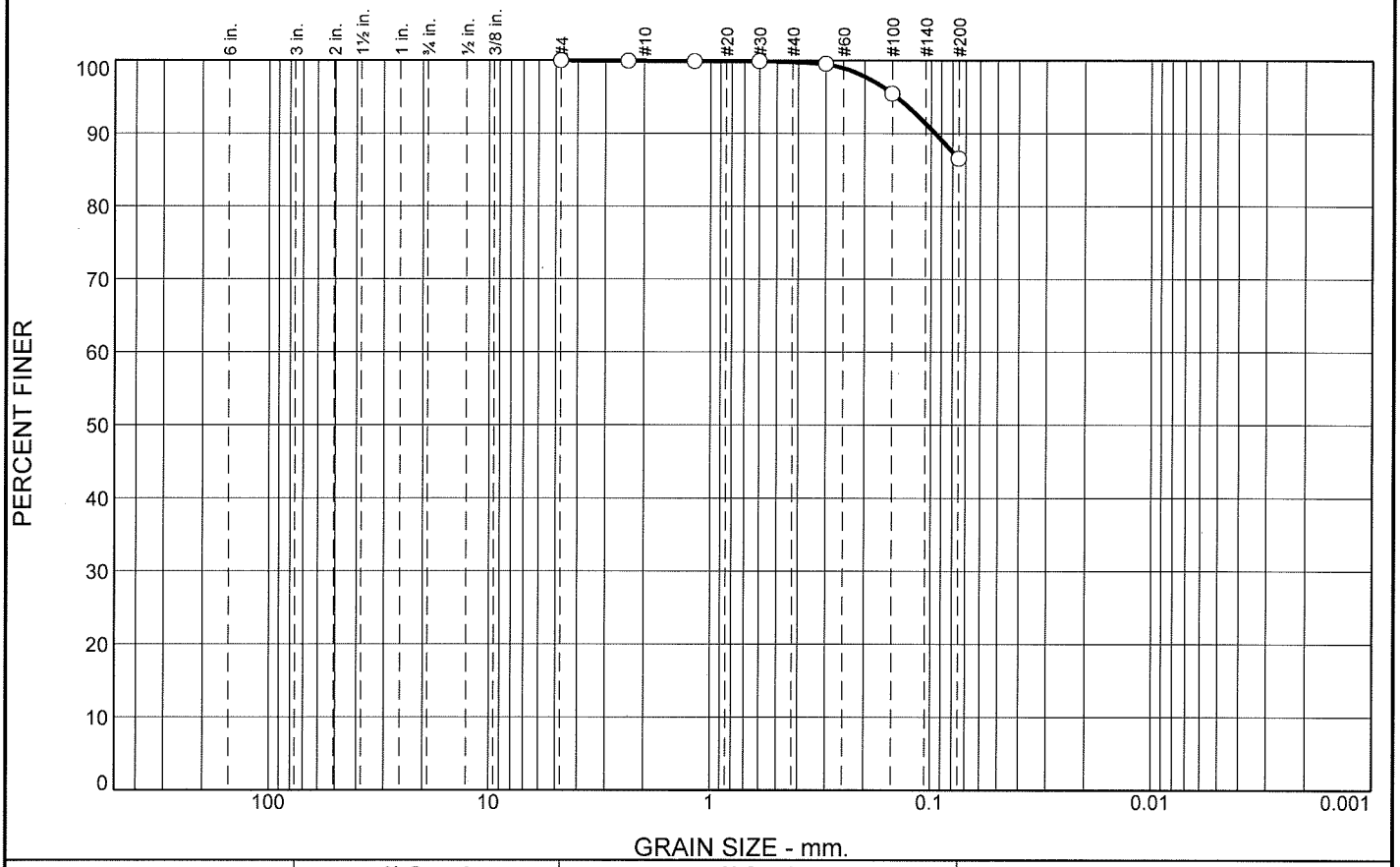
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	13.2	86.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#16	99.9		
#30	99.9		
#50	99.6		
#100	95.5		
#200	86.6		

* (no specification provided)

Material Description

Very Dark Greenish Gray Fat CLAY

Atterberg Limits

PL= 28 LL= 55 PI= 27

Coefficients

D_{90}= 0.0955 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(27)

Remarks

Sample Number: B4-2 B **Depth:** 10.5'-11.0'

Date: 11-7-09

Blackburn Consulting

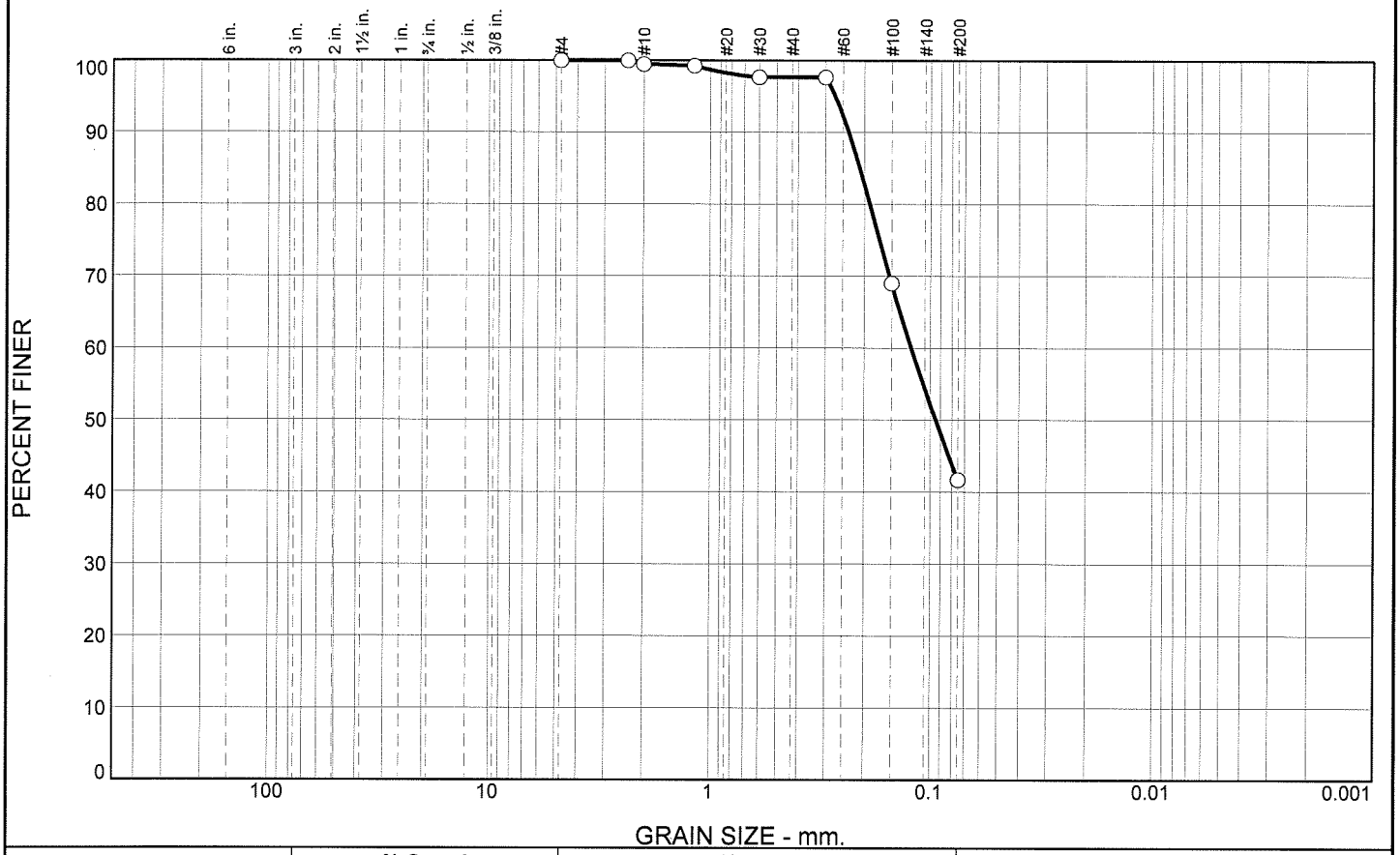
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	1.8	56.0	41.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#10	99.5		
#16	99.3		
#30	97.7		
#50	97.7		
#100	69.0		
#200	41.7		

* (no specification provided)

Material Description

Bluish black SILTY SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.2349 D_{85}= 0.2092 D_{60}= 0.1220
D_{50}= 0.0943 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Source of Sample: Boring B4 **Depth:** 15.5-16.0'
Sample Number: 3b

Date: 11/16/2009

Blackburn Consulting

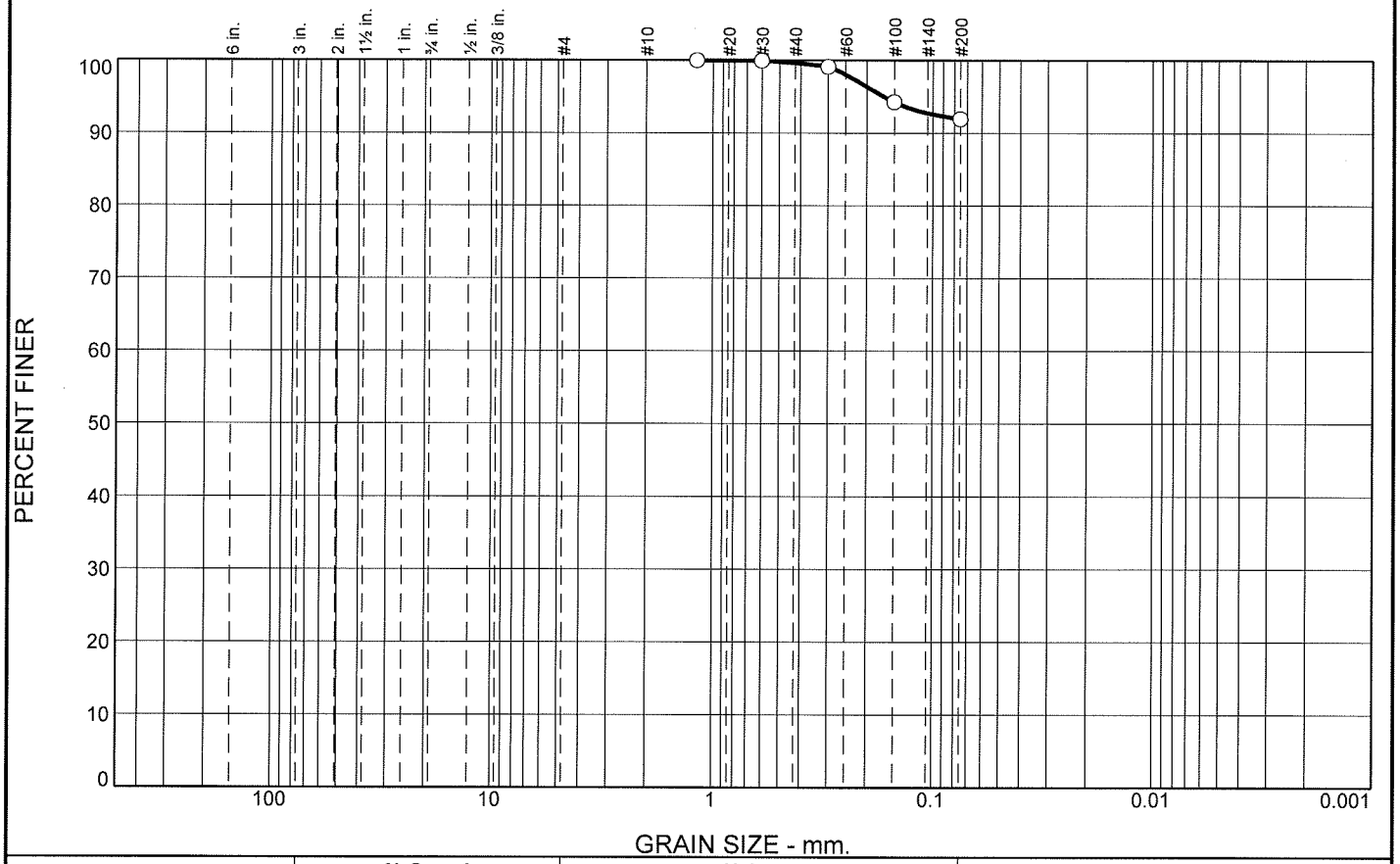
W. Sacramento, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	7.7	92.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#16	100.0		
#30	100.0		
#50	99.2		
#100	94.3		
#200	92.0		

* (no specification provided)

Material Description

Very Dark Greenish Gray Fat CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: B4-7 C **Depth:** 36.0'-36.5'

Date: 11-7-09

Blackburn Consulting

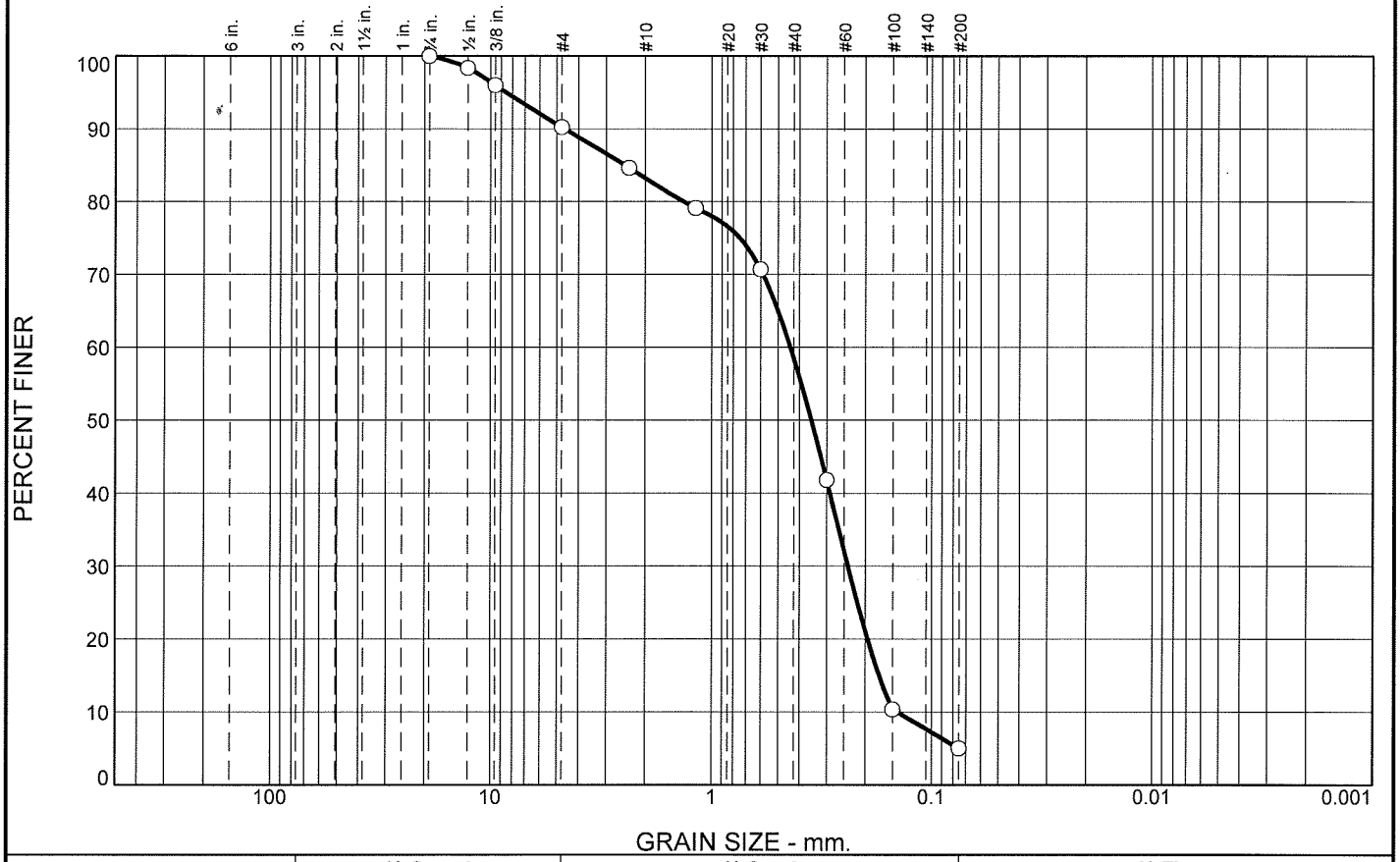
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.8	6.9	24.7	53.6	5.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.4		
3/8"	96.0		
#4	90.2		
#8	84.6		
#16	79.1		
#30	70.7		
#50	41.8		
#100	10.4		
#200	5.0		

