GEOTECHNICAL INVESTIGATION
SHARP CHULA VISTA
ENTRANCE BUILDING
MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

Prepared For:

SHARP HEALTHCARE
8695 Spectrum Center Boulevard
San Diego, California 92123

Project No. 603541-003

December 18, 2015

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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To: Sharp HealthCare
8695 Spectrum Center Boulevard
San Diego, California 92123

Attention: Ms. Pat Nemeth

Subject: Geotechnical Investigation, Proposed Entrance Building, Sharp Chula Vista Medical Center Master Plan, Chula Vista, California

In accordance with your request and authorization, we have prepared this supplemental geotechnical study for the proposed Entrance Building located within the Master Plan of the Sharp Chula Vista Medical Center located in Chula Vista, California. Our study includes providing site specific design information for the proposed Entrance Building structure which is a part of the Master Plan.

Based on the results of our original study (Leighton, 2013b) and this additional study, it is our continued opinion that the proposed project is feasible provided the geotechnical recommendations contained in this report are implemented during design and construction of the proposed Entrance Building.

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If you have any questions regarding our report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

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APPENDICES

1.0 INTRODUCTION

In accordance with your request and authorization, we have prepared this supplemental geotechnical study for the proposed Entrance Building located within the Master Plan of the Sharp Chula Vista Medical Center located in Chula Vista, California. Our study includes providing site specific design information for the proposed Entrance Building structure which is a part of the Master Plan. This report presents our findings, conclusions and recommendations for the Entrance Building with regard to geotechnical conditions.

1.1 Purpose and Scope

Specifically, the purpose of our investigation was to identify and evaluate the geologic hazards and significant geotechnical conditions present at the site in order to provide geotechnical recommendations for the proposed structures and associated site improvements associated with the Entrance Building. Taking into consideration previously completed geotechnical work at the site (Appendix A), our scope of services included:

- Prior to our subsurface exploration, we notified Underground Service Alert (USA) to screen the proposed exploration locations for the presence of subsurface utilities.
- We performed a subsurface evaluation consisting of drilling, logging, and sampling of three (3) exploratory borings. At the completion of drilling, the borings were backfilled with bentonite grout (per DEH standards) and patched as appropriate.
- We conducted geotechnical laboratory testing on selected soil samples. We performed lab testing consisting of dry unit weights, moisture contents, direct shear, grain size, and corrosivity tests including - minimum electrical resistivity, pH, and water soluble sulfates and chlorides content tests.
- Preparation of this report presenting our findings, conclusions, and geotechnical recommendations with respect to the proposed geotechnical design, site grading and general construction considerations. Specifically, this report provides the following:
  - ➢ Vicinity map and site plan showing approximate locations of soil borings;
  - ➢ Logs of soil borings, and laboratory test results;

- Discussion of the site and subsurface conditions;
- Discussion of field exploration methods and laboratory test procedures;
- Discussion of faulting and seismicity in the region;
- Discussion of potential geologic hazards, which may impact the site;
- Site Classification type and Site Coefficients based on 2013 California Building Code (CBC).
- Discussion of anticipated excavation conditions;
- Soil parameters and recommendations for design of temporary shoring;
- Discussion of groundwater conditions, need for temporary dewatering, if any, and preliminary dewatering information, if any;
- Guidelines for earthwork construction, including recommendations for site preparation, fill and backfill placement, and compaction;
- Discussion of the possible foundation types;
- Soil parameters for foundation design;
- Estimated foundation settlements;
- Lateral earth pressures for design of permanent basement walls; and
- A preliminary screening of the soil properties affecting corrosion of concrete and steel;
- Preliminary pavement design;

1.2 Site Location and Description

The Entrance Building Project is located within the Sharp Chula Vista Master Plan area at 751 Medical Center Court (APN 641-010-28). The Sharp Chula Vista Master Plan area is currently occupied with the existing hospital, subsidiary structures, new parking structure, parking deck structure, surface parking, and several new segmental retaining walls, new loop road and utility corridor, and other site improvements. The above described new improvements have been constructed under the geotechnical observation of Leighton.

With regard to topography, the Entrance Building is located in the upper portion of the Master Plan property situated along the top of a hill at a topographic elevation of approximately 455 feet above mean sea level (msl). The topographically lowest portion of the Entrance Building site is located adjacent to the existing hospital structure at approximately 445 feet msl located approximately 40 feet to the south.

The Entrance Building footprint is bound along the north by a moderately sloping descending cut slope. Based on our review of the topographic data the cut slope is approximately 33-feet high at an inclination of approximately 2.2:1 (horizontal:vertical). Along the southern portion of the site a descending approximately 10 foot high 2:1 (horizontal:vertical) slope descends to the existing hospital structure (Plate 1).

Total topographic relief across the property is approximately 60 feet, with an average elevation difference across the portion of the campus proposed for improvements at approximately 30 feet. In general, the overall property is located on a topographic hill and descends southward and westward toward existing medical office facilities and the Birch Patrick Convalescent Facility.

Site Coordinates:

Latitude:	32.6196º N
Longitude:	117.0233º W

1.3 Project Description

Based on our review of conceptual site plans by Degenkolb and discussions with members of the project team, we understand that the new Entrance Building will be seismically separate from the north main hospital structure and the proposed Ocean View Tower (Figure 2 and Plate 1). The Entrance Building structure will have a canopy providing access from a new loop road, landscaping, ambulance access to the hospital and emergency drop off area, with canopy. The Entrance Building will include a non-isolated basement wall at the north edge to retain soil for the first level. The structure is proposed to consist of one level below grade and one level above grade. The finish floor elevation of the lower level is planned at 437.6 feet msl.

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

The subsurface exploration performed for this geotechnical investigation consisted of the excavation, logging, and sampling of three (3) exploratory hollow-stem borings (Borings B-21 through B-23) within the vicinity of the new Entrance Building. The approximate locations of the exploration borings are shown on Figure 2 and Plate 1. The purpose of the borings was to investigate the underlying stratigraphy, physical characteristics, and specific engineering properties of the soils within the area of the proposed Entrance Building improvements. In addition we have also plotted the locations of borings from our previously completed explorations (Appendix A) which consisted of the excavation of approximately 21 borings across the Master Plan area.

2.1 Exploratory Borings

Borings for this study were excavated to depths between approximately 22 feet to 31 feet below the existing ground surface (bgs). The boring explorations were generally performed using a heavy duty truck mounted hollow-stem auger drill rig, with 8-inch diameter continuous flight auger. During the exploration operations, a Geologist from our firm prepared geologic logs and collected bulk and relatively undisturbed samples for laboratory testing and evaluation. After logging, the excavations were backfilled with bentonite grout and patched where appropriate. In addition for reference, we have included boring logs previously completed explorations provided in Appendix B.

2.2 Previous Exploratory Trenches

Leighton Consulting (2013a) previously excavated six trenches to provide coverage for potential faulting within portions of the Master Plan area (Appendix H). The trenches totaled approximately 1,100 lineal feet. Trench depths ranged between 7 and 15 feet with an average depth of approximately 7 feet. In addition, two additional fault studies have been completed at the site. Specifically, the existing Main Hospital facility was relocated to a position where minor faults did not transect the new facility footprint (Woodward-Gizenski & Associates, 1973), and a Geocon (1998) study indicated the presence of minor faults located in the southeastern parking area west of the existing medical office building (MOB) prompting relocation of that new MOB facility to avoid the mapped minor faults. The locations of these previously completed trenches are depicted on Figure 2 and Plate 1. No faults are mapped transecting or projecting toward the Entrance Building area.

2.3 Previous Exploration

Previous geotechnical reports have been performed within the site and site area. The following reports (ordered chronologically) were reviewed as part of our background study for the project:

- Leighton, 2014, Geotechnical Review of Revised Grading Plan, Sharp Chula Vista, Medical Center Master Plan, Chula Vista, California, dated April 23.