* (no specification provided)

Material Description

Very Dark Greenish Gray Poorly Graded SAND with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.6168 D_{85}= 2.4627 D_{60}= 0.4390
D_{50}= 0.3526 D_{30}= 0.2393 D_{15}= 0.1725
D_{10}= 0.1421 C_u= 3.09 C_c= 0.92

Classification

USCS= SP-SM AASHTO=

Remarks

Sample Number: B5-4 B **Depth:** 19.5'-20.0'

Date: 11-7-09

Blackburn Consulting

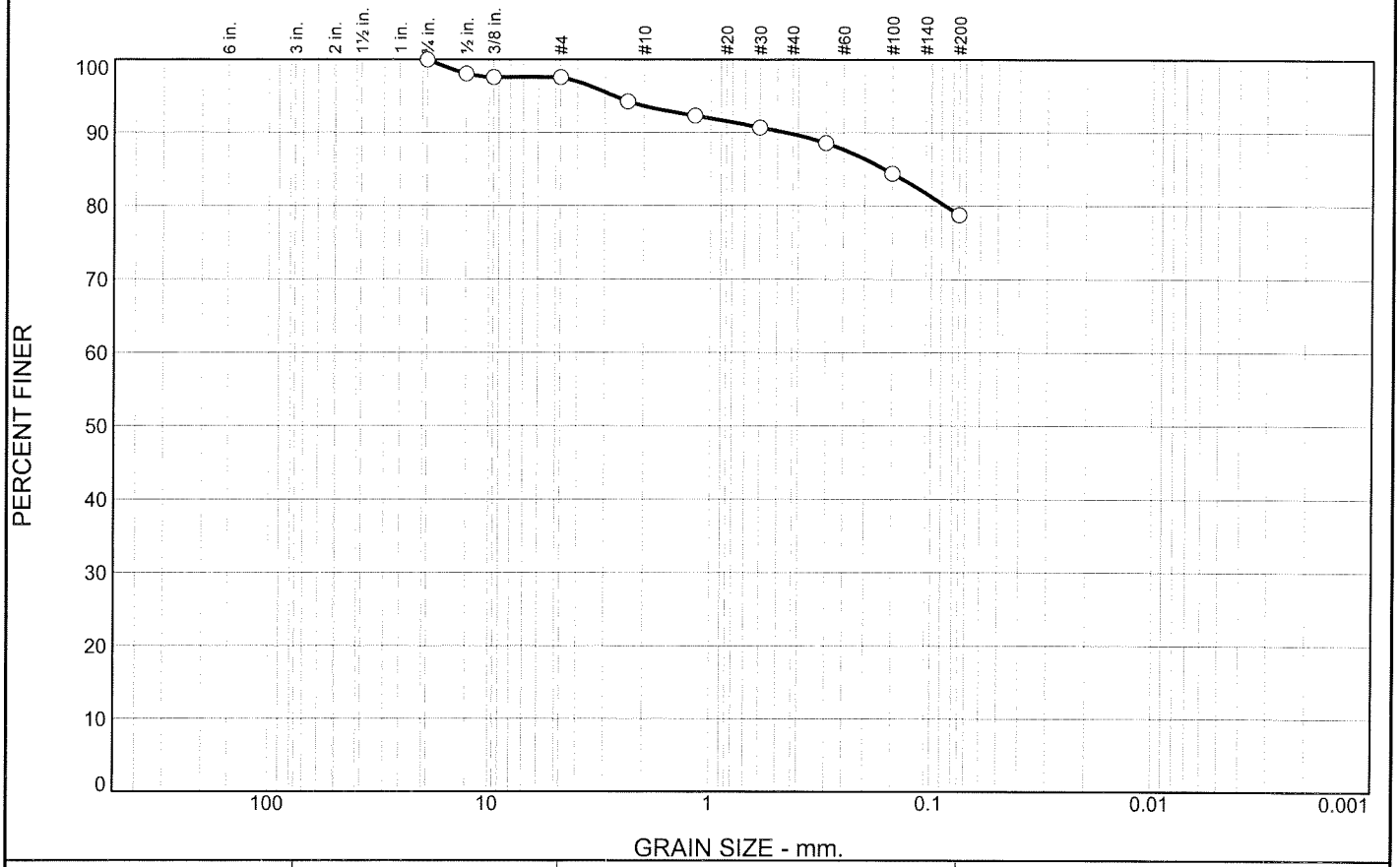
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	4.0	3.8	11.0	78.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.1		
3/8"	97.6		
#4	97.6		
#8	94.3		
#16	92.3		
#30	90.7		
#50	88.6		
#100	84.4		
#200	78.8		

* (no specification provided)

Material Description

Dark Gray Fat CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4556 D_{85}= 0.1627 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample Number: B7-2 B **Depth:** 10.5'-11.0'

Date: 11-7-09

Blackburn Consulting

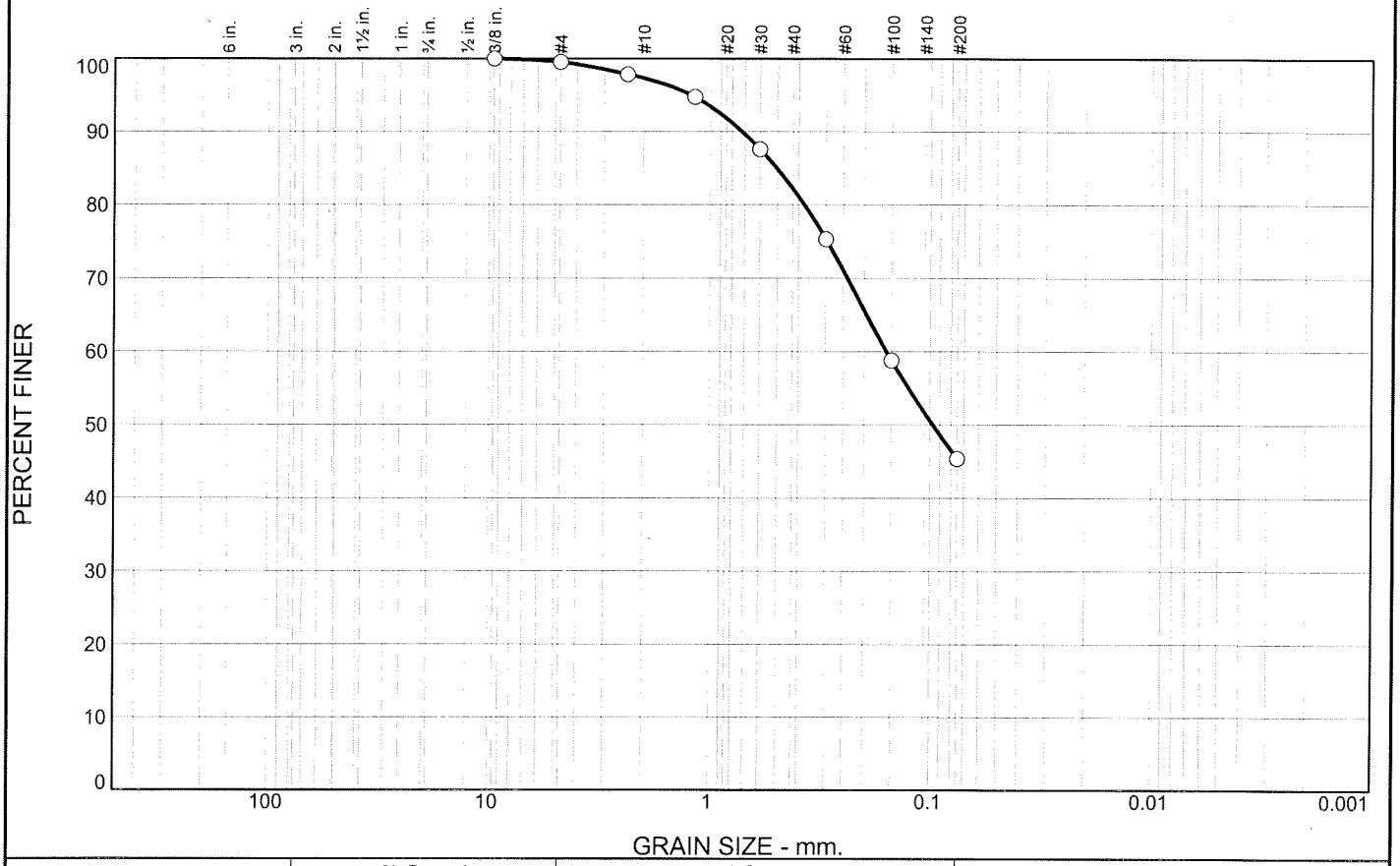
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	2.2	15.1	36.8	45.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.5		
#8	97.8		
#16	94.7		
#30	87.6		
#50	75.3		
#100	58.8		
#200	45.4		

* (no specification provided)

Material Description

Very Dark Gray Clayey SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7215 D_{85}= 0.5028 D_{60}= 0.1582
D_{50}= 0.0969 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample Number: B8-4 B **Depth:** 20.5'-21.0'

Date: 11-7-09

Blackburn Consulting

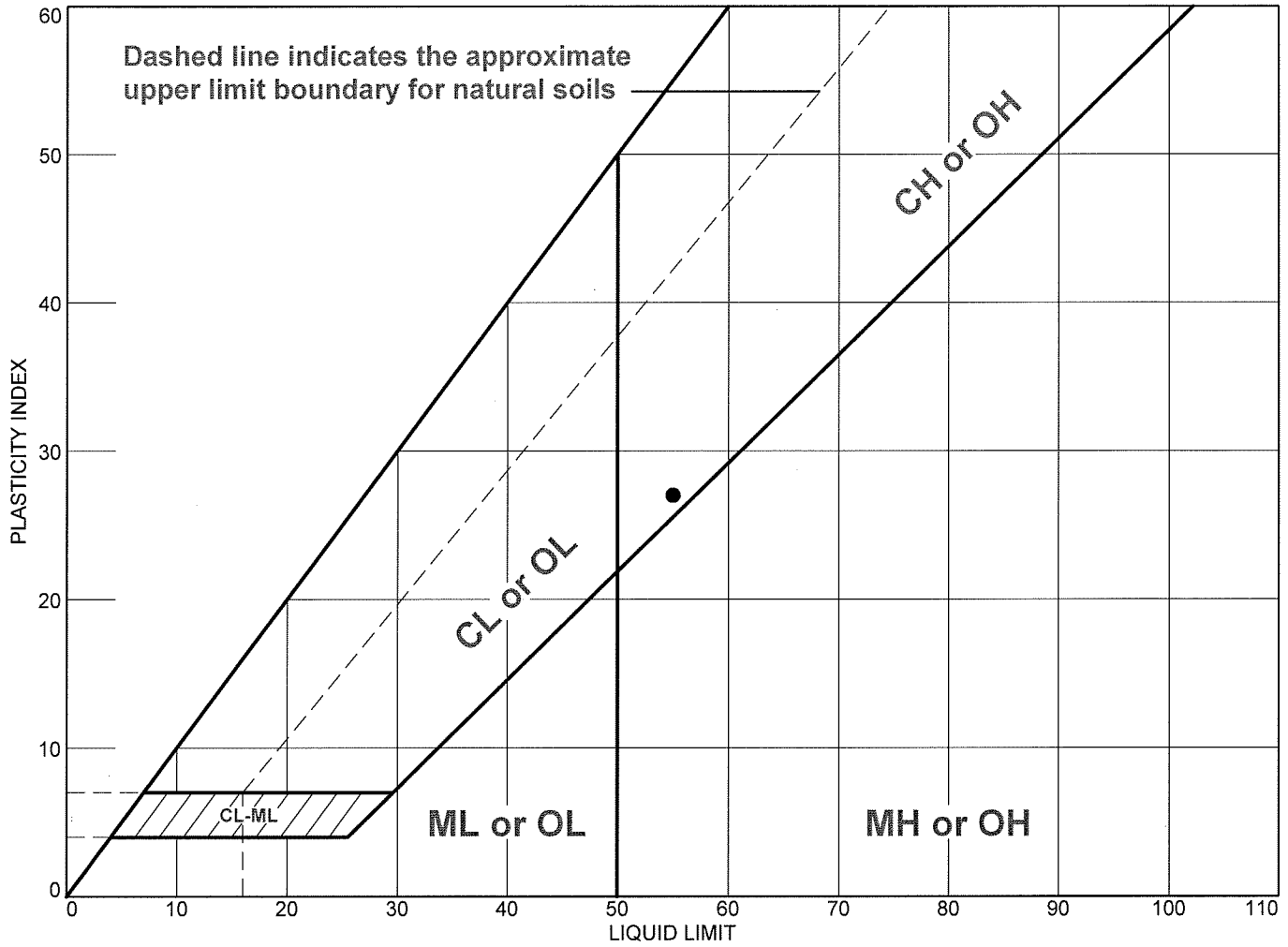
Auburn, CA

Client: Winzler and Kelly
Project: Arcata Trail Project

Project No: 1873.1 **Figure**

Tested By: ECH **Checked By:** KLC

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dark Greenish Gray Fat CLAY	55	28	27	99.8	86.6	CH

Project No. 1873.1 **Client:** Winzler and Kelly

Project: Arcata Trail Project

● **Depth:** 10.5'-11.0' **Sample Number:** B4-2 B

Remarks:

Blackburn Consulting

Auburn, CA

Figure

Tested By: KLC **Checked By:** KLC

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B1-4c	Depth	20.0-20.5
Sample Description	Very Dark Bluish Gray Lean CLAY (CL)		
Date	11/10/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.58
Original Diameter (in)	2.39
Sample Area (in^2)	4.49
Sample Weight (g)	689.80
Wet Sample Weight (g)	428.80
Tare Number	SS
Tare Weight (g)	104.80
Dry Sample Weight (g)	311.10
Dry Weight (g)	206.3
Water Weight (g)	117.7
Percent Moisture (%)*	57.1
Wet Density (pcf)	105.0
Dry Density (pcf)	66.8