- Leighton, 2013b, Geotechnical Investigation, Sharp Chula Vista Medical Center Master Plan, Chula Vista, California, revised August 29.
- Leighton, 2013a, Fault Hazard Study, Sharp Chula Vista Medical Center Master Plan, Chula Vista, California, January 31, 2013.
- Leighton and Associates, 2008, Fault Hazard Study, Proposed Senior Care Campus at Vista Hill, 730 Medical Center Court, Chula Vista, California, dated June 23.
- URS, 2006, Updated Geotechnical Evaluation, Sharp Chula Vista Medical Center, Chula Vista, California, dated August 10, revised February 8, 2007
- Geocon, 1998, Geotechnical Investigation, Chula Vista Medical Plaza Medical Office Building, Chula Vista, California, dated November 19.
- Leighton and Associates, 1996, Evaluation of Faulting and Seismicity, Proposed Veteran's Home, Chula Vista, California, dated July 2.
- Woodward-Clyde, 1989, Geotechnical Investigation for the Proposed Additions to the Main Hospital and Overhead Parking Deck, Community Hospital of Chula Vista, Chula Vista, California, dated April 25.
- Robert Prater Associates, 1988, Fault Location Study, Vista Hill Hospital Expansion, RTC, CDU, and Support Buildings, Chula Vista, California, dated September 21.
- Robert Prater Associates, 1988, Radiocarbon Dating Analysis, Vista Hill Hospital Expansion, RTC, CDU, and Support Buildings, Chula Vista, California, dated October 20.

- Woodward-Clyde Consultants, 1986, Fault and Geologic Hazards Investigation, Proposed Vista Hill Hospital Expansion, San Diego County, California, dated September 2.
- Woodward-Clyde, 1984, Geotechnical Investigation for the Proposed South Bay Community Convalescent Hospital of Chula Vista, California, dated April 20.
- Woodward-Gizenski & Associates, 1973, Additional Engineering and Geological Study, General Hospital Facility, Community Hospital of Chula Vista, California, dated March 15.

Our review of the consultant reports referenced above, along with our review of available geologic literature, indicates that the Entrance Building site area is not transected faults and is generally underlain by dense sandstone of the Pliocene-age San Diego Formation.

2.4 Geotechnical Laboratory Testing

Laboratory testing performed on soil samples representative of on-site soils obtained during the recent subsurface exploration included tests of moisture and density, shear strength, grain size, and a screening geochemical analysis for corrosion. A discussion of the laboratory tests performed and a summary of the laboratory test results are presented in Appendix C. In-situ moisture and density test results are provided on the boring logs (Appendix B). In addition, for reference, we have included laboratory testing from previously completed studies (Appendix A) pertinent to the site.

3.0 SUMMARY OF GEOLOGIC CONDITIONS

3.1 Geologic and Tectonic Setting

The site is located in the coastal section of the Peninsular Range Province, a geomorphic province with a long and active geologic history throughout Southern California (Norris and Webb, 1990). Throughout the last 54 million years, the area known as the “San Diego Embayment” has undergone several episodes of marine inundation and subsequent marine regression, resulting in the deposition of a thick sequence of marine and nonmarine sedimentary rocks (Figure 3) on the basement rock of the Southern California batholith (Kennedy and Tan, 2008).

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest (Jennings, 2010). Several of these faults are major active faults. The Whittier-Elsinore, San Jacinto, and San Andreas faults are major active fault systems located northeast of the study area and the Agua Blanca-Coronado Bank and San Clemente faults are active faults located west of the project area (Figure 4). Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement.

3.2 Local Geologic Setting

During Eocene time, sediments located east of the site were eroded and then deposited in a westerly direction within deep-water fan and delta environments, while uplift of basement materials to the west resulted in deposition of coarse-grained sediments eastward. Simultaneously, additional uplift along the east then resulted in continued deposition of alluvial fan deposits westward. The site is located near the western limits of a broad structural trough formed by downwarping and normal faulting along the Rose Canyon fault system and the La Nacion Fault Zone (LNFZ) see Figure 5.

Gradual emergence of the region from the sea occurred in Pleistocene time, and numerous wave-cut platforms, most of which were covered by relatively thin marine and nonmarine terrace deposits, formed as the sea receded from the land. Specifically, the site is located in an area where deep-water fan and delta environments have now been exposed due to continued uplift, faulting and erosion. Accelerated fluvial erosion during periods of heavy rainfall, coupled with the lowering of the base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms we see in the general site area today

3.3 Site-Specific Geology

Based on the site specific subsurface exploration, and our review of pertinent geologic literature and maps, the site is generally underlain by a thin layer of documented fill, Late Pleistocene-age Old Paralic Deposits and Pliocene-age San Diego Formation. A brief generalized description of each of these units as encountered in the exploration borings are presented below. Detailed descriptions are presented on the exploration boring logs (Appendix B). The lateral and vertical extent of the geology underlying the site are depicted on Plates 1 and 2.

3.3.1 Documented and Undocumented Fill (Af and Afu)

Minor fill soils placed along the northern portion of the site were placed during grading operations for the recently completed loop road and were observed by Leighton Consulting. Where fills are generally less than 5 feet in thickness they are not depicted on the Geotechnical Map (Plate 1). An as-graded report summarizing the compaction results of the documented fill (Af) across the site is pending. However, Plate 1 summarizes the mapped extent of the documented fill with bottom of excavation elevations provided. Elsewhere, and away from the proposed Entrance Building footprint, generally undocumented fill (Afu) soils were placed during the initial mass grading of the site in the 1970s, and later in the 1980s and 1990s. The majority of the undocumented fill in the eastern portion of the site was removed during remedial grading for the Loop Road. However, areas of fill where left in place where underlain by utilities or anticipated to be outside of proposed improvements associated with the Loop Road. These areas where fill was left in place are also depicted on Plate 1 and are generally depicted with dotted lines as the undocumented fill is buried. Outside of the proposed Entrance Building, fills deeper than 5 feet are located in the northwestern portion of the site, northwest of the existing parking deck. As encountered in the borings, the fill soils generally consisted of brown to dark brown, dry to moist, loose to medium dense, silty sands.

3.3.2 Very Old Paralic Deposits (Qvop)

As encountered in our boring excavations, these deposits generally consisted of light to medium brown silty sandstone with scattered interbedded cobble-gravel conglomerate and coarse-grained sandstone, dry to damp, very dense. Locally light reddish brown zones were present. This unit was encountered within the three borings excavated. The Very Old Paralic Deposits are middle to early Pleistocene in age and correlate to the Lindavista Formation.

3.3.3 San Diego Formation (Tsdss)

As encountered in our boring excavations, the San Diego Formation generally consisted of fine- to locally medium-grained sandstones. The sandstones encountered during our study were generally light brown to light olive brown, damp to moist, dense to very dense, slightly cemented and friable to very friable. Typically, the unit was micaceous, contained various amounts of iron oxide staining, scattered zones of abundant carbonate blebs, stringers, and infilled fractures. Locally the San Diego Formation contains very dense siltstone and hard claystone interbedded layers and cemented sandstone. It should be noted that well cemented sandstone was encountered in Borings B-21, B-22 and B-23 at an elevation of approximately 425 to 430 msl. The San Diego Formation is early Pleistocene to Pliocene in age.

3.4 Geologic Structure

Based on our field observations and subsurface exploration, the site is underlain by favorably oriented geologic structure consisting of generally massive fine-grained sandstone of the San Diego Formation. Specifically, our review of pertinent geologic references (Appendix A), and the results of our previous subsurface trench exploration (Appendix H), bedding within the San Diego Formation is generally flat lying with localized dips of between 3 to 5 degrees south to southwest.