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

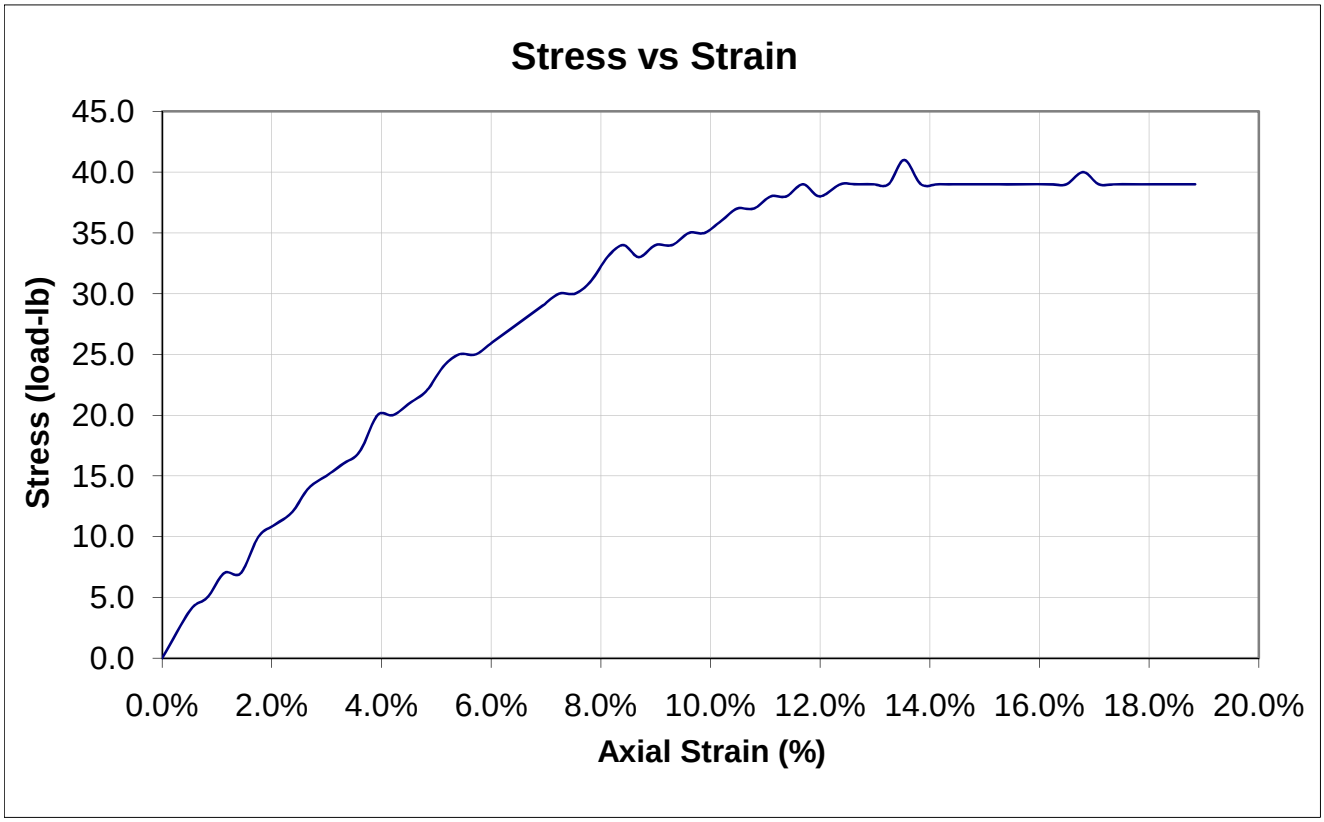
Maximum Load (lb)	41.0
Deflection at Max. Load (in)	0.755
Axial Strain at Max. Load	13.5%
Average Cross-Sectional Area (in^2)	5.19
Compressive Strength (tsf)	**0.57**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
4.000	0.029	25.000	0.302	36.000	0.569	39.000	0.839
5.000	0.046	25.000	0.319	37.000	0.585	39.000	0.856
7.000	0.063	26.000	0.336	37.000	0.602	39.000	0.872
7.000	0.080	27.000	0.353	38.000	0.619	39.000	0.887
10.000	0.098	28.000	0.370	38.000	0.635	39.000	0.904
11.000	0.115	29.000	0.387	39.000	0.652	39.000	0.920
12.000	0.132	30.000	0.404	38.000	0.669	40.000	0.937
14.000	0.149	30.000	0.420	39.000	0.690	39.000	0.953
15.000	0.167	31.000	0.436	39.000	0.706	39.000	0.970
16.000	0.184	33.000	0.453	39.000	0.723	39.000	0.986
17.000	0.201	34.000	0.469	39.000	0.739	39.000	1.002
20.000	0.219	33.000	0.485	41.000	0.755	39.000	1.018
20.000	0.235	34.000	0.502	39.000	0.772	39.000	1.035
21.000	0.252	34.000	0.519	39.000	0.789	39.000	1.051
22.000	0.269	35.000	0.536	39.000	0.805		
24.000	0.286	35.000	0.552	39.000	0.823		

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B1-4c
Material Description
Very Dark Bluish Gray Lean CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	105.0
Dry Density (pcf)	66.8
% Moisture	57.1

Unconfined Compressive Strength (tsf) **0.57**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B1-7c	Depth	35.0-35.5
Sample Description	Very Dark Bluish Gray Sandy CLAY (CL)		
Date	11/10/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.51
Original Diameter (in)	2.38
Sample Area (in^2)	4.45
Sample Weight (g)	765.20
Wet Sample Weight (g)	517.2
Tare Number	VV
Tare Weight (g)	104.9
Dry Sample Weight (g)	418.8
Dry Weight (g)	313.9
Water Weight (g)	98.4
Percent Moisture (%)*	31.3
Wet Density (pcf)	118.9
Dry Density (pcf)	90.5

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

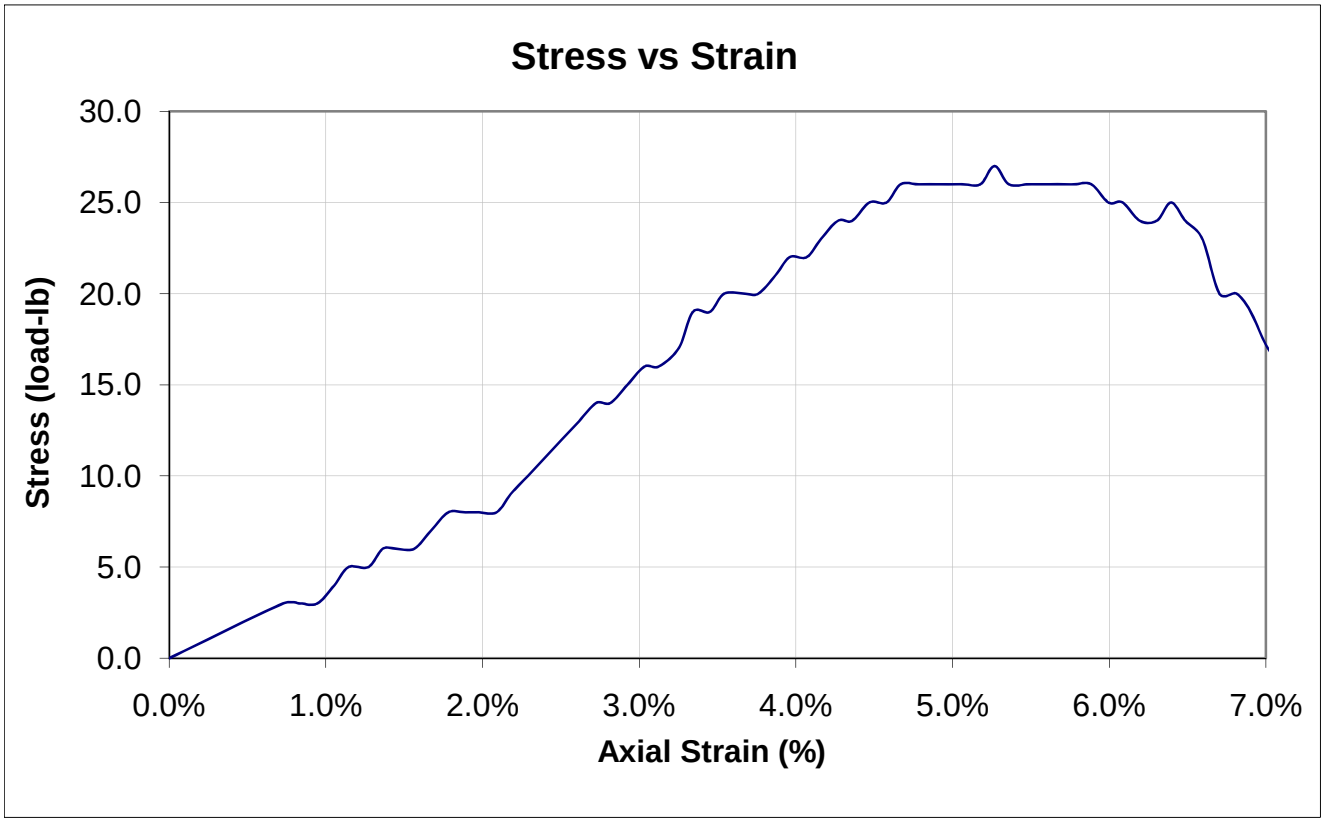
Maximum Load (lb)	27.0
Deflection at Max. Load (in)	0.290
Axial Strain at Max. Load	5.3%
Average Cross-Sectional Area (in^2)	4.70
Compressive Strength (tsf)	**0.41**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.040	11.000	0.132	22.000	0.224	26.000	0.312
3.000	0.046	12.000	0.138	23.000	0.229	26.000	0.318
3.000	0.052	13.000	0.144	24.000	0.235	26.000	0.324
4.000	0.058	14.000	0.150	24.000	0.240	25.000	0.330
5.000	0.063	14.000	0.155	25.000	0.246	25.000	0.335
5.000	0.070	15.000	0.161	25.000	0.252	24.000	0.341
6.000	0.075	16.000	0.167	26.000	0.257	24.000	0.347
6.000	0.080	16.000	0.172	26.000	0.263	25.000	0.352
6.000	0.086	17.000	0.179	26.000	0.268	24.000	0.357
7.000	0.092	19.000	0.184	26.000	0.274	23.000	0.363
8.000	0.098	19.000	0.190	26.000	0.279	20.000	0.369
8.000	0.104	20.000	0.195	26.000	0.285	20.000	0.375
8.000	0.109	20.000	0.202	27.000	0.290	19.000	0.380
8.000	0.115	20.000	0.207	26.000	0.295	17.000	0.386
9.000	0.120	21.000	0.213	26.000	0.302	16.000	0.392
10.000	0.126	22.000	0.218	26.000	0.307	16.000	0.396

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B1-7c
Material Description
Very Dark Bluish Gray Sandy CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	118.9
Dry Density (pcf)	90.5
% Moisture	31.3

Unconfined Compressive Strength (tsf) **0.41**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B2-2b	Depth	10.5-11.0
Sample Description	Very Dark Bluish Gray Sandy CLAY (CL)		
Date	11/10/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.32
Original Diameter (in)	2.40
Sample Area (in^2)	4.53
Sample Weight (g)	873.90
Wet Sample Weight (g)	559.4
Tare Number	UU
Tare Weight (g)	105.7
Dry Sample Weight (g)	488.0
Dry Weight (g)	382.3
Water Weight (g)	71.4
Percent Moisture (%)*	18.7
Wet Density (pcf)	138.0
Dry Density (pcf)	116.3

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

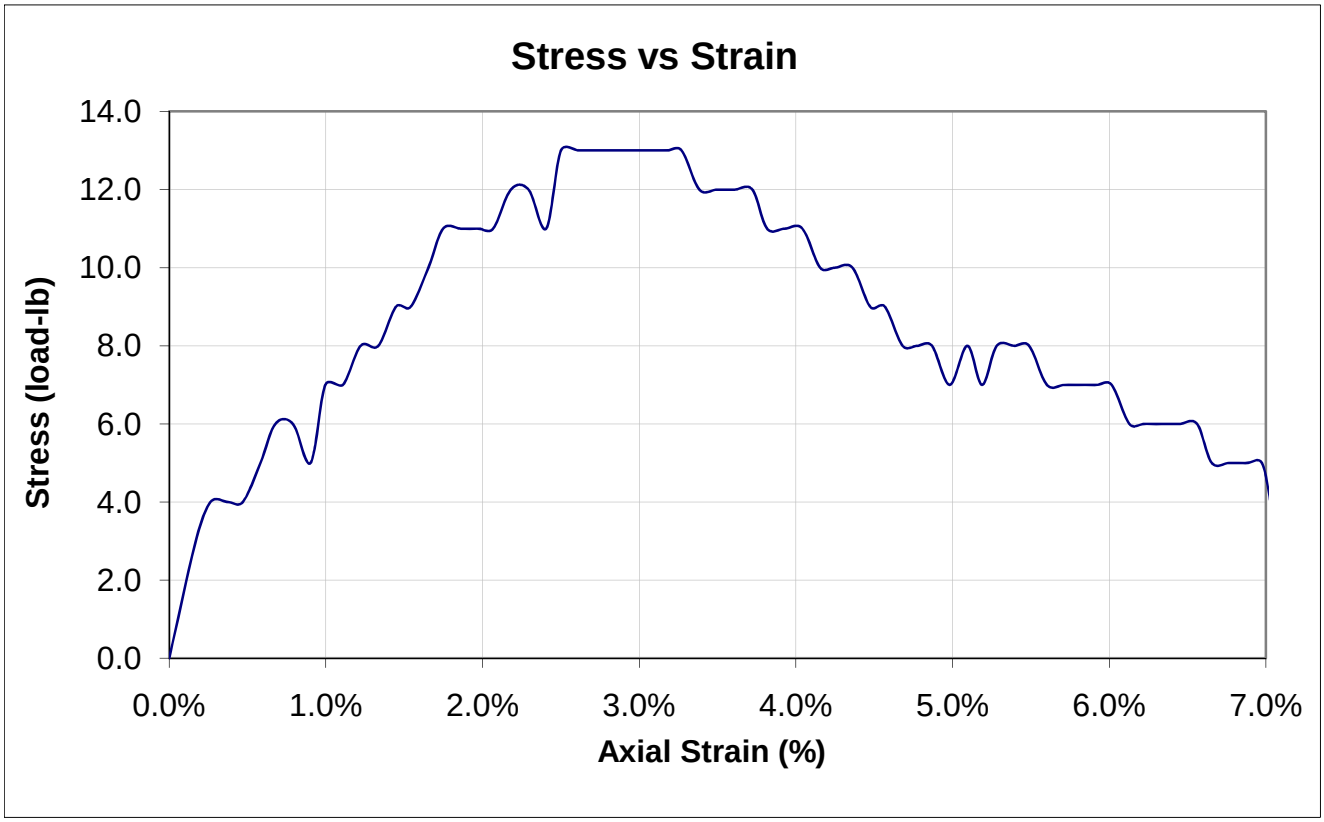
Maximum Load (lb)	13.0
Deflection at Max. Load (in)	0.133
Axial Strain at Max. Load	2.5%
Average Cross-Sectional Area (in^2)	4.65
Compressive Strength (tsf)	**0.20**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.009	11.000	0.099	12.000	0.192	8.000	0.281
4.000	0.014	11.000	0.105	12.000	0.198	8.000	0.287
4.000	0.020	11.000	0.110	11.000	0.203	8.000	0.292
4.000	0.025	12.000	0.116	11.000	0.209	7.000	0.298
5.000	0.031	12.000	0.122	11.000	0.215	7.000	0.304
6.000	0.036	11.000	0.128	10.000	0.221	7.000	0.309
6.000	0.042	13.000	0.133	10.000	0.226	7.000	0.315
5.000	0.048	13.000	0.139	10.000	0.232	7.000	0.320
7.000	0.053	13.000	0.145	9.000	0.238	6.000	0.326
7.000	0.059	13.000	0.151	9.000	0.243	6.000	0.331
8.000	0.065	13.000	0.157	8.000	0.249	6.000	0.337
8.000	0.071	13.000	0.163	8.000	0.254	6.000	0.343
9.000	0.077	13.000	0.169	8.000	0.259	6.000	0.349
9.000	0.082	13.000	0.174	7.000	0.265	5.000	0.354
10.000	0.088	12.000	0.180	8.000	0.271	5.000	0.360
11.000	0.093	12.000	0.186	7.000	0.276	5.000	0.366

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B2-2b
Material Description
Very Dark Bluish Gray Sandy CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	138.0
Dry Density (pcf)	116.3
% Moisture	18.7