3.5 Landslides

Several formations within the San Diego region are particularly prone to landsliding. These formations generally have high clay content and mobilize when they become saturated with water. Other factors, such as steeply dipping bedding that project out of the face of the slope and/or the presence of fracture planes, will also increase the potential for landsliding.

No landslides or indications of deep-seated landsliding were indicated at the site during our field exploration or our review of available geologic literature, topographic maps, and stereoscopic aerial photographs (Appendix A). Furthermore, our field reconnaissance, review of City of Chula Vista hazard maps (Figure 6), and review of Soil-Slip Susceptibility Maps (USGS, 2003), indicate the site is mapped has having a low susceptibility to soil slip. However, based on CGS, 1995, Open-File Report 95-03, the site is mapped as “3-1 – Generally Susceptible” to landslides. Therefore, we have performed slope stability analysis for the site slopes. Additional discussion of slope stability is discussed in the following sections of this report. It should be noted that the closest mapped landslide is approximately 2,000 feet northeast of the site along the very steep northerly descending slope of Telegraph Canyon (CGS, 1995; and Kennedy and Tan 2008).

3.6 Slope Stability

Based on topographic data provided, the site is bound along the north by a moderately sloping cut slope within the San Diego Formation. Based on our review of the topographic data the cut slope is approximately 33-feet high at an inclination of approximately 2.2:1 (horizontal:vertical). Elsewhere, slightly sloping to moderately sloping natural topography also had no indication of slope failures.

At the time of drafting this report, proposed grading plans for the site were not available for our review. However, based on the proposed location of the Entrance Building, we anticipate that proposed grading will consist of minor cuts and fills between 5 feet and 10 feet. Updated analysis should be performed based on Final designs. Our slope stability analysis for the site considered the existing and proposed site conditions. The slope stability calculations are presented in Appendix D.

Table 1 Soil Strength Parameters		
Soil Type	Friction Angle (degrees)	Cohesion (psf)
Very Old Paralic Deposits	33	300
San Diego Formation	39	100
Otay Formation	36	200
Anisotropic	12	150

Our deep-stability search routines considered surfaces analyzed using Spencer's Method of limit equilibrium analysis. In addition, the Otay Formation is generally considered a slide-prone formation in the San Diego area. Therefore, we have modeled presumptive clay seams within the Otay Formation based on observed and referenced data. Our model includes presumptive clay seams are oriented into the analyzed sections (having southwest dips) between 3 and 5 degrees (generally flat lying apparent dip for Cross Section D - D'), see Plate 2.

Pseudostatic slope stability analysis was performed using a seismic coefficient of 0.21 determined using the methods of Bray and Travasarou (2009). Specifically, the coefficient determination was based on a 5 cm median seismic displacement threshold for the design earthquake. The peak ground acceleration for the design earthquake equal to two-thirds of the site modified Geometric Mean Maximum Considered Earthquake was determined to be 0.25g. Since the characteristic period of the slide mass being analyzed is approximately 0.2 seconds, the anchoring formula presented as Eq. 11.4-5 in ASCE 7-10 was utilized to attain the design spectral acceleration from the design earthquake PGA. Deaggregation using the 2008 USGS deaggregation tool identified a modal magnitude of M_W 6.7 for the design earthquake acceleration. A 20 percent increase was considered for dynamic strengths for surfaces along presumptive clay seams. The slope stability calculations are presented in Appendix D. Our analysis indicated a static factor of safety of 1.5, or greater and pseudostatic slope stability of 1.0, or greater.

3.7 Expansive Soils

Based on our field observations, subsurface investigation, and laboratory testing, highly expansive soils were not observed at the site. However, localized more clayey expansive soils were observed at boring B-1 (Leighton, 2013b) at a depth between 10 and 15 feet below the ground surface. An expansion index test performed on representative clayey soils at the site indicated an Expansion Index of 62 and is classified as Medium. However, materials encountered in Borings B-21 through B-23 were granular and judged to possess very low to low expansion potential.

3.8 Hydrocollapse and Compressible Soils

Based on the results of our subsurface exploration, the potential for hydro-collapse of the underlying San Diego and Otay Formation is considered low at the site. Our opinion is supported by our observation of in-place drive samples which indicated a dense to hard, non-porous character for the underlying sandstone, siltstone, and claystone materials. Based on generally low sampler blow counts and visual observations, undocumented fill materials exhibit a potential for settlement under loading. As a result, where settlement sensitive improvements are planned, existing fill soils at the site are considered compressible. Therefore, measures to mitigate settlement potential are considered necessary during design and construction where undocumented fills are present. We anticipate that minor undocumented fills will be encountered below the proposed Entrance Building and shallow in place materials will be disturbed by demolition activities.

3.9 Soil Corrosivity

A screening of the onsite materials for corrosivity was performed to evaluate their potential effect on concrete and ferrous metals. The corrosion potential was evaluated using the results of laboratory testing on a representative soil sample obtained during our subsurface evaluation.

Laboratory testing was performed to evaluate pH, minimum electrical resistivity, and chloride and soluble sulfate content. A representative sample was tested. The sample tested had a measured pH of 7.17 and measured minimum electrical resistivity of 1,177 ohm-cm. Test results also indicated that the sample had a chloride content of 124 ppm, and soluble sulfate content of less than 0.0150 percent (by weight in soil). Previously completed tests (Leighton, 2013b) are also included in Appendix B.

3.10 Surface and Ground Water

Ground water was not encountered during our subsurface exploration. Based on site topography and Department of Water Resources well data, we estimate ground water is greater than 150 feet in depth (elevation 300 feet above msl) below the site. Based on site topography, surface water likely drains in various directions away from the center of the site which is generally located at the top of a topographic high. Perched ground water may develop on less permeable layers such as between the existing fill unit and the underlying San Diego and Otay Formation at the site, and on interbedded less permeable units such as claystone. It should be noted that ground water levels may fluctuate during periods of precipitation. Nevertheless, based on the above information, we do not anticipate ground water will be a constraint to the construction of the project.

3.11 Infiltration

The results of our subsurface exploration and laboratory testing indicate that on-site fill soils are of a generally silty sandy nature having relatively good infiltration rates. However, sites located in areas underlain by the San Diego and Otay Formations are known to contain both permeable and impermeable layers which can transmit and perch ground water in unpredictable ways and some LID measures may not be appropriate for the site.

3.12 Flood Hazard

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 1997); the site is not located within a flood zone (Figure 7). In addition, based on our review of dam inundation and topographic maps, the site is not located within a dam inundation area (Figure 8).

3.13 Exceptional Geologic Conditions

Exceptional geologic items are items that are present across the State of California, and occur on a site by site basis. We have addressed the presence or non-presence of these items typically present across the State in the sections below.

3.13.1 Hazardous Materials

Our scope of work has not included evaluation of the site for hazardous materials and we are not aware of any such reports that pertain to the site.

3.13.2 Regional Subsidence

Due to the depth of ground water and the dense nature of the underlying Eocene-age deposits combined with the close proximity of Mesozoic rock, the possibility of regional subsidence is considered to be nil.

3.13.3 Non-Tectonic Faulting

Surface expressions of differential settlement, such as ground fissures, can develop in areas affected by ground water withdrawal or banking activities, including geothermal production. The site location is not within an area affected by differential settlement caused by non-tectonic sources.

3.13.4 Volcanic Eruption

The proposed site is not located within or near a mapped area of potential volcanic hazards (Miller, C.D., 1989). The nearest volcanic activity is located in the Salton Sea area of southern California. Therefore, volcanic activity is not considered a hazard at the site.

3.13.5 Asbestos

Due to the lack of proximal sources of serpentinic or ultramafic rock bodies, naturally-occurring asbestos is not considered a hazard at the site.