Unconfined Compressive Strength (tsf) **0.20**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B3-2c	Depth	21.0-21.5
Sample Description	Very Dark Bluish Gray Sandy CLAY (CL)		
Date	11/11/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.17
Original Diameter (in)	2.40
Sample Area (in^2)	4.52
Sample Weight (g)	844.70
Wet Sample Weight (g)	523.9
Tare Number	NN
Tare Weight (g)	103.7
Dry Sample Weight (g)	462.1
Dry Weight (g)	358.4
Water Weight (g)	61.8
Percent Moisture (%)*	17.2
Wet Density (pcf)	137.7
Dry Density (pcf)	117.5

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

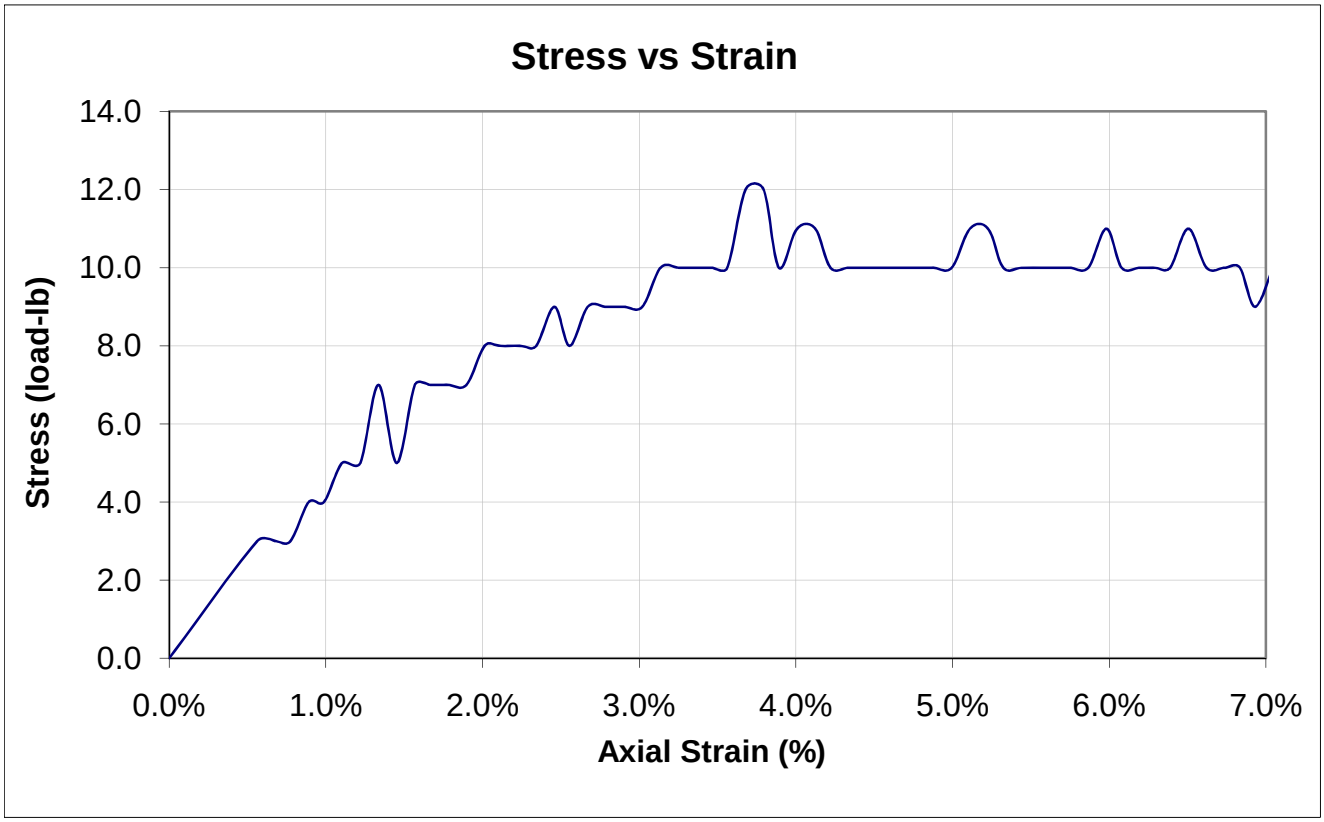
Maximum Load (lb)	12.0
Deflection at Max. Load (in)	0.190
Axial Strain at Max. Load	3.7%
Average Cross-Sectional Area (in^2)	4.70
Compressive Strength (tsf)	**0.18**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.029	8.000	0.121	11.000	0.213	10.000	0.303
3.000	0.035	9.000	0.127	10.000	0.218	11.000	0.309
3.000	0.040	8.000	0.132	10.000	0.224	10.000	0.314
4.000	0.046	9.000	0.138	10.000	0.230	10.000	0.320
4.000	0.051	9.000	0.144	10.000	0.235	10.000	0.325
5.000	0.057	9.000	0.150	10.000	0.241	10.000	0.330
5.000	0.063	9.000	0.156	10.000	0.247	11.000	0.336
7.000	0.069	10.000	0.162	10.000	0.252	10.000	0.342
5.000	0.075	10.000	0.168	10.000	0.258	10.000	0.348
7.000	0.081	10.000	0.173	11.000	0.264	10.000	0.353
7.000	0.086	10.000	0.179	11.000	0.270	9.000	0.358
7.000	0.092	10.000	0.184	10.000	0.275	10.000	0.364
7.000	0.098	12.000	0.190	10.000	0.281	10.000	0.370
8.000	0.104	12.000	0.196	10.000	0.286	9.000	0.376
8.000	0.109	10.000	0.201	10.000	0.292	9.000	0.382
8.000	0.116	11.000	0.207	10.000	0.297	9.000	0.387

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B3-2c
Material Description
Very Dark Bluish Gray Sandy CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	137.7
Dry Density (pcf)	117.5
% Moisture	17.2

Unconfined Compressive Strength (tsf) **0.18**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B4-4c	Depth	21.0-21.5
Sample Description	Very Dark Bluish Gray Sandy CLAY (CL)		
Date	11/11/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.50
Original Diameter (in)	2.38
Sample Area (in^2)	4.44
Sample Weight (g)	875.70
Wet Sample Weight (g)	560.4
Tare Number	TT
Tare Weight (g)	105.1
Dry Sample Weight (g)	488.5
Dry Weight (g)	383.4
Water Weight (g)	71.9
Percent Moisture (%)*	18.8
Wet Density (pcf)	136.6
Dry Density (pcf)	115.1

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

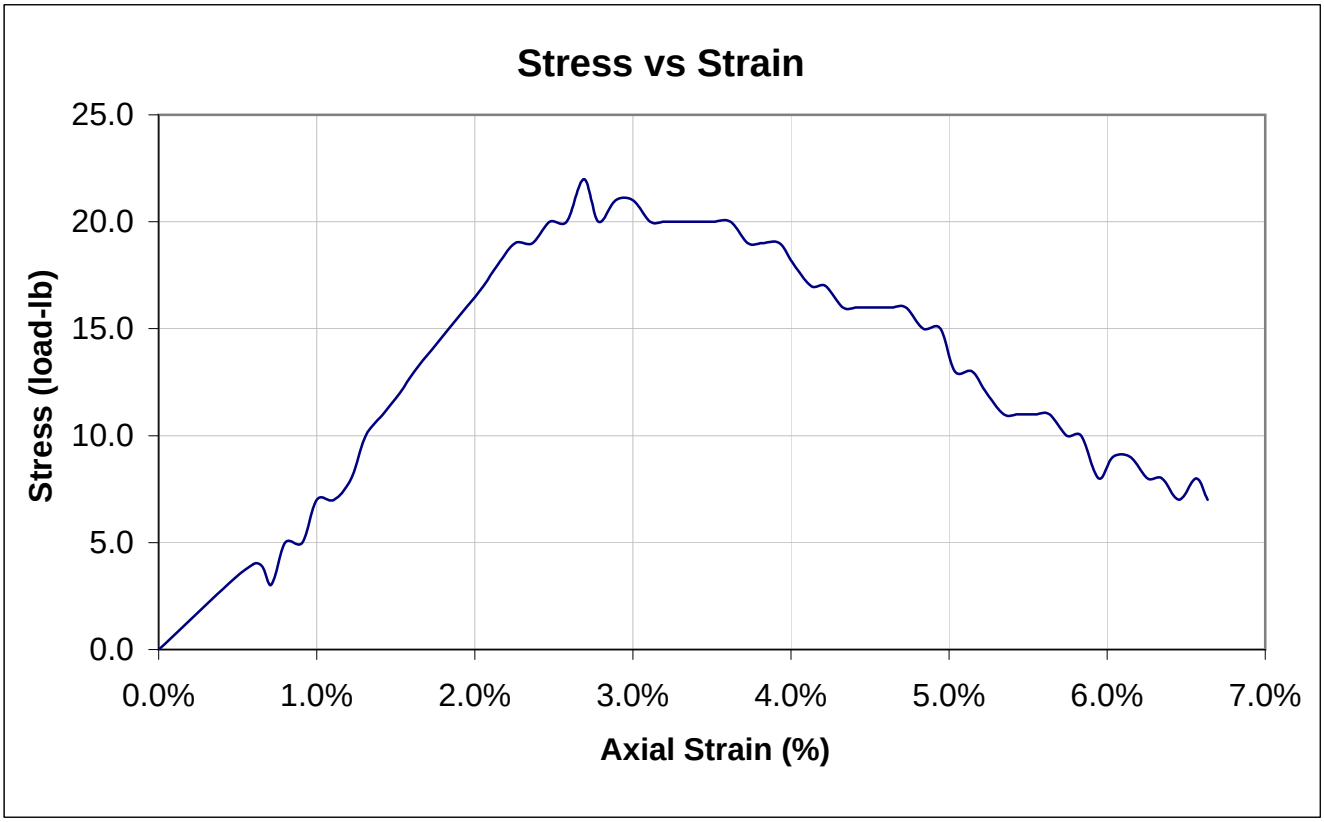
Maximum Load (lb)	22.0
Deflection at Max. Load (in)	0.148
Axial Strain at Max. Load	2.7%
Average Cross-Sectional Area (in^2)	4.56
Compressive Strength (tsf)	**0.35**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
4.000	0.033	19.000	0.124	19.000	0.216	11.000	0.305
3.000	0.039	19.000	0.130	18.000	0.221	11.000	0.310
5.000	0.044	20.000	0.136	17.000	0.227	10.000	0.316
5.000	0.050	20.000	0.142	17.000	0.232	10.000	0.321
7.000	0.055	22.000	0.148	16.000	0.238	8.000	0.327
7.000	0.061	20.000	0.153	16.000	0.243	9.000	0.332
8.000	0.067	21.000	0.159	16.000	0.249	9.000	0.338
10.000	0.072	21.000	0.165	16.000	0.255	8.000	0.344
11.000	0.078	20.000	0.171	16.000	0.260	8.000	0.349
12.000	0.084	20.000	0.176	15.000	0.266	7.000	0.355
13.000	0.089	20.000	0.182	15.000	0.272	8.000	0.361
14.000	0.095	20.000	0.188	13.000	0.277	7.000	0.365
15.000	0.101	20.000	0.193	13.000	0.283		
16.000	0.107	20.000	0.199	12.000	0.288		
17.000	0.113	19.000	0.205	11.000	0.294		
18.000	0.118	19.000	0.210	11.000	0.299		

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B4-4c
Material Description
Very Dark Bluish Gray Sandy CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	136.6
Dry Density (pcf)	115.1
% Moisture	18.8

Unconfined Compressive Strength (tsf) **0.35**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B5-7b	Depth	34.5-35.0
Sample Description	Bluish Gray Lean CLAY (CL)		
Date	11/11/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.65
Original Diameter (in)	2.39
Sample Area (in^2)	4.49
Sample Weight (g)	669.50
Wet Sample Weight (g)	402.80
Tare Number	QQ
Tare Weight (g)	105.60
Dry Sample Weight (g)	293.70
Dry Weight (g)	188.1
Water Weight (g)	109.1
Percent Moisture (%)*	58.0
Wet Density (pcf)	100.6
Dry Density (pcf)	63.7

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

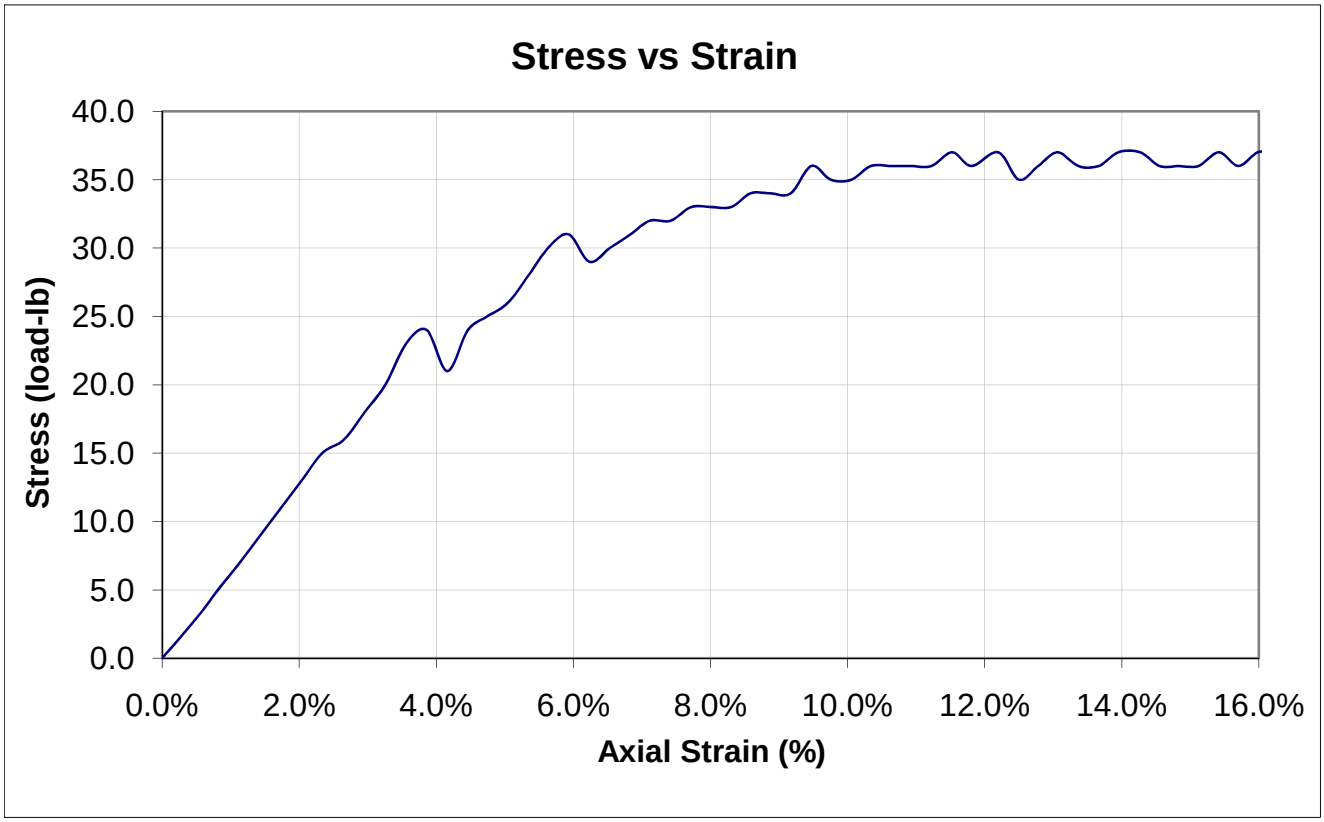
Maximum Load (lb)	37.0
Deflection at Max. Load (in)	0.651
Axial Strain at Max. Load	11.5%
Average Cross-Sectional Area (in^2)	5.07
Compressive Strength (tsf)	**0.53**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.029	28.000	0.302	35.000	0.568	36.000	0.838
5.000	0.046	30.000	0.318	36.000	0.584	36.000	0.854
7.000	0.064	31.000	0.335	36.000	0.601	37.000	0.871
9.000	0.081	29.000	0.352	36.000	0.617	36.000	0.887
11.000	0.098	30.000	0.369	36.000	0.634	37.000	0.903
13.000	0.115	31.000	0.386	37.000	0.651	37.000	0.919
15.000	0.132	32.000	0.402	36.000	0.667	37.000	0.936
16.000	0.150	32.000	0.419	37.000	0.689	36.000	0.953
18.000	0.167	33.000	0.436	35.000	0.706	37.000	0.969
20.000	0.184	33.000	0.452	36.000	0.722	37.000	0.986
23.000	0.201	33.000	0.469	37.000	0.738	37.000	1.003
24.000	0.218	34.000	0.485	36.000	0.755	36.000	1.019
21.000	0.235	34.000	0.501	36.000	0.772	36.000	1.032
24.000	0.252	34.000	0.518	37.000	0.788		
25.000	0.268	36.000	0.535	37.000	0.806		
26.000	0.285	35.000	0.551	36.000	0.822		

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B5-7b
Material Description
Bluish Gray Lean CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	100.6
Dry Density (pcf)	63.7
% Moisture	58.0

Unconfined Compressive Strength (tsf) **0.53**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B6-3c	Depth	31.0-31.5
Sample Description	Very Dark Bluish Gray Lean CLAY (CL)		
Date	11/11/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.81
Original Diameter (in)	2.38
Sample Area (in^2)	4.45
Sample Weight (g)	729.60
Wet Sample Weight (g)	446.00
Tare Number	WW
Tare Weight (g)	104.70
Dry Sample Weight (g)	334.20
Dry Weight (g)	229.5
Water Weight (g)	111.8
Percent Moisture (%)*	48.7
Wet Density (pcf)	107.5
Dry Density (pcf)	72.3

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

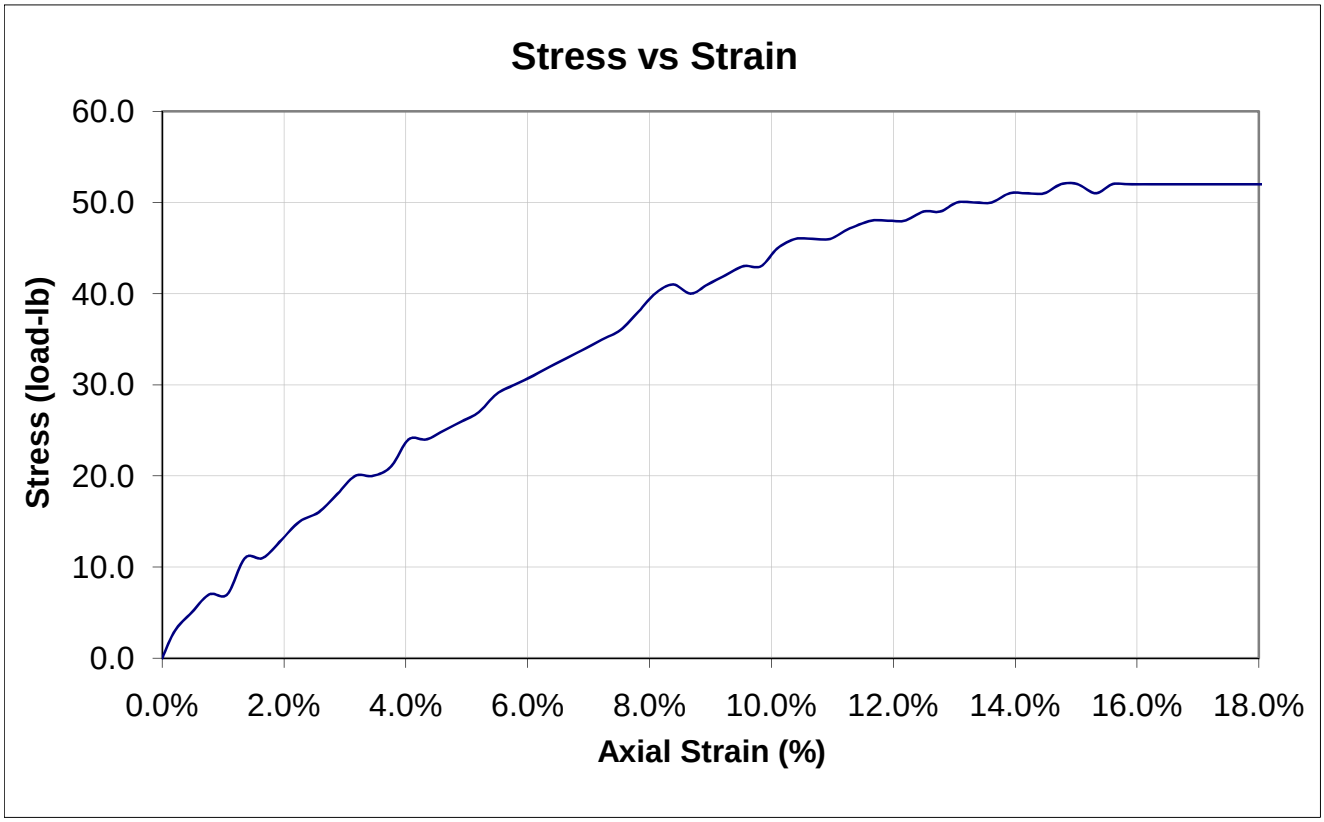
Maximum Load (lb)	52.0
Deflection at Max. Load (in)	0.906
Axial Strain at Max. Load	15.6%
Average Cross-Sectional Area (in^2)	5.27
Compressive Strength (tsf)	**0.71**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.012	26.000	0.286	43.000	0.554	51.000	0.824
5.000	0.028	27.000	0.302	43.000	0.571	51.000	0.841
7.000	0.045	29.000	0.319	45.000	0.587	52.000	0.857
7.000	0.062	30.000	0.336	46.000	0.604	52.000	0.873
11.000	0.079	31.000	0.354	46.000	0.620	51.000	0.890
11.000	0.096	32.000	0.370	46.000	0.637	52.000	0.906
13.000	0.114	33.000	0.387	47.000	0.653	52.000	0.922
15.000	0.131	34.000	0.404	48.000	0.676	52.000	0.939
16.000	0.149	35.000	0.420	48.000	0.692	52.000	0.955
18.000	0.167	36.000	0.437	48.000	0.708	52.000	0.971
20.000	0.184	38.000	0.454	49.000	0.726	52.000	0.988
20.000	0.201	40.000	0.470	49.000	0.742	52.000	1.005
21.000	0.218	41.000	0.487	50.000	0.758	52.000	1.021
24.000	0.235	40.000	0.504	50.000	0.775	52.000	1.038
24.000	0.252	41.000	0.520	50.000	0.791	52.000	1.055
25.000	0.269	42.000	0.537	51.000	0.808	52.000	1.071

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B6-3c
Material Description
Very Dark Bluish Gray Lean CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	107.5
Dry Density (pcf)	72.3
% Moisture	48.7

Unconfined Compressive Strength (tsf) **0.71**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B6-5c	Depth	46.0-46.5
Sample Description	Very Dark Bluish Gray Lean CLAY (CL)		
Date	11/11/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.77
Original Diameter (in)	2.38
Sample Area (in^2)	4.45
Sample Weight (g)	804.80
Wet Sample Weight (g)	557.80
Tare Number	CC
Tare Weight (g)	155.10
Dry Sample Weight (g)	460.70
Dry Weight (g)	305.6
Water Weight (g)	97.1
Percent Moisture (%)*	31.8
Wet Density (pcf)	119.4
Dry Density (pcf)	90.6

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

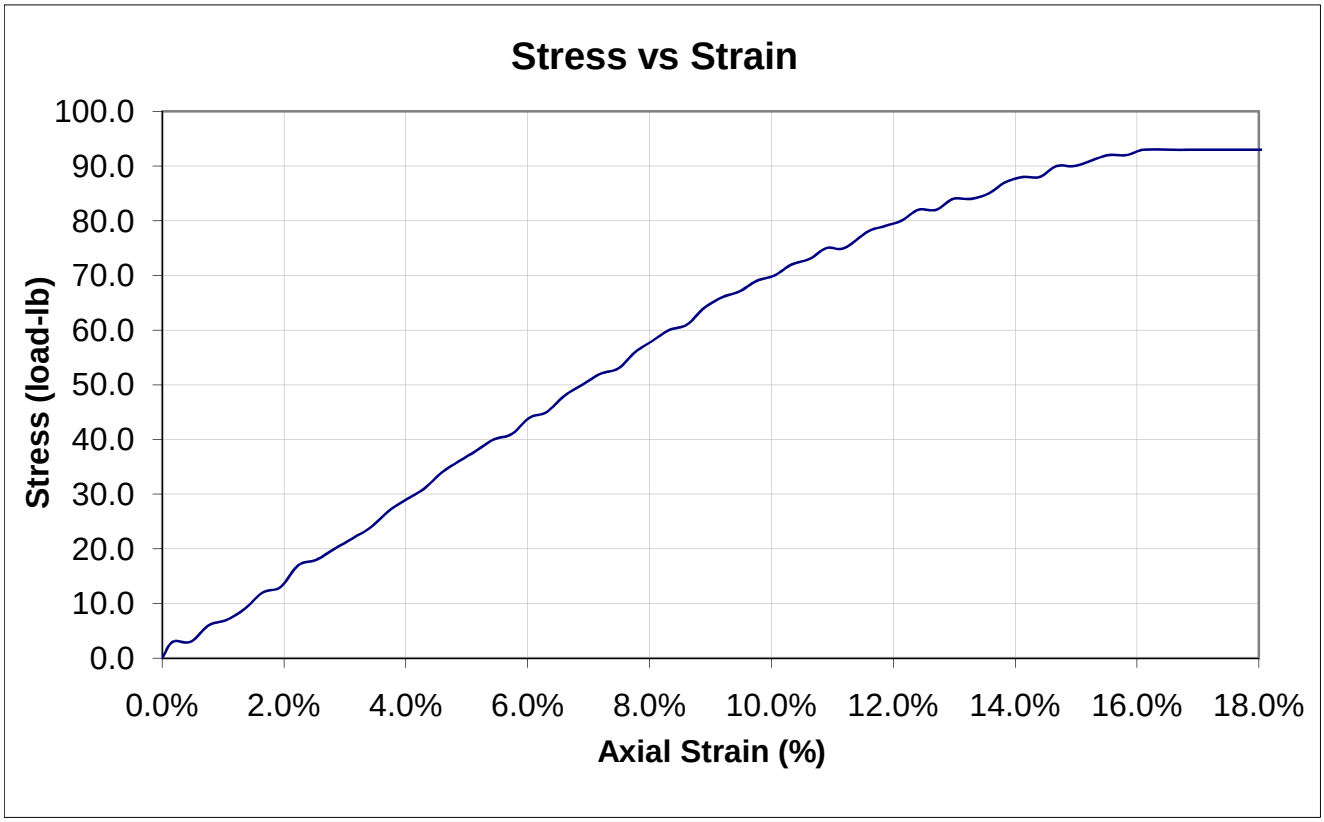
Maximum Load (lb)	93.0
Deflection at Max. Load (in)	0.929
Axial Strain at Max. Load	16.1%
Average Cross-Sectional Area (in^2)	5.30
Compressive Strength (tsf)	**1.26**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.010	36.000	0.281	67.000	0.546	88.000	0.815
3.000	0.027	38.000	0.298	69.000	0.563	88.000	0.831
6.000	0.044	40.000	0.314	70.000	0.580	90.000	0.847
7.000	0.061	41.000	0.331	72.000	0.596	90.000	0.864
9.000	0.078	44.000	0.348	73.000	0.613	91.000	0.880
12.000	0.095	45.000	0.364	75.000	0.629	92.000	0.896
13.000	0.112	48.000	0.381	75.000	0.646	92.000	0.913
17.000	0.129	50.000	0.398	78.000	0.668	93.000	0.929
18.000	0.146	52.000	0.415	79.000	0.684	93.000	0.945
20.000	0.163	53.000	0.432	80.000	0.700	93.000	0.963
22.000	0.181	56.000	0.448	82.000	0.716	93.000	0.979
24.000	0.198	58.000	0.464	82.000	0.733	93.000	0.995
27.000	0.215	60.000	0.480	84.000	0.749	93.000	1.011
29.000	0.231	61.000	0.497	84.000	0.766	93.000	1.028
31.000	0.248	64.000	0.513	85.000	0.783	93.000	1.044
34.000	0.265	66.000	0.530	87.000	0.798	93.000	1.061

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B6-5c
Material Description
Very Dark Bluish Gray Lean CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	119.4
Dry Density (pcf)	90.6
% Moisture	31.8

Unconfined Compressive Strength (tsf) **1.26**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B7-6c	Depth	31.0-31.5
Sample Description	Very Dark Gray Lean CLAY (CL)		
Date	11/12/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.70
Original Diameter (in)	2.39
Sample Area (in^2)	4.47
Sample Weight (g)	744.00
Wet Sample Weight (g)	497.90
Tare Number	RR
Tare Weight (g)	105.00
Dry Sample Weight (g)	371.40
Dry Weight (g)	266.4
Water Weight (g)	126.5
Percent Moisture (%)*	47.5
Wet Density (pcf)	111.1
Dry Density (pcf)	75.3