3.13.6 Radon-222 Gas

Historically, Radon-222 gas has not typically been recognized as an environmental consideration in San Diego County. In particular the site area is not mapped as containing organic rich marine shales commonly characterized to potentially contain Radon-222 gas. Therefore, based on our review of the referenced literature, and our site exploration, the potential for the occurrence of Radon-222 gas at the site is considered low.

4.0 FAULTING AND SEISMICITY

4.1 Faulting

The California Mining and Geology Board (now referred to as the California Geologic Survey or CGS) defines an active fault as a fault which has had surface displacement within Holocene time (about the last 11,000 years). The Rose Canyon fault for example is considered active. Furthermore, the State Geologist has defined a potentially active fault as any fault considered to have been active during Quaternary time (last 1,600,000 years). This definition is used in delineating Special Studies Zones as mandated by the Alquist-Priolo Geologic Hazards Zones Act of 1972 and as subsequently revised (Hart, and Bryant, 2007). The intent of this act is to assure that unwise urban development does not occur across the traces of active faults.

Although similar to the State definition, the City of San Diego (1999) defines a Potentially Active fault, as a fault that has had activity within the last 1.6 million years (Quaternary Period) and can be demonstrated to be inactive during the last 11,000 years (Holocene Epoch). For the purpose of this report, we utilize the City of San Diego definition when referring to fault activity levels.

The primary seismic risk to the San Diego metropolitan area is the Rose Canyon fault zone located approximately 7.5 miles west of the site. The Rose Canyon fault zone consists predominantly of right-lateral strike-slip faults that extend south-southeast bisecting the San Diego metropolitan area (Figure 4). Various fault strands display strike-slip, normal, oblique, or reverse components of displacement. The Rose Canyon fault zone extends offshore at La Jolla and continues north-northwest subparallel to the coastline. The offshore segments are poorly constrained regarding location and character. South of downtown, the fault zone splits into several splays that underlie San Diego Bay, Coronado, and the ocean floor south of Coronado (Treiman, 1993; Kennedy and Clarke, 1999). Portions of the fault zone in the Mount Soledad, Rose Canyon, and downtown San Diego areas have been designated by the State of California (CGS, 2000 and 2003a) as being Earthquake Fault Zones.

A geologic map covering the Imperial Beach Quadrangle (Kennedy and Tan, 1977), an updated geologic map by Kennedy and Tan (2008), and fault maps by

Treiman (1984 and 1993) indicate the site is east of the main La Nacion Fault trace and within a right step-over and associated zone of deformation. As previously mentioned, the LNFZ extends approximately 20 miles (32 kilometers) from the United States/Mexico border along the east side of Chula Vista and National City northward to the Mission Valley area. The fault zone comprises a series of parallel to subparallel, closely spaced west dipping, normal faults which include the La Nacion, Sweetwater and Chula Vista fault strands. The fault strands within the LNFZ generally dip 60 to 75 degrees west and appear to have had predominantly dip-slip movement throughout their history (west side down). The Pliocene-aged San Diego Formation has been displaced a minimum of 256 feet while early Pleistocene deposits have been displaced a minimum of 224 feet (Artim and Pickney, 1973). Fault strands of the LNFZ typically juxtapose the San Diego Formation and Otay Formation and often separate the Lindavista Formation and San Diego Formation. The nearest active fault is the Rose Canyon fault located approximately 7.5 miles west of the site (Figure 4).

4.1.1 Surface Rupture

Based on the results of our previous fault study (Leighton, 2013a), the Master Plan area is transected by several minor and discontinuous northeast trending (N10ºE to N45ºE) faults associated with the La Nacion Fault zone. The faults generally dip northwest at 30º to 45º, with a few faults dipping with similar inclination southeast creating zones of down-dropped San Diego Formation (Plate 1 and 2). Of the faults encountered at the site, only one fault was interpreted to be more than 200 feet in length. The remaining faults, including previously mapped faults by others, all appear less than 200 feet in length and do not extend to the overlapping trenches.

Based on the results of our previous study (Appendix H), we conclude that the faults do not transect the proposed Entrance Building site. Therefore, the potential for ground rupture due to faulting at the Entrance Building site is considered low. No structural setbacks are recommended. In addition, it should be noted, as observed in our exploration trenches, mapped faults in the Master Plan area do not constitute a surface rupture hazard.

Ground lurching is defined as movement of low density materials on a bluff, steep slope, or embankment due to earthquake shaking. Since the Entrance Building foot print is relatively flat and removed from any over-steepened slopes (slopes steeper than 2:1 horizontal to vertical inclination), lurching or cracking of the ground surface as a result of nearby or distant seismic events is unlikely.

4.2 Historical Seismicity

Historically, the San Diego region has been spared major destructive earthquakes. The most recent earthquake on the Rose Canyon fault in San Diego occurred after A.D. 1523 but before the Spanish arrived in 1769. Studies by Rockwell and Murbach (1999) indicate that the earthquake occurred at A.D. 1650 ± 125. Two additional earthquakes, the 1800 M6.5 and 1862 M5.9, may have also occurred in the Rose Canyon fault zone. However, no direct evidence of ground rupture within the Rose Canyon fault zone for those events was recorded.

4.3 Seismicity

The site can be considered to lie within a seismically active region, as can all of Southern California. Specifically, the Rose Canyon fault zone located approximately 7.5 miles west of the site is the ‘active’ fault considered having the most significant effect at the site from a design standpoint.

4.3.1 Suspension Logging

The downhole PS Suspension survey was performed by GEOVision (Appendix E). The primary purpose of performing suspension logging at Boring S-1 (referred to as B-1 in GEOVision report) was to develop subsurface compressional-wave (P) and shear-wave (S) velocity models down to a depth of approximately 100 feet below the bottom of excavation. See the attached Figure 2 for Boring S-1 location. Velocity measurements were performed using the PS logging system at 1.6 foot intervals, manufactured by OYO Corporation, and their subsidiary, Robertson Logging. The acquired data were analyzed and a profile of velocity versus depth was produced for both compressional and shear waves.

The results of the geophysical testing indicated an average shear wave velocity of approximately 1,300 feet/second (396 m/s) for the upper 100 feet below the bottom of proposed basement excavation.

4.3.2 Site Characterization (Site Class)

Utilizing 2013 California Building Code (CBSC, 2013a) procedures, we have characterized the site soil profile to be Site Class C based on our experience with similar sites in the project area and the results of our measured shear wave velocity profile in the upper 30 meters (Vs30) at Boring S-1 (Plate 1).

4.3.3 2013 CBC Mapped Spectral Acceleration Parameters

The effect of seismic shaking may be mitigated by adhering to the California Building Code and state-of-the-art seismic design practices of the Structural Engineers Association of California. Provided below in Table 2 are the risk-targeted spectral acceleration parameters for the project determined in accordance with the 2013 California Building Code (CBSC, 2013) and the USGS U.S. Seismic Design Map tool.

Table 2
CBC Mapped Spectral Acceleration Parameters

Site Longitude (decimal degrees)	-117.0233
Site Latitude (decimal degrees)	32.6196
Site Class	C
Site Coefficients	F_a = 1.048 F_v = 1.465
Mapped MCE_R Spectral Accelerations	S_S = 0.879g S_1 = 0.335g
Site Modified MCE_R Spectral Accelerations	S_{MS} = 0.921g S_{M1} = 0.491g
Design Spectral Accelerations	S_{DS} = 0.614g S_{D1} = 0.328g

Utilizing ASCE Standard 7-10, in accordance with Section 11.8.3, the following additional parameters for the peak horizontal ground acceleration are associated with the Geometric Mean Maximum Considered

Earthquake (MCE_G). The mapped MCE_G peak ground acceleration (PGA) is 0.352g for the site. For a Site Class C, the F_{PGA} is 1.048 and the mapped peak ground acceleration adjusted for Site Class effects (PGA_M) is 0.369g for the site.