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

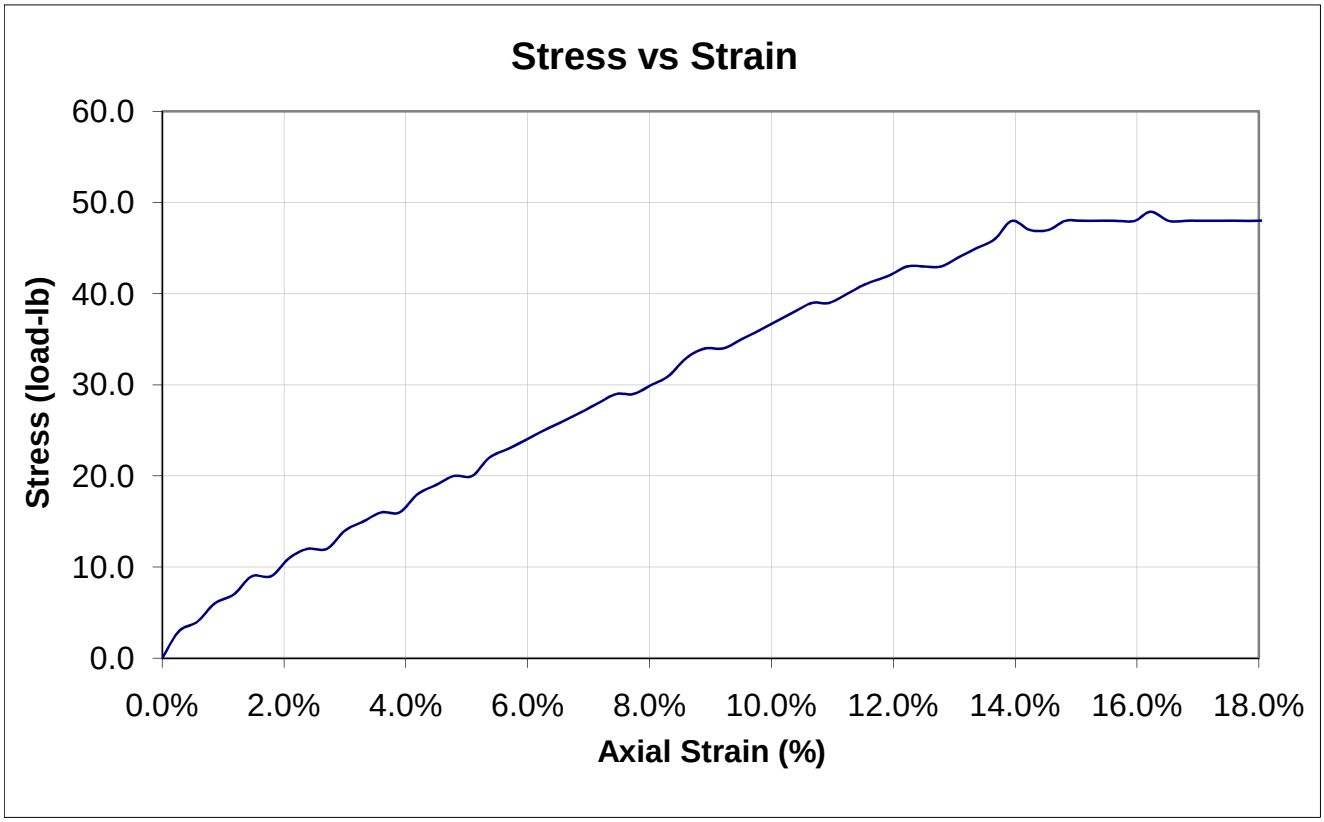
Maximum Load (lb)	49.0
Deflection at Max. Load (in)	0.925
Axial Strain at Max. Load	16.2%
Average Cross-Sectional Area (in^2)	5.34
Compressive Strength (tsf)	**0.66**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.016	20.000	0.290	36.000	0.559	47.000	0.829
4.000	0.033	22.000	0.306	37.000	0.575	48.000	0.845
6.000	0.049	23.000	0.324	38.000	0.591	48.000	0.861
7.000	0.067	24.000	0.341	39.000	0.608	48.000	0.878
9.000	0.084	25.000	0.357	39.000	0.624	48.000	0.894
9.000	0.102	26.000	0.375	40.000	0.641	48.000	0.910
11.000	0.119	27.000	0.392	41.000	0.657	49.000	0.925
12.000	0.136	28.000	0.408	42.000	0.680	48.000	0.942
12.000	0.154	29.000	0.425	43.000	0.697	48.000	0.958
14.000	0.171	29.000	0.441	43.000	0.713	48.000	0.975
15.000	0.188	30.000	0.458	43.000	0.729	48.000	0.992
16.000	0.205	31.000	0.474	44.000	0.745	48.000	1.008
16.000	0.222	33.000	0.491	45.000	0.762	48.000	1.024
18.000	0.239	34.000	0.508	46.000	0.779	48.000	1.040
19.000	0.256	34.000	0.525	48.000	0.795	47.000	1.057
20.000	0.273	35.000	0.542	47.000	0.812		

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B7-6c
Material Description
Very Dark Gray Lean CLAY (CL)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	111.1
Dry Density (pcf)	75.3
% Moisture	47.5

Unconfined Compressive Strength (tsf) **0.66**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B8-2c	Depth	11.0-11.5
Sample Description	Very Dark Bluish Gray Clayey SAND (SC)		
Date	11/12/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.42
Original Diameter (in)	2.39
Sample Area (in^2)	4.50
Sample Weight (g)	809.30
Wet Sample Weight (g)	451.00
Tare Number	PP
Tare Weight (g)	105.10
Dry Sample Weight (g)	380.00
Dry Weight (g)	274.9
Water Weight (g)	71.0
Percent Moisture (%)*	25.8
Wet Density (pcf)	126.2
Dry Density (pcf)	100.3

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

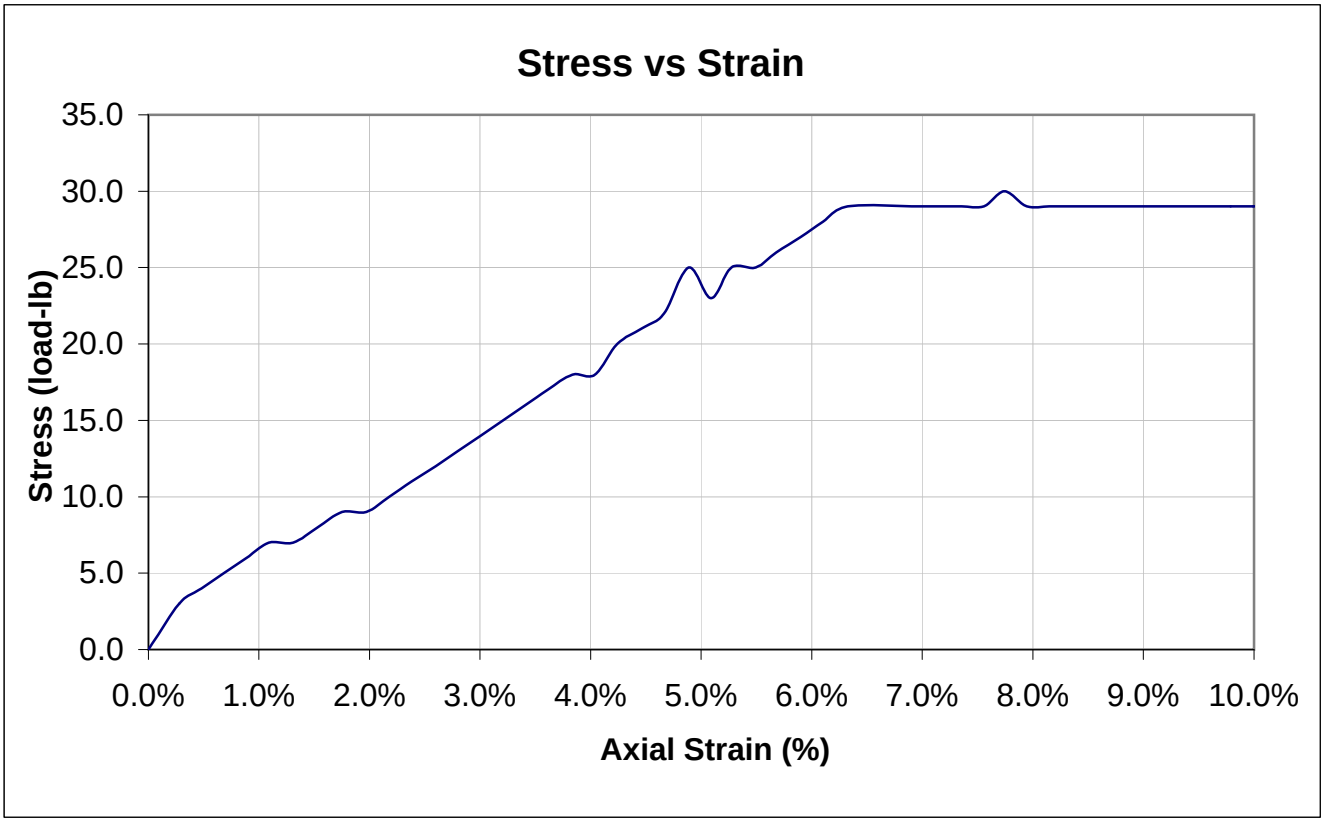
Maximum Load (lb)	30.0
Deflection at Max. Load (in)	0.420
Axial Strain at Max. Load	7.7%
Average Cross-Sectional Area (in^2)	4.88
Compressive Strength (tsf)	**0.44**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.015	17.000	0.196	29.000	0.399	29.000	0.575
4.000	0.026	18.000	0.208	29.000	0.410	29.000	0.586
5.000	0.037	18.000	0.219	30.000	0.420	27.000	0.597
6.000	0.048	20.000	0.230	29.000	0.431	26.000	0.608
7.000	0.059	21.000	0.242	29.000	0.442	25.000	0.618
7.000	0.071	22.000	0.253	29.000	0.453	25.000	0.629
8.000	0.083	25.000	0.265	29.000	0.464		
9.000	0.095	23.000	0.276	29.000	0.475		
9.000	0.107	25.000	0.286	29.000	0.487		
10.000	0.118	25.000	0.298	29.000	0.498		
11.000	0.129	26.000	0.308	29.000	0.509		
12.000	0.141	27.000	0.320	29.000	0.520		
13.000	0.152	28.000	0.331	29.000	0.531		
14.000	0.163	29.000	0.343	29.000	0.542		
15.000	0.174	29.000	0.376	29.000	0.554		
16.000	0.185	29.000	0.388	29.000	0.565		

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B8-2c
Material Description
Very Dark Bluish Gray Clayey SAND (SC)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	126.2
Dry Density (pcf)	100.3
% Moisture	25.8

Unconfined Compressive Strength (tsf) **0.44**

Unconfined Compression Test
ASTM D 2166-00

Project Name	Arcata Trail Project		
Project Number	1873.1		
Sample	B8-7c	Depth	36.0-36.5
Sample Description	Very Dark Bluish Gray Lean CLAY (CL)		
Date	11/12/2009	Tested By:	KISB

Moisture Density

Original Sample Length	5.80
Original Diameter (in)	2.38
Sample Area (in^2)	4.44
Sample Weight (g)	688.30
Wet Sample Weight (g)	385.90
Tare Number	SS
Tare Weight (g)	104.80
Dry Sample Weight (g)	277.80
Dry Weight (g)	173.0
Water Weight (g)	108.1
Percent Moisture (%)*	62.5
Wet Density (pcf)	101.7
Dry Density (pcf)	62.6

Remarks: * % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

Test Results

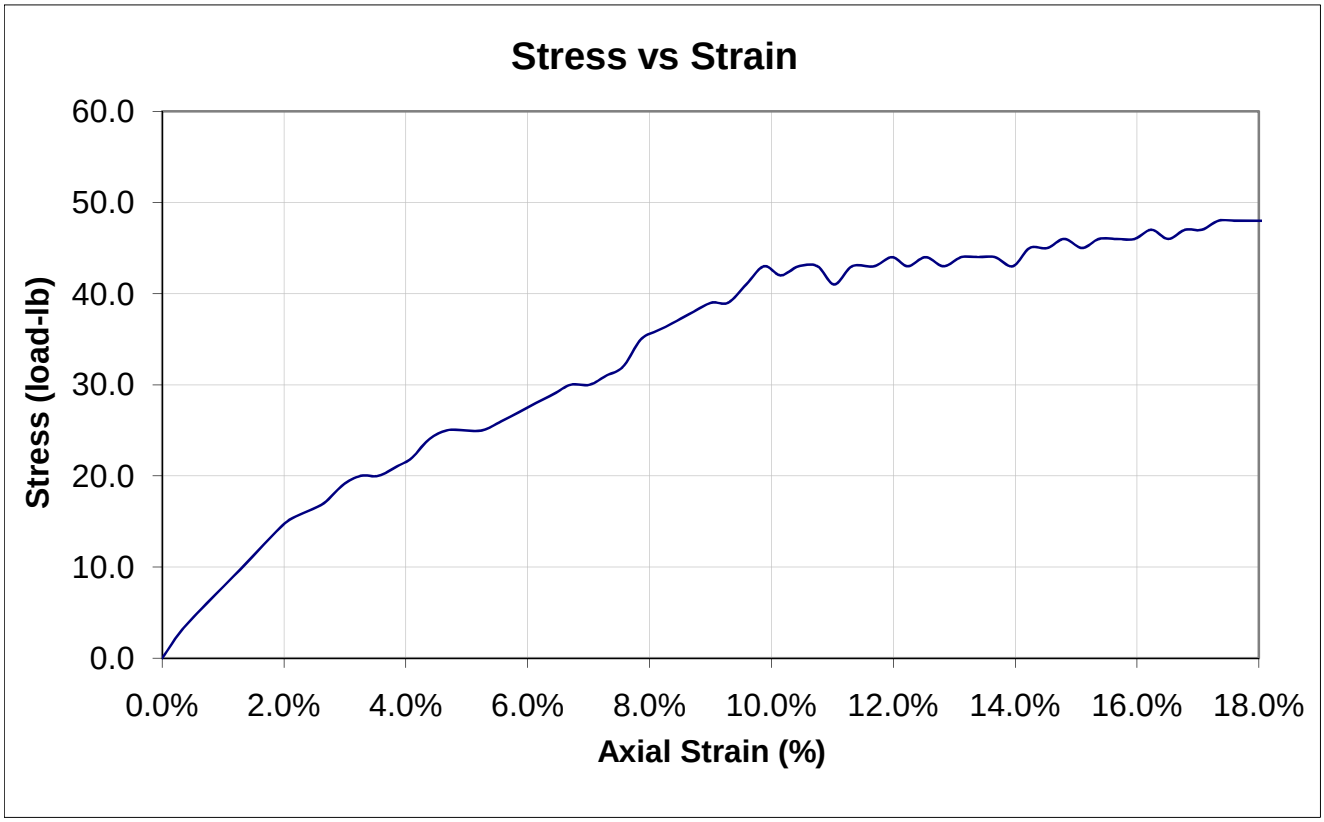
Maximum Load (lb)	48.0
Deflection at Max. Load (in)	1.006
Axial Strain at Max. Load	17.3%
Average Cross-Sectional Area (in^2)	5.37
Compressive Strength (tsf)	**0.64**

Unconfined Compression Test Readings

Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading
3.000	0.018	25.000	0.288	41.000	0.556	45.000	0.826
5.000	0.034	25.000	0.305	43.000	0.573	45.000	0.843
7.000	0.051	26.000	0.323	42.000	0.589	46.000	0.859
9.000	0.068	27.000	0.340	43.000	0.606	45.000	0.876
11.000	0.085	28.000	0.356	43.000	0.624	46.000	0.892
13.000	0.101	29.000	0.373	41.000	0.640	46.000	0.909
15.000	0.119	30.000	0.389	43.000	0.657	46.000	0.926
16.000	0.136	30.000	0.407	43.000	0.678	47.000	0.942
17.000	0.154	31.000	0.423	44.000	0.695	46.000	0.958
19.000	0.172	32.000	0.439	43.000	0.710	47.000	0.974
20.000	0.189	35.000	0.456	44.000	0.727	47.000	0.990
20.000	0.206	36.000	0.473	43.000	0.744	48.000	1.006
21.000	0.223	37.000	0.490	44.000	0.761	48.000	1.023
22.000	0.238	38.000	0.506	44.000	0.777	48.000	1.039
24.000	0.254	39.000	0.523	44.000	0.793	48.000	1.056
25.000	0.271	39.000	0.539	43.000	0.810	48.000	1.072

Project
Arcata Trail Project
Project Number
1873.1
Sample Number
B8-7c
Material Description
Very Dark Bluish Gray Lean CLAY (CL)
Tested By
KISB

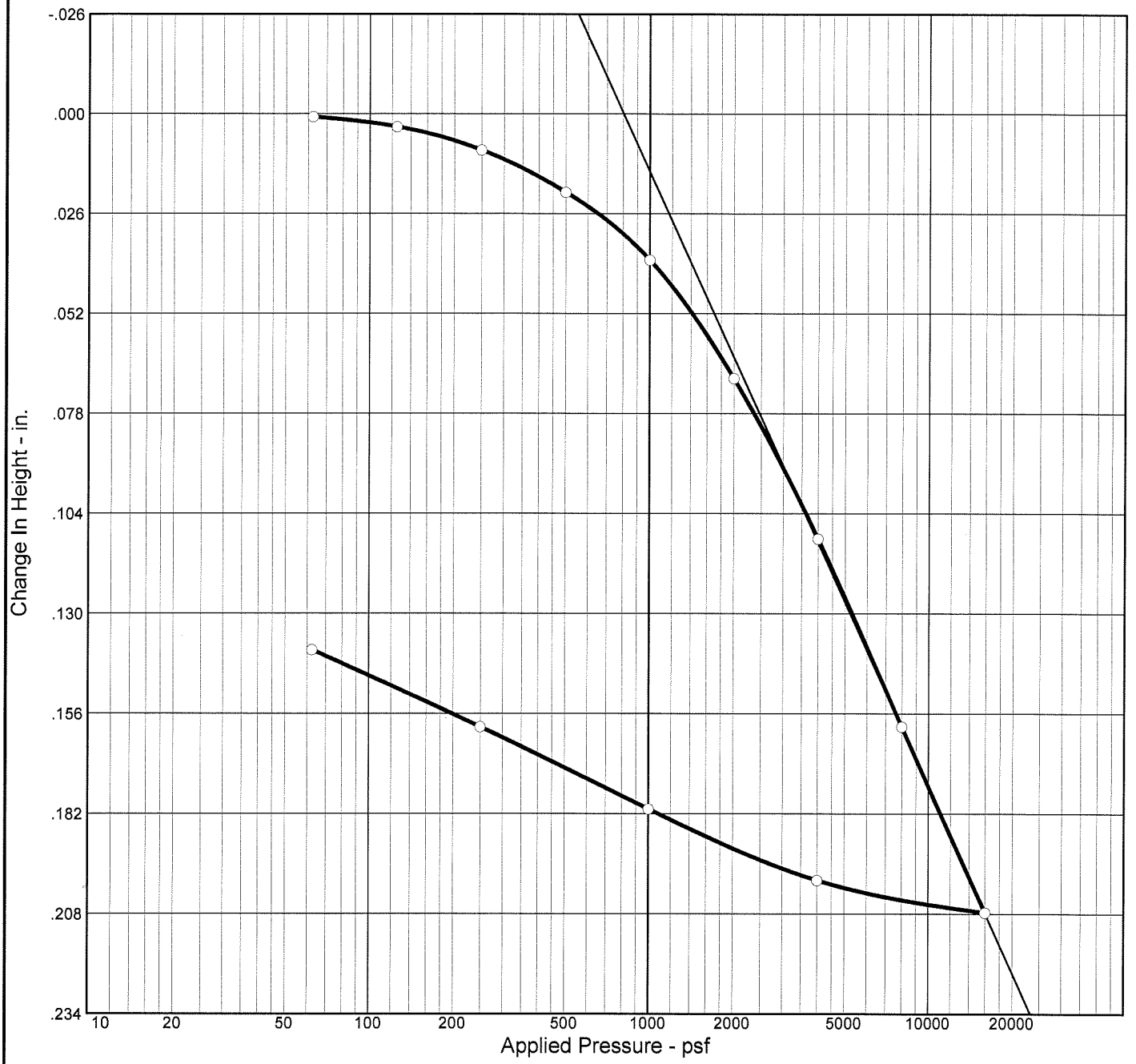
ASTM D 2166-00



Wet Density (pcf)	101.7
Dry Density (pcf)	62.6
% Moisture	62.5

Unconfined Compressive Strength (tsf) **0.64**

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.3 %	54.3 %	68.7	56	29	2.7	300	1551	0.54	0.10	1.523

MATERIAL DESCRIPTION	USCS	AASHTO
Greenish black Fat CLAY	CH	

Project No. 1873.1 **Client:** Winzler and Kelly

Project: Arcata Trail Project

Source: Boring B1 **Sample No.:** 1b **Elev./Depth:** 4.5-5.0'

Blackburn Consulting

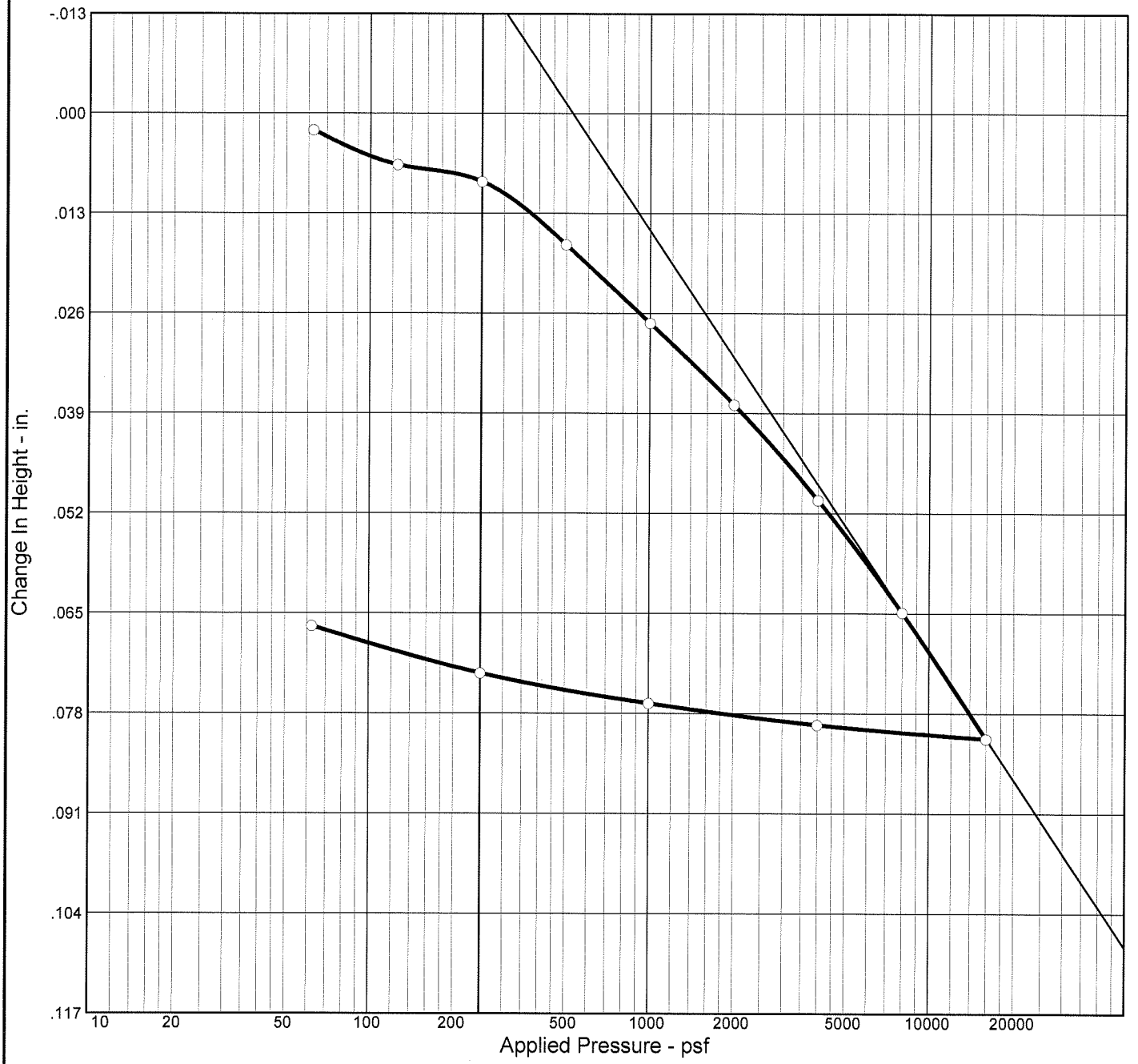
W. Sacramento, CA

Remarks:

97.7% Fines, Liquidity Index = 0.9

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
88.0 %	19.1 %	107.9	NV	NP	2.7	1100	921	0.12	0.01	0.588

MATERIAL DESCRIPTION	USCS	AASHTO
Bluish black SILTY SAND	SM	A-4(0)

Project No. 1873.1 **Client:** Winzler and Kelly

Project: Arcata Trail Project

Source: Boring B4 **Sample No.:** 3b **Elev./Depth:** 15.5-16.0'

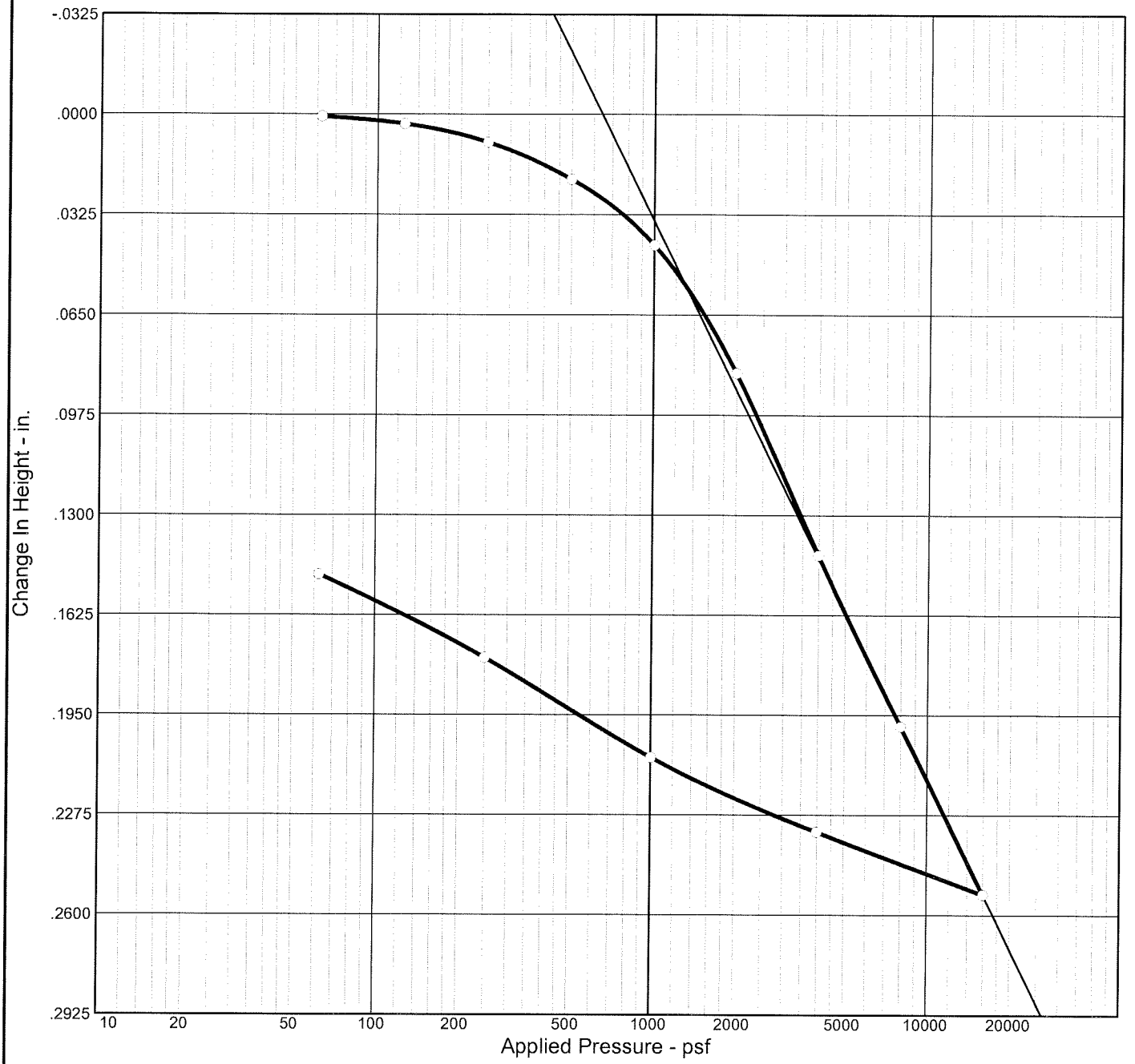
Blackburn Consulting

W. Sacramento, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.3 %	71.7 %	57.0	96	59	2.7	500	1145	0.73	0.17	2.010

MATERIAL DESCRIPTION	USCS	AASHTO
Very dark greenish gray Fat CLAY with organics	CH	

Project No. 1873.1 **Client:** Winzler and Kelly

Project: Arcata Trail Project

Source: Boring B5 **Sample No.:** 2b **Elev./Depth:** 9.5-10.0'

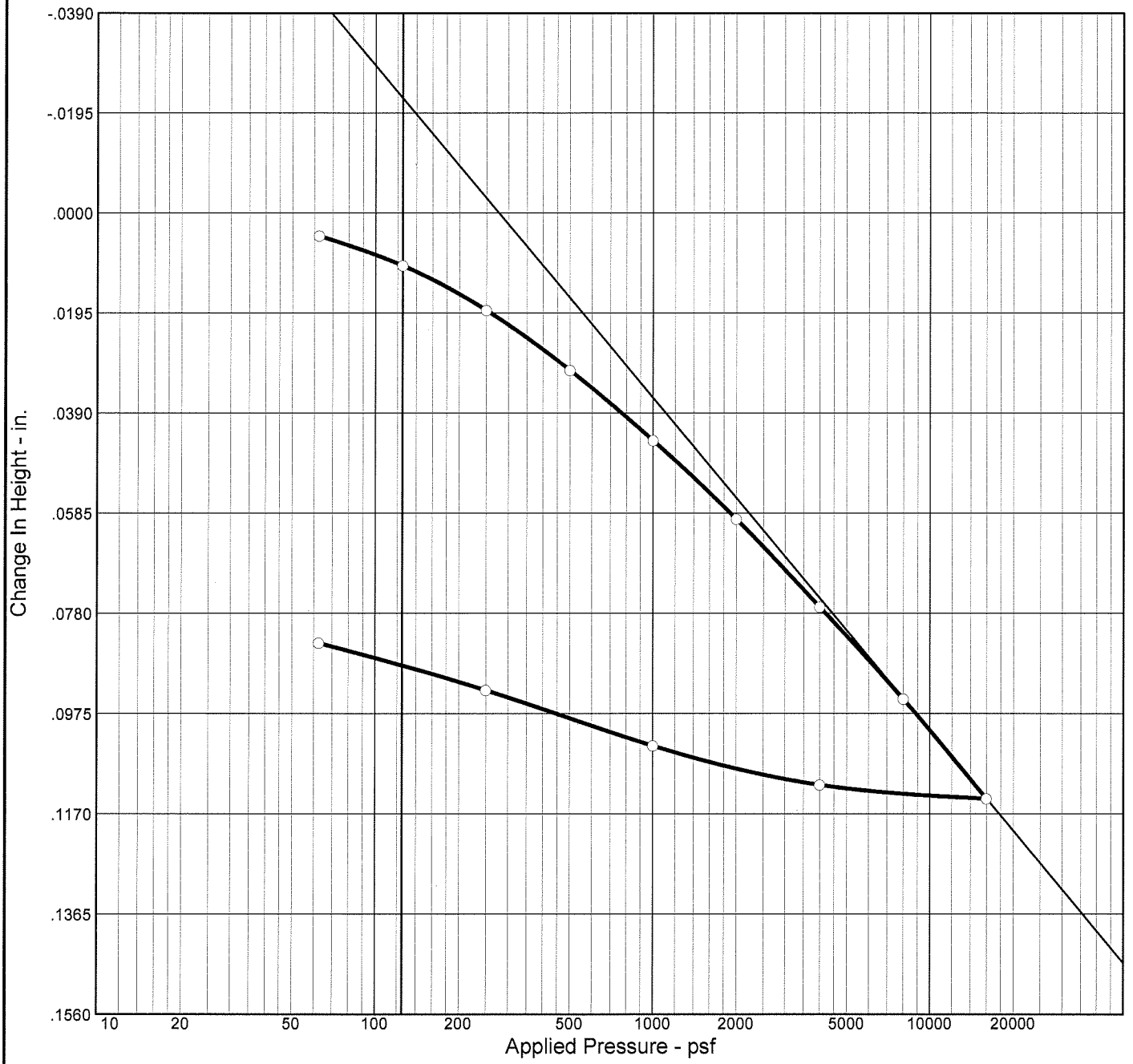
Blackburn Consulting

W. Sacramento, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
118.0 %	30.2 %	97.7	31	12	2.7	1100	516	0.15	0.03	0.691

MATERIAL DESCRIPTION	USCS	AASHTO
Greenish black Lean CLAY with SAND & some organics	CL	

Project No. 1873.1 **Client:** Winzler and Kelly

Project: Arcata Trail Project

Source: Boring B7 **Sample No.:** 2c **Elev./Depth:** 11.0-11.5'

Blackburn Consulting

W. Sacramento, CA

Remarks:

Figure

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/13/2009
Date Submitted 11/09/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

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

The reported analysis was requested for the following location:
Location : 1873.1/ARCATA TRAIL Site ID : B3-3B.
Your purchase order number is 1873.1.
Thank you for your business.