4.3.4 Site-Specific Ground Motion Analysis

The site is not located in a Seismic Hazard Zone, an Alquist-Priolo Earthquake Fault Zone or in a seismic hazard zone designated in the Safety Element for the City of Chula Vista. In addition the site is not assigned to a Seismic Design Category E or F. Therefore, per Section 4-317(e) of the California Administrative Code the development of a site-specific ground motion analysis is not required per Section 1616A.1.3 of the 2013 CBC.

4.4 Secondary Seismic Hazards

Seismic hazard analysis has been performed considering seismicity prescribed by the 2013 CBC. In general, secondary seismic hazards can include soil liquefaction, seismically-induced settlement, lateral displacement, surface manifestations of liquefaction, landsliding, seiches, and tsunamis. Specifically, the potential for secondary seismic hazards at the subject site is discussed below.

4.4.1 Liquefaction Potential

Liquefaction is the loss of soil strength or stiffness due to a buildup of excess pore-water pressure during strong ground shaking. Liquefaction is associated primarily with loose (low density), granular, saturated soil. Effects of severe liquefaction can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

Due to an absence of a shallow ground water table and the presence of loose to medium dense fine-grained silty sandy and clayey fill materials underlain by very dense San Diego and Otay sandstone and claystone materials, the potential for liquefaction at the site is low. In addition, the site is not located within a mapped liquefaction hazard zone (Figure 9).

4.4.2 Seismically-Induced Settlement

Dynamic settlement of soils can occur as a result of strong vibratory ground shaking. Due to the dense nature of the underlying San Diego and Otay Formation, the potential for dynamic settlement is considered to be low within these units.

The proposed Entrance Building is located overlying dense silty sandstone to well indurated claystones of the San Diego and Otay Formations, respectively. Therefore, the potential for seismically induced settlement is low.

4.4.3 Surface Manifestation of Liquefaction and Dynamic Settlement

Due to absence of a shallow ground water table and the generally fine-grained silty and sandy fill materials in turn underlain by dense San Diego and Otay Formations, the surface manifestation of dynamic settlement is anticipated to be minor.

4.4.4 Lateral Spreading or Flow Failure

Due to the low potential for liquefaction, and dense nature of the onsite materials, the potential for lateral spreading flow failure is low.

4.4.5 Tsunamis or Seiches

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. A seiche is an oscillation (wave) of a body of water in an enclosed or semi-enclosed basin that varies in period, depending on the physical dimensions of the basin, from a few minutes to several hours, and in height from several inches to several feet. Based on the elevation (approximately 450 feet msl) and inland location of the site, the potential for damage due to either a tsunami or seiche is low.

5.0 CONCLUSIONS

Based on the results of our investigation of the site, it is our opinion that the proposed Entrance Building located within the Sharp Chula Vista Master Plan area is feasible from a geotechnical standpoint, provided the following conclusions and recommendations are incorporated into the project plans and specifications. The following is a summary of the significant geotechnical factors that we expect may affect development of the site. Our conclusions and recommendations were derived based on the current 2013 CBC.

- Existing compacted fill thickness in the area of the proposed Entrance Building is less than 5 feet and will be removed during grading.
- Due to the generally dense sandy character of formational materials underlying the site and lack of adverse geologic conditions, landsliding and mass movement is considered to be unlikely.
- Ground water was not encountered during our investigation and is not anticipated to be a constraint to construction of the proposed structure or site improvements.
- Onsite soils were found to have a very low to medium potential for expansion.
- The San Diego appears to provide moderate infiltration of surface water. However, due to the potential for encountering less permeable interbedded claystone and cemented sandstone within the San Diego Formation.
- Exceptional geologic hazards are not anticipated to impact the site or the proposed site development.
- Active or potentially active faults do not transect or project toward the site. The closest active fault is the Rose Canyon fault located approximately 7.5 miles to the west. Therefore, the potential for ground rupture due to faulting at the site is considered low.
- The Master Plan area is transected by several potentially active faults. Based on the results of our previous fault study, we conclude that the faults do not constitute a surface rupture hazard to the Entrance Building project.
- The mapped MCE_G peak ground acceleration (PGA) is 0.352g for the site, and for a Site Class C, the mapped peak ground acceleration, adjusted for Site Class effects (PGA_M) is 0.369g for the site.

- The potential for liquefaction at the site is considered to be low. Differential seismic settlement potential is considered negligible.
- The potential for slope instability at the site is considered to be low.
- Based on the subsurface exploration of the soils underlying the site, we anticipate that fill materials can be excavated with conventional heavy-duty earthwork equipment. Where excavations or borings are proposed into the San Diego and Otay Formation, sloughing within zones of friable sands should be anticipated.
- Laboratory test results indicate the granular onsite soils have a negligible potential for sulfate exposure on concrete and a high corrosion potential to buried uncoated ferrous metals.

6.0 PRELIMINARY RECOMMENDATIONS

6.1 Earthwork

We anticipate that earthwork at the site will consist of site preparation, excavation, and fill operations. We recommend that earthwork on the site be performed in accordance with the following recommendations and the General Earthwork and Grading Specifications for Rough Grading included in Appendix G. In case of conflict, the following recommendations shall supersede those in Appendix G.

6.1.1 Site Preparation

Prior to grading, all areas to receive structural fill, engineered structures, or hardscape should be cleared of surface and subsurface obstructions, including any existing debris and undocumented, loose, or unsuitable fill soils, and stripped of vegetation. Removed vegetation and debris should be properly disposed off site. All areas to receive fill and/or other surface improvements should be scarified to a minimum depth of 8 inches, brought to optimum or above-optimum moisture conditions, and recompacted to at least 90 percent relative compaction based on ASTM Test Method D1557.

6.1.2 Removals of Compressible Soils in Building Pad

Potentially compressible fill soils that may settle as a result of wetting or settle under the surcharge of engineered fill and/or foundation loads should be removed and placed as moisture conditioned engineered fill. Based on the results of our subsurface exploration, we anticipate excavation to a pad grade elevation of approximately 437 feet will expose competent formation of the San Diego Formation. It should be noted that footings located at shallower depths (approximately 5 feet or more below the ground surface) may also be supported in the competent formation of Very Old Paralic Deposits. The top 6 inches of the pad should be compacted to 90 percent relative compaction. The bottom of the removal should be evaluated by a Certified Engineering Geologist to confirm conditions are as anticipated.

In general, the old fill and native soil that is removed may be reused and placed as fill provided the material is moisture conditioned to above optimum moisture content, and then recompacted prior to additional fill placement or construction. Soil with an expansion index greater than 50 should not be used within 5 feet of finish grade in the building pad. The actual depth and extent of the required removals should be confirmed during grading operations by the geotechnical consultant.

6.1.3 Cut/Fill Transition Mitigation

Although grading plans were not available at the time of this report, based on our review of the existing topography and our subsurface exploration, the proposed Entrance Building structure appears to not be situated where a cut/fill transition beneath the structure would exist.

However, should such a transition occur, in order to mitigate the impact of an underlying cut/fill transition condition beneath the Entrance Building structure, all footings for the proposed structure can be extended to bear onto competent formational material. The additional depth can be filled with concrete or controlled low-strength material (CLSM) prior to placement of foundation reinforcing steel and concrete.

6.1.4 Excavations and Oversize Material

Excavations of the onsite materials may generally be accomplished with conventional heavy-duty earthwork equipment. Temporary excavations less than 4 feet in depth, such as utility trenches with vertical sides, should remain stable for the short period required to construct the utility, provided they are free of adverse geologic conditions and friable dry soils.

It should be noted that the site is underlain by dense and moderately cemented materials of the San Diego and Otay Formation. The excavatability of the San Diego and Otay Formation material with conventional heavy-duty construction equipment is expected to require normal effort. It should be noted that heavy ripping and possible rock breaking may be needed in locally cemented and concretionary zones within the formational units. If oversize material (typically over 6 inches in maximum dimension) is generated, it should be placed in non-structural areas or hauled off-site.

In accordance with OSHA requirements, excavations deeper than 5 feet should be shored or be laid back if workers are to enter such excavations. Temporary sloping gradients should be determined in the field by a “competent person” as defined by OSHA. For preliminary planning, sloping of fill soils at 1:1 (horizontal to vertical) may be assumed where surcharge loading is not present. Excavations greater than 20 feet in height or supporting surcharge loads will require an alternative sloping plan or shoring plan prepared by a California registered civil engineer.

6.1.5 Engineered Fill

In areas proposed to receive engineered fill, the existing upper 8 inches of subgrade soils should be scarified then moisture conditioned to moisture content at or above the optimum content and compacted to 90 percent or more of the maximum laboratory dry density, as evaluated by ASTM D 1557. Soil materials utilized as fill should be free of oversized rock, organic materials, and deleterious debris. Rocks greater than 6 inches in diameter should not be placed within 2 feet of finished grade. Fill should be moisture conditioned to at least 2 percent above the optimum moisture content and compacted to 90 percent or more relative compaction, in accordance with ASTM D 1557. Although the optimum lift thickness for fill soils will be dependent on the type of compaction equipment utilized, fill should generally be placed in uniform lifts not exceeding approximately 8 inches in loose thickness.

In pavement roadway areas the upper 12 inches of subgrade soils should be scarified then moisture conditioned to a moisture content at or above optimum content and compacted to 95 percent or more of the maximum laboratory dry density, as evaluated by ASTM D 1557.

Placement and compaction of fill should be performed in general accordance with the current City of Chula Vista grading ordinances, California Building Code, sound construction practice, these recommendations and the General Earthwork and Grading Specifications for Rough Grading presented in Appendix G.

6.1.6 Earthwork Shrinkage/Bulking

The volume change of excavated onsite materials upon recompaction as fill is expected to vary with material and location. Typically, the surficial soils and formational sandstone materials vary significantly in natural and compacted density, and therefore, accurate earthwork shrinkage/bulking estimates cannot be determined. However, based on the results of our geotechnical analysis and our experience, a 5 percent shrinkage factor is considered appropriate for the existing fill and a 0 to 5 percent bulking factor is considered appropriate for the San Diego and Otay Formation.

6.1.7 Import Soils

Although not anticipated, if import soils are necessary to bring the site up to the proposed grades, these soils should be granular in nature, and have an expansion index less than 50 (per ASTM Test Method D4829) and have a low corrosion impact to the proposed improvements. Import soils and/or the borrow site location should be evaluated by the geotechnical consultant prior to import. The contractor should provide evidence that all import materials comply with DTSC requirements for import materials.

6.1.8 Removal and Recompaction

Excluding the settlement sensitive building pad areas discussed in Section 6.1.2, existing fill and disturbed soils within the limits of proposed improvements should also be partially removed, moisture conditioned, and recompacted. Removal depths may be limited to 3 feet below site improvements. Where utilities and pipes are planned in existing fills, the trench subgrade should be scarified at least 8 inches; moisture conditioned and re-compacted to at least 90 percent prior to placement of bedding materials.

6.1.9 Expansive Soils and Selective Grading

Based on our laboratory testing and observations we anticipate the onsite soil materials will generally possess a very low to low expansion potential. It should be noted however that more highly expansive materials may be locally encountered as observed in Boring B-1. Therefore, should more expansive materials be encountered selective grading may need to be performed. In addition, to accommodate conventional foundation and retaining wall design, the upper 5 feet of materials within building pads and 10 feet outside the limits of the building foundations should have a very low to low expansion potential (EI<50).

6.2 Foundation and Slab Considerations

The proposed structure may be constructed with conventional foundations. Foundations and slabs should be designed in accordance with structural considerations and the following recommendations. These recommendations assume that the soils encountered within 5 feet of pad grade have a very low to medium potential for expansion (EI<50). If more expansive materials are encountered and selective grading cannot be accomplished, revised foundation recommendations may be necessary. The foundation recommendations below assume that the all building foundations will be underlain by properly compacted fill.

6.2.1 Shallow Spread Footing Foundations

We have provided shallow foundation capacity curves for foundations bearing on fill soils and undisturbed formation (Very Old Paralic Deposits and San Diego Formation). We recommend that foundations supporting buildings be founded in formation. Additionally, foundations supporting accessory structures may be supported in properly compacted fill or formation. Allowable bearing capacity curves are provided in Appendix F.

Bearing capacity of shallow foundations is controlled by footing shape and size, embedment, and tolerable settlement. We recommend that shallow foundations supporting buildings be embedded a minimum of 1.5 feet in undisturbed formation. Figures F-1 and F-2 provide allowable bearing capacity curves for 1-inch and 1/2-inch of tolerable foundation settlement for square and continuous footings considering embedment depths of 1.5 feet and 3 feet in formation. Note that the allowable bearing capacity at relatively narrow footing widths is controlled by the shear strength of the soil using a factor of safety equal to 3.0. For progressively larger footing widths, the bearing capacity is limited by the potential settlement of soils below the footing. Where strength governs, an additional increase short term loads such as seismic will not be permissible, unless the overstrength factor for the supported structure is less than 3.0.

We anticipate that some accessory structures (retaining walls, seat walls, equipment pads, etc.) may be founded on properly compacted fill soils. Figure F-3 provides allowable bearing capacity for 1-inch of tolerable settlement on fill. Subgrade preparation (including recommendations for removal of compressible soils) for shallow foundations should be conducted in accordance with our 2013 geotechnical investigation. Soils within 5 feet of footings should have a very low to low expansion potential (EI <50).

Continuous footings should be designed in accordance with the structural engineer's requirements and have a minimum reinforcement of four No. 5 reinforcing bars (two top and two bottom). Reinforcement of individual column footings should be per the structural requirements.

6.2.2 Foundation Setback

We recommend a minimum horizontal setback distance from the face of slopes for all structural foundations, footings, and other settlement-sensitive structures as indicated on the Table 3 below. The minimum recommended setback distance from the face of retaining wall is equal to 1.5 times the height of the retaining wall. This distance is measured from the outside bottom edge of the footing, horizontally to the slope or retaining wall face, and is based on the slope or wall height. However, the foundation setback distance may be revised by the geotechnical consultant on a case-by-case basis if the geotechnical conditions are different than anticipated.

Table 3

Minimum Foundation Setback from Slope Faces

Slope Height	Minimum Recommended Foundation Setback
Less than 5 feet	7 feet
Greater than 5 feet	10 feet

Please note that the soils within the structural setback area possess poor lateral stability, and improvements (such as retaining walls, sidewalks, fences, pavements, etc.) constructed within this setback area may be subject to lateral movement and/or differential settlement. Potential distress to such improvements may be mitigated by providing a deepened footing or a grade beam foundation system to support the improvement.

In addition, open or backfilled utility trenches that parallel or nearly parallel structure footings should not encroach within an imaginary 2:1 (horizontal to vertical) downward sloping line starting 9 inches above the bottom edge of the footing and should also not be located closer than 18 inches from the face of the footing. Deepened footings should meet the setbacks as described above. Also, over-excavation should be accomplished such that deepening of footings to accomplish the setback will not introduce a cut/fill transition bearing condition.

Where pipes cross under footings, the footings should be specially designed. Pipe sleeves should be provided where pipes cross through footings or footing walls and sleeve clearances should provide for possible footing settlement, but not less than 1 inch around the pipe.