* For future reference to this analysis please use SUN # 57006-115352.

EVALUATION FOR SOIL CORROSION

Soil pH	7.42	
Minimum Resistivity	0.23 ohm-cm (x1000)	
Chloride	1115.0 ppm	00.11150 %
Sulfate	114.0 ppm	00.01140 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/13/2009
Date Submitted 11/09/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

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

The reported analysis was requested for the following location:
Location : 1873.1/ARCATA TRAIL Site ID : B5-3B.
Your purchase order number is 1873.1.
Thank you for your business.

* For future reference to this analysis please use SUN # 57006-115353.

EVALUATION FOR SOIL CORROSION

Soil pH	8.15	
Minimum Resistivity	0.09 ohm-cm (x1000)	
Chloride	4228.1 ppm	00.42281 %
Sulfate	248.0 ppm	00.02480 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/13/2009
Date Submitted 11/09/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

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

The reported analysis was requested for the following location:
Location : 1873.1/ARCATA TRAIL Site ID : B6-4B.
Your purchase order number is 1873.1.
Thank you for your business.

* For future reference to this analysis please use SUN # 57006-115354.

EVALUATION FOR SOIL CORROSION

Soil pH	8.21	
Minimum Resistivity	0.27 ohm-cm (x1000)	
Chloride	1088.1 ppm	00.10881 %
Sulfate	19.2 ppm	00.00192 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

APPENDIX C

As-Built Log of Test Borings (Caltrans):

Jacoby Creek (10/4/55)

Gannon Slough (10/4/55)

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.			40	46

F-75 (7)

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
I	Hum	101		6	6

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

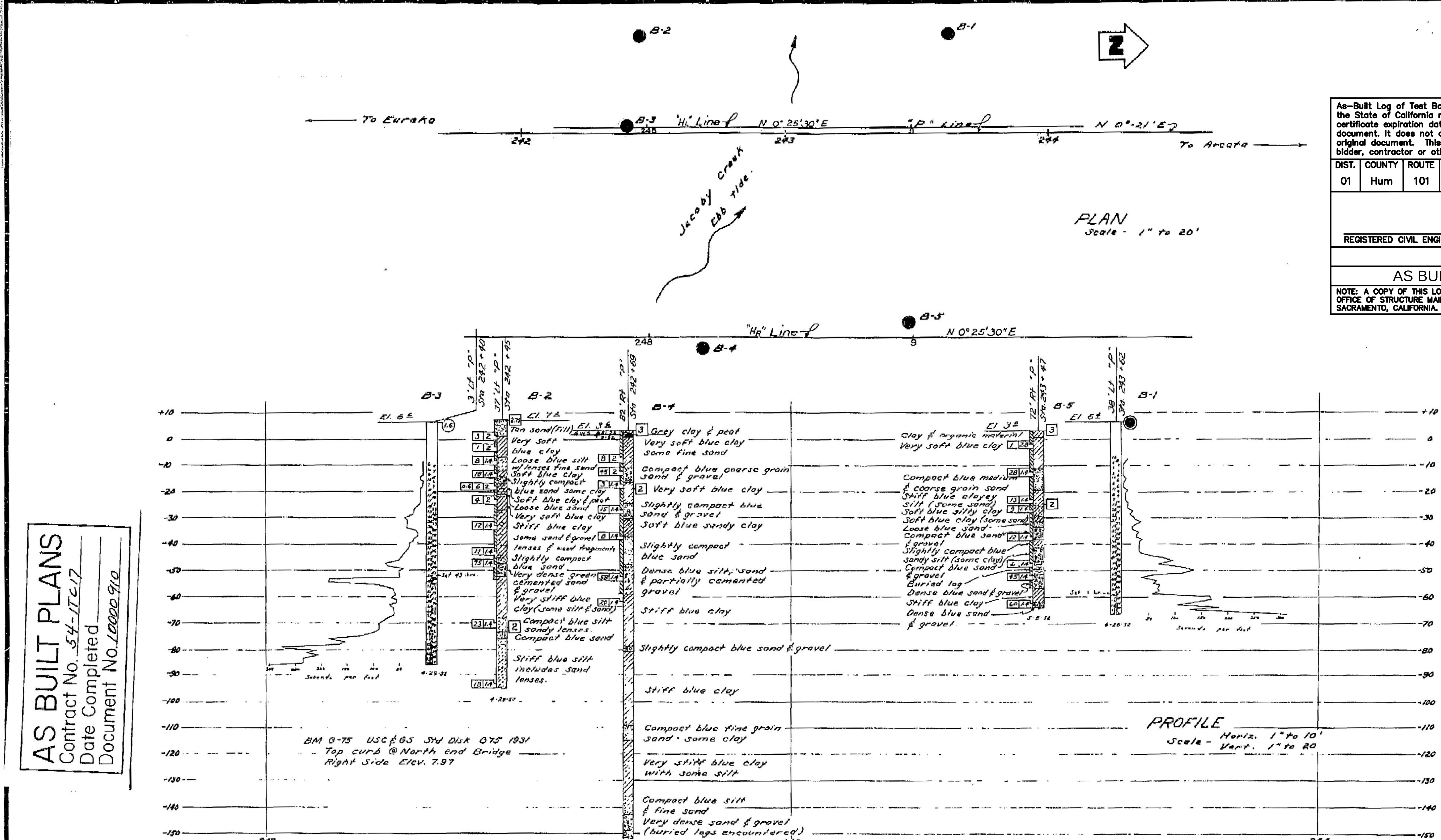
JACOBY CREEK BRIDGE

AS BUILT LOG OF TEST BORINGS 1 of 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.

CU: 01
EA:
BRIDGE NO.
SHEET OF

REGISTERED PROFESSIONAL ENGINEER
RICHARD D. SOWERS
No. C38788
Exp. 03/31/11
CIVIL
STATE OF CALIFORNIA



AS BUILT PLANS
Contract No. 54-1TC17
Date Completed
Document No. 10000910

AS BUILT
CORRECTIONS BY
DATE

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

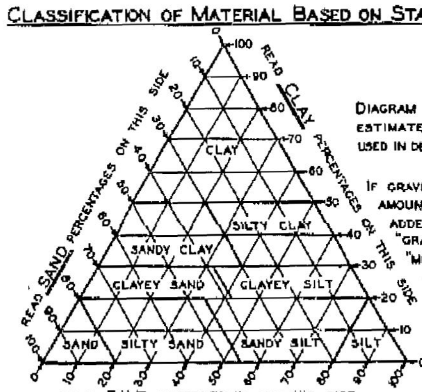


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES

IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND", THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- GRAVEL
- SAND
- SILT
- CLAY
- SANDY CLAY OR CLAYEY SAND
- SANDY SILT OR SILTY SAND
- SILTY CLAY OR CLAYEY SILT
- PEAT AND/OR ORGANIC CLAY
- FILLED MATERIAL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PENETROMETER
- 2½" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT

1" SOIL TUBE: Top Hole El., Location, B-No, Blows per foot (Using — lb hammer with 12" free fall), Description of material, Groundwater surface, Pulled pipe, Sample taken, Date

ROTARY BORING: Top Hole El., Location, B-No, Casing set, Description of material, Size of sampler (inches), Unconfined compressive strength (T/sq ft), % Moisture, Consolidation Test, Unit wt. (#/cu. ft), Blows per foot (Using a 140 lb hammer with 30" drop, unless otherwise specified), Conformable material change, Estimated, Unconformable, Date

NOTES

THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.

CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A Nº 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

JACOBY CREEK

LOG OF TEST BORINGS

SCALE: As noted BRIDGE 4-23R FILE DRAWING C-2942-6

PREL. DRAWING No P-2942 17 28

BRIDGE DEPARTMENT

FIELD STUDY / DRAWN / CHECKED / Approval Recommended by

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	Hum	101	84.6/84.9	30	30

TO ACCOMPANY PLANS DATED

GEOTECHNICAL PROFESSIONAL

REGISTERED PROFESSIONAL ENGINEER — LINO C. CHEANG — No. C41401 — Exp. 9-30-99 — CIVIL — STATE OF CALIFORNIA

5-13-96
PLANS APPROVAL DATE

Earth Mechanics, Inc.
17660 Newhope Street, Suite E
Fountain Valley, Ca. 92708

LeBuono, Armstrong & Associates
601 University Avenue, Suite 274
Sacramento, Ca. 95825

Note:
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this sheet.

Note The As-built log of Test Borings Sheets were used to prepare the Geotechnical Report.

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

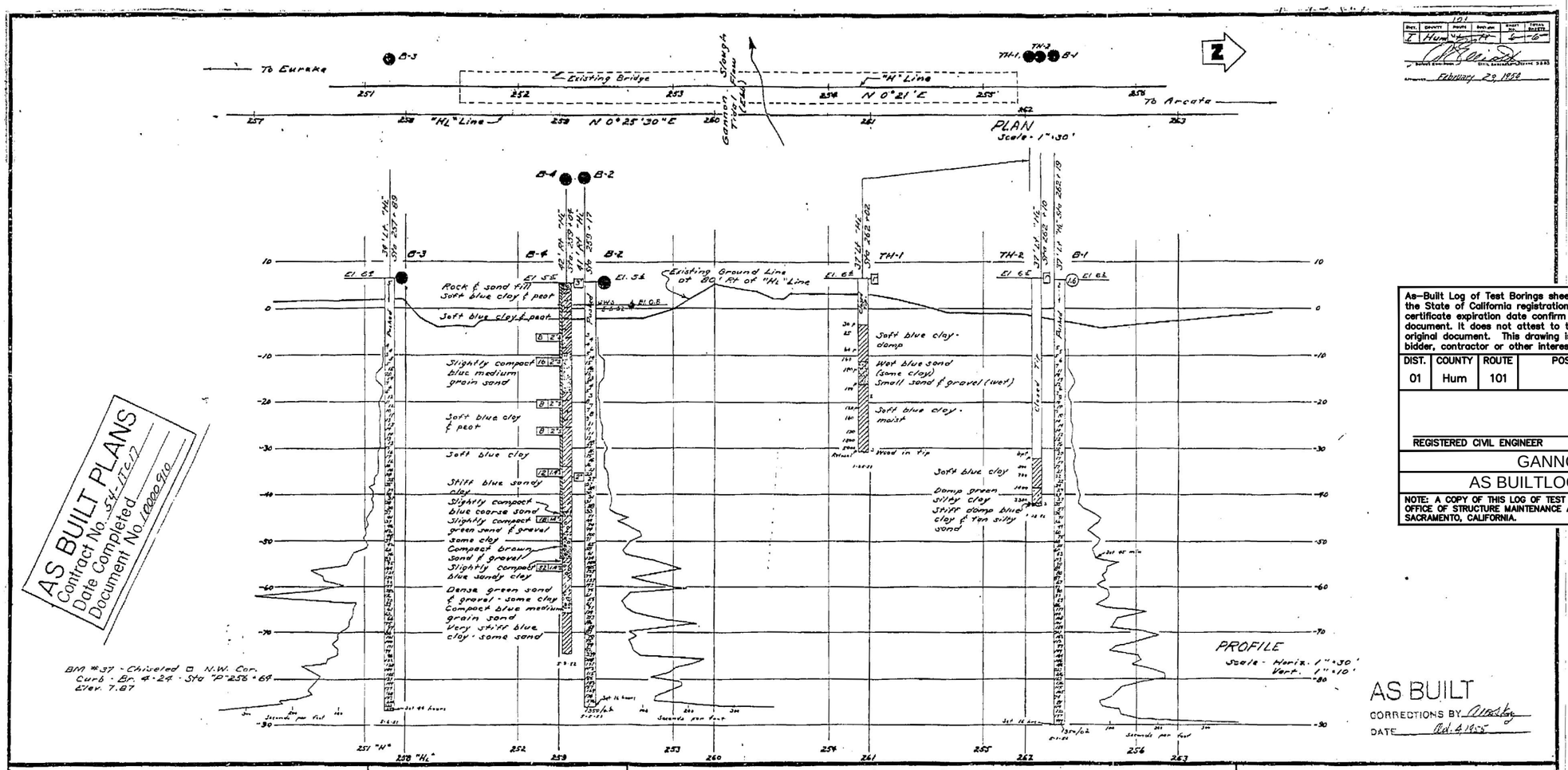
GANNON SLOUGH BRIDGE

AS BUILTLOG OF TEST BORINGS 2 of 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA. CU: 01 EA: BRIDGE NO. SHEET OF

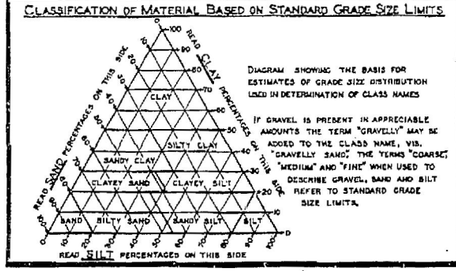
REGISTERED PROFESSIONAL ENGINEER — RICHARD D. SOWERS — No. C38788 — Exp. 03/31/11 — CIVIL — STATE OF CALIFORNIA

AS BUILT PLANS
Contract No. 5K-1712
Date Completed
Document No. 1000910



AS BUILT
CORRECTIONS BY Mosley
DATE Rel. 4/1995

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS



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- AUGER BORING (DRY)
- JET BORING
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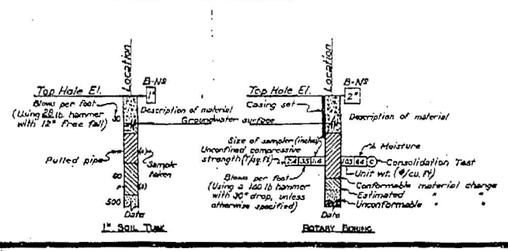
- TEST PIT



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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GANNON SLOUGH

LOG OF TEST BORINGS

SCALE As Noted	BRIDGE 4-24	FILE	DRAWING 5-2946-6

AS BUILT
CORRECTIONS BY _____
CONTRACT NO. _____
DATE _____

EARTHQUAKE RETROFIT PROJECT NO. 323.3

GANNON SLOUGH BRIDGE REPLACEMENT

AS-BUILT LOG OF TEST BORINGS

A. BOUTROS DESIGN OVERSIGHT	NOTE: ADDITIONAL AS-BUILT FOUNDATION DATA MAY BE AVAILABLE AT THE OFFICE OF TRANSPORTATION MATERIALS AND RESEARCH 5900 FOLSOM BOULEVARD, SACRAMENTO, CALIFORNIA 95819	DESIGN BY A. LIM	CHECKED B. POTEET	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO. 04-0024L
SIGN OFF DATE 4/22/96		DETAILS BY T. WALTZ	CHECKED R. QUINONES	Steve L. Mellon PROJECT ENGINEER	POST MILE 84.70
		QUANTITIES BY T. WALTZ	CHECKED B. GREEN	CU 01 EA 328811	DISREGARD PRINTS BEARING EARLIER REVISION DATES →

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 4

REVISION DATES (PRELIMINARY STAGE ONLY) | SHEET 13 | OF 13

1/21/2010 16:51:10 TB 2 OF 2 Gannon Slough Bridge As Built.dwg