6.2.4 Floor Slabs

Slab-on-grade should be at least 5 inches thick and be reinforced with No. 4 rebars 18 inches on center each way (minimum) placed at mid-height in the slab. We recommend control joints be provided across the slab at appropriate intervals as designed by the project architect. Where moisture-sensitive finishes are planned, underslab moisture protection should be designed by the project architect in accordance with Section 4.505 of the 2013 California Green Building Standards Code (CBSC, 2013b).

The potential for slab cracking may be reduced by careful control of water/cement ratios. The contractor should take appropriate curing precautions during the pouring of concrete in hot weather to minimize cracking of the slabs. We recommend that a slipsheet (or equivalent) be utilized if grouted tile, marble tile, or other crack-sensitive floor covering is planned directly on concrete slabs. All slabs should be designed in accordance with structural considerations. If heavy vehicle or equipment loading is proposed for the slabs, greater thickness and increased reinforcing may be required. The additional measures should be designed by the structural engineer using a modulus of subgrade reaction of 150 pounds per cubic inch. Additional moisture/waterproofing measures that may be needed to accomplish desired serviceability of the building finishes and should be designed by the project architect.

6.2.5 Settlement

For conventional footings founded in undisturbed formation consisting of either Very Old Paralic Deposits and/or San Diego Formation, the recommended allowable-bearing capacity is based on a maximum total static settlement of 1/2 inch and 1 inch depending on the selected design chart. Since settlements are a function of footing size and contact bearing pressures, some differential settlement can be expected where a large differential loading condition exists.

6.2.6 Moisture Conditioning

The building pad and site flatwork subgrade soils should be maintained at a moisture content at least 2 percent above optimum. Testing to confirm the moisture content should be performed prior to placing building slab underlayment and site flatwork.

6.3 Lateral Earth Pressures and Retaining Wall Design

Table 4 presents the lateral earth pressure values for level or sloping backfill for walls backfilled with fully drained soils of very low to low expansion potential (less than 50 per ASTM D4829). We understand that the Entrance Building will have retaining walls up to approximately 17 feet in height.

Table 4 Static Equivalent Fluid Weight (pcf)		
Conditions	Level	2:1 Slope
Active	35	55
At-Rest	55	65
Passive	300 (Maximum of 3 ksf)	100 (sloping down)

Unrestrained (yielding) cantilever walls up to 20 feet in height should be designed for an active equivalent pressure value provided above. If conditions other than those covered herein are anticipated, the equivalent fluid pressure values should be provided on an individual case-by-case basis by the geotechnical engineer. A surcharge load for a restrained or unrestrained wall resulting from automobile traffic may be assumed to be equivalent to a uniform lateral pressure of 75 psf which is in addition to the equivalent fluid pressure given above. For other uniform surcharge loads, a uniform pressure equal to 0.35q should be applied to the wall. The wall pressures assume walls are backfilled with free draining materials and water is not allowed to accumulate behind walls. A typical drainage design is contained in Appendix F. Wall backfill should be compacted by mechanical methods to at least 90 percent relative compaction (based on ASTM D1557). If foundations are planned over the backfill, the backfill should be compacted to 95 percent. Wall footings should be designed in accordance with the foundation design recommendations and reinforced in accordance with structural considerations. For all retaining walls, we recommend a minimum horizontal distance from the outside base of the footing to daylight as outlined in Table 3.

Lateral soil resistance developed against lateral structural movement can be obtained from the passive pressure value provided above. Further, for sliding resistance, the friction coefficient of 0.4 may be used at the concrete and soil interface. These passive earth pressure and the friction coefficient are considered allowable values determined with a factor of safety of 1.5.

To account for potential redistribution of forces during a seismic event, retaining walls providing lateral support where exterior grades on opposites sides differ by more than 6 feet fall under the requirements of 2013 CBC Section 1616A.1.11 and/or ASCE 7-10 Section 15.6.1 and should also be analyzed for seismic loading. For that analysis, an additional uniform lateral seismic force of $12.5H^2$ pounds per foot should be considered for the design of the retaining walls with level backfill, where H is the height of the wall. This increment should be added to the unfactored static active earth pressure to obtain the total seismic earth pressure on the wall. The seismic increment may be determined as a fluid pressure equal to 8 pcf for cantilevered retaining walls with level backfill that require consideration of seismic earth pressure and are allowed to displace.

6.4 Shoring of Excavations

We anticipate shoring of the basement excavations may be necessary. Based on the proposed finish floor elevation of the basement and existing finish grades at the site, we anticipate shoring heights on the order of 15 to 20 feet. We recommend that cuts be retained by a soldier beam and lagging shoring system deriving passive support from cast-in-place soldier piles and (lagging-shoring system) with tie-backs. Specialty engineers and contractors with local knowledge of the soil conditions typically perform shoring of excavations of this size should be utilized for structural design and construction of the system.

Based on our experience with nearby projects, it is our opinion that the caving potential of the on-site soils is moderate. To accommodate installation of the shoring in the dense to hard underlying geologic units, wide-flange sections may be installed into pre-drilled holes surrounded by concrete. If caving of the drilled holes occurs, drilling slurry or casing may be required. In addition, caving of drilled holes for the tieback anchors may be encountered.

For design of temporary tie-back shoring we recommend a restrained active pressure of 20H assuming a rectangular distribution. All shoring systems should consider adjacent surcharging (such as the presence of construction equipment). The above pressures do not include hydrostatic pressures. A uniform horizontal pressure of equivalent to 2 additional feet of soil should be exerted against the walls that are offset at least 2 feet from vehicular traffic. Additional surcharge loading from the adjacent buildings should also be considered and shoring elements designed to minimize deflection and preserve the necessary factor of safety for existing footings.

For design of tie-backs, we recommend a concrete-soil bond stress of 1,000 psf of the concrete-soil interface area for straight shaft anchors installed by a competent contractor. This value should be considered only behind the 30 degree line (measured from the vertical) up from the base of the excavation. Temporary tie-back anchors should be individually proof-tested to 150 percent of design capacity. Further details and design criteria for tie-backs can be provided as appropriate. Since design of retaining systems is sensitive to surcharge pressures behind the excavation, we recommend that this office be consulted if unusual load conditions are anticipated. Care should be exercised when excavating into the on-site soils since caving or sloughing of these materials is possible. We recommend that the void space behind lagging be filled with sand/cement slurry. Field testing of tie-backs and observation of soldier pile excavations should be performed during construction.

6.5 Design Ground Water Elevation

As previously discussed in Section 3.3, ground water was not observed in our exploration borings. Based on the results of our subsurface explorations and our experience with similar projects in the site area, we anticipate ground water to be at a depth of 100 feet or more. We do not anticipate that the static ground water will be encountered during the construction of the proposed project. Ground water levels may fluctuate during periods of precipitation.

6.6 Monitoring of Shoring

Settlement monitoring of adjacent sidewalks and structures should be performed to evaluate the performance of the shoring. Shoring of the excavation is the responsibility of the contractor. Extreme caution should be used to minimize damage to existing pavement, utilities, and/or structures caused by settlement or reduction of lateral support. Sequencing of underpinning, shoring installation, excavation and dewatering will be critical to control of deflections and settlement. Once the shoring contractor is selected, a detail excavation phasing plan should be submitted and reviewed by the shoring designer and geotechnical engineer.

The shoring should be surveyed for vertical and horizontal deflection by the Civil Engineer at the top, mid-point, and bottom of each wall face (4 faces) at 50-foot intervals along the wall length. Vertical settlements should be surveyed along an alignment behind the wall at each of the mid-wall monitoring points to a distance behind the wall equal to 1/2 times the wall height. The survey points should be established prior to the start of construction and continued on a weekly basis as the construction proceeds and while the excavation remains open. After completion of the excavation, the survey interval may be extended based on evaluation by the geotechnical consultant.

6.7 Dewatering

We do not anticipate that ground water will be encountered during construction and subterranean levels and foundation excavations will not extend below the ground water table. Therefore, dewatering during construction is not anticipated.

6.8 Preliminary Pavement Design Considerations

Based on R-value and SE test results, we have utilized an R-value of 30 for pavements associated with the loop driveway entrance area in located north of the Entrance Building. Actual subgrade R Value results should be verified during grading and adjustment made to the base thicknesses as appropriate. If more clayey materials with lower R-value are placed as subgrade in proposed pavement areas, increased base thickness will be necessary.

6.8.1 Flexible Pavement Section

It is our understanding that three types of vehicular traffic are to be considered for pavement design; those are auto parking, auto driveway and fire lane/industrial. Table 5 below provides the traffic indices we have considered in our analysis. For the purposes of developing a traffic index for the project, we have utilized the City of Chula Vista, Subdivision Manual, Section 3, General Design Criteria, dated March 13, 2012.

Table 5
Design Traffic Index Values

Traffic	Traffic Index
Auto Parking	5.0
Auto Driveway	6.0
Fire Lane/Industrial	9.0

Flexible pavement sections have been evaluated in general accordance with the Caltrans method for flexible pavement design and are summarized below in Table 6.

Table 6
AC over Aggregate Base Pavement Sections

Traffic	*R-Value	TI	AC (in)	Aggregate Base (in)
Auto Parking	30	5.0	3	6
Auto Driveway	30	6.0	3	8
Fire Lane / Industrial Driveway	30	9.0	5.5	13

*assumed value based on preliminary laboratory testing

6.8.2 Rigid Pavement Section

Where Portland Cement Concrete pavements are planned, Table 7 presents PCC pavements sections.

Table 7
PCC Pavement Sections

Traffic	*R-Value	TI	PCCP (in)	Aggregate Base (in)
Auto Parking	40	5.0	5.5	--
Auto Driveway	30	6.0	7	--
Fire Lane / Industrial Driveway	30	9.0	8	--

*assumed value based on preliminary laboratory testing

Regular crack control joints should be provided for PCC pavement to mitigate the potential for adverse cracking. We recommend that sections be as nearly square as possible. A mix that provides a minimum 600 psi modulus of rupture should be utilized. The actual pavement design should also be in accordance with City of Chula Vista and ACI criteria. All pavement section materials should conform to and be placed in accordance with the latest revision of the Greenbook and American Concrete Institute (ACI) codes and guidelines.

For trash truck aprons, we recommend a full depth of Portland Cement Concrete section of 7 inches with No. 4 bars at 24 inches on center, each way steel and crack-control joints as designed by the project civil or structural engineer. We recommend that jointed sections be as nearly square as possible.

6.8.3 Pavement Section Materials

Prior to placement of the aggregate base material, the upper 12 inches of subgrade soils (including beneath the curb and gutter and 6-inches behind the curb and gutter) should be scarified, moisture-conditioned (or dried back) as necessary to 2 percent above optimum moisture content and compacted to a minimum 95 percent relative compaction based on ASTM Test Method D1557. Aggregate base should be compacted to a minimum 95 percent relative compaction in accordance with ASTM Test Method D1557. Flexible pavements should be constructed in accordance with current Greenbook Specifications. Crushed aggregate base should have a minimum sand equivalent of 40.

Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils that are exposed at the finished subgrade elevations across the site at the completion of the mass grading operations.

6.8.4 Pervious Pavements

If pervious pavements or the use of pavers are proposed, our office should review the proposed paving location and system to provide supplemental recommendations, if any.

6.9 Geochemical Considerations

Concrete in direct contact with soil or water that contains a high concentration of soluble sulfates can be subject to chemical deterioration commonly known as “sulfate attack.” Soluble sulfate results (Appendix C) indicated a negligible soluble sulfate content. We recommend that concrete in contact with earth materials be designed in accordance with Section 4 of ACI 318-11 (ACI, 2011).

Minimum resistivity and pH tests were performed on representative samples of subgrade soils (Appendix C). Based on our results, the site soils have a high corrosion potential to buried uncoated metal conduits (Caltrans, 2003). We recommend measures to mitigate corrosion be implemented during design and construction.

6.10 Concrete Flatwork

Concrete sidewalks and other flatwork (including construction joints) should be designed by the project civil engineer and should have a minimum thickness of 4 inches. For all concrete flatwork, the upper 12 inches of subgrade soils should be moisture conditioned to at least 3 percent or above optimum moisture content and compacted to at least 90 percent relative compaction based on ASTM Test Method D1557 prior to the concrete placement.

6.11 Control of Ground Water and Surface Waters

Surface drainage should be controlled at all times and carefully taken into consideration during precise grading, landscaping, and construction of site improvements. Positive drainage (e.g., roof gutters, downspouts, area drains, etc.) should be provided to direct surface water away from structures and improvements and towards the street or suitable drainage devices. Ponding of water adjacent to structures or pavements should be avoided. Roof gutters, downspouts, and area drains should be aligned so as to transport surface water to a minimum distance of 5 feet away from structures. The performance of structural foundations is dependent upon maintaining adequate surface drainage away from structures.

Water should be transported off the site in approved drainage devices or unobstructed swales. We recommend a minimum flow gradient for unpaved drainage within 5 feet of structures of 2 percent sloping away.

The impact of heavy irrigation or inadequate runoff gradient can create perched water conditions, resulting in seepage or shallow ground water conditions where previously none existed. Maintaining adequate surface drainage and controlled irrigation will significantly reduce the potential for nuisance-type moisture problems. To reduce differential earth movements such as heaving and shrinkage due to the change in moisture content of foundation soils, which may cause distress to a structure and improvements, moisture content of the soils surrounding the structure should be kept as relatively constant as possible. Below grade planters should not be situated adjacent to structures or pavements unless provisions for drainage such as catch basins and drains are made.

All area drain inlets should be maintained and kept clear of debris in order to function properly. In addition, landscaping should not cause any obstruction to site drainage. Rerouting of drainage patterns and/or installation of area drains should be performed, if necessary, by a qualified civil engineer or a landscape architect.

6.12 Low Impact Development (LID) Measures and Infiltration

Based on the results of our geotechnical study, we do not recommend the practice of surface water infiltration into near surface soils at the site due to the proximity of numerous subterranean structures and settlement sensitive improvements, along with the dense nature of the underlying materials. Specifically, bioswales, infiltration basins, and other unlined onsite detention and retention systems can potentially create adverse perched ground water conditions both on-site and off-site.

Although, infiltration-type BMPs are not recommended for use on the project, Low Impact Development (LID) BMPs that contain and filter surface waters (flow-through planters and bioretention areas) are acceptable provided that they are completely lined with an impermeable liner and have subdrain systems that tie into an approved existing or proposed storm drain system.

6.13 Construction Observation

The recommendations provided in this report are based on preliminary design information and subsurface conditions disclosed by widely spaced excavations. The interpolated subsurface conditions should be checked by Leighton Consulting, Inc. in the field during construction. Construction observation of all onsite excavations and field density testing of all compacted fill should be performed by a representative of this office. We recommend that all excavations be mapped by the geotechnical consultant during grading to determine if any potentially adverse geologic conditions exist at the site.

6.14 Plan Review

Final project grading and foundation plans should be reviewed by Leighton Consulting as part of the design development process to ensure that recommendations in this report are incorporated in project plans.

7.0 LIMITATIONS

The recommendations contained in this report are based on available project information. Changes made during design development, should be reviewed by Leighton Consulting, Inc. to determine if recommendations are still applicable. Any questions regarding the contents of this report should be directed to the attention of Robert Stroh, CEG, (858) 300-4090 of Leighton Consulting, Inc.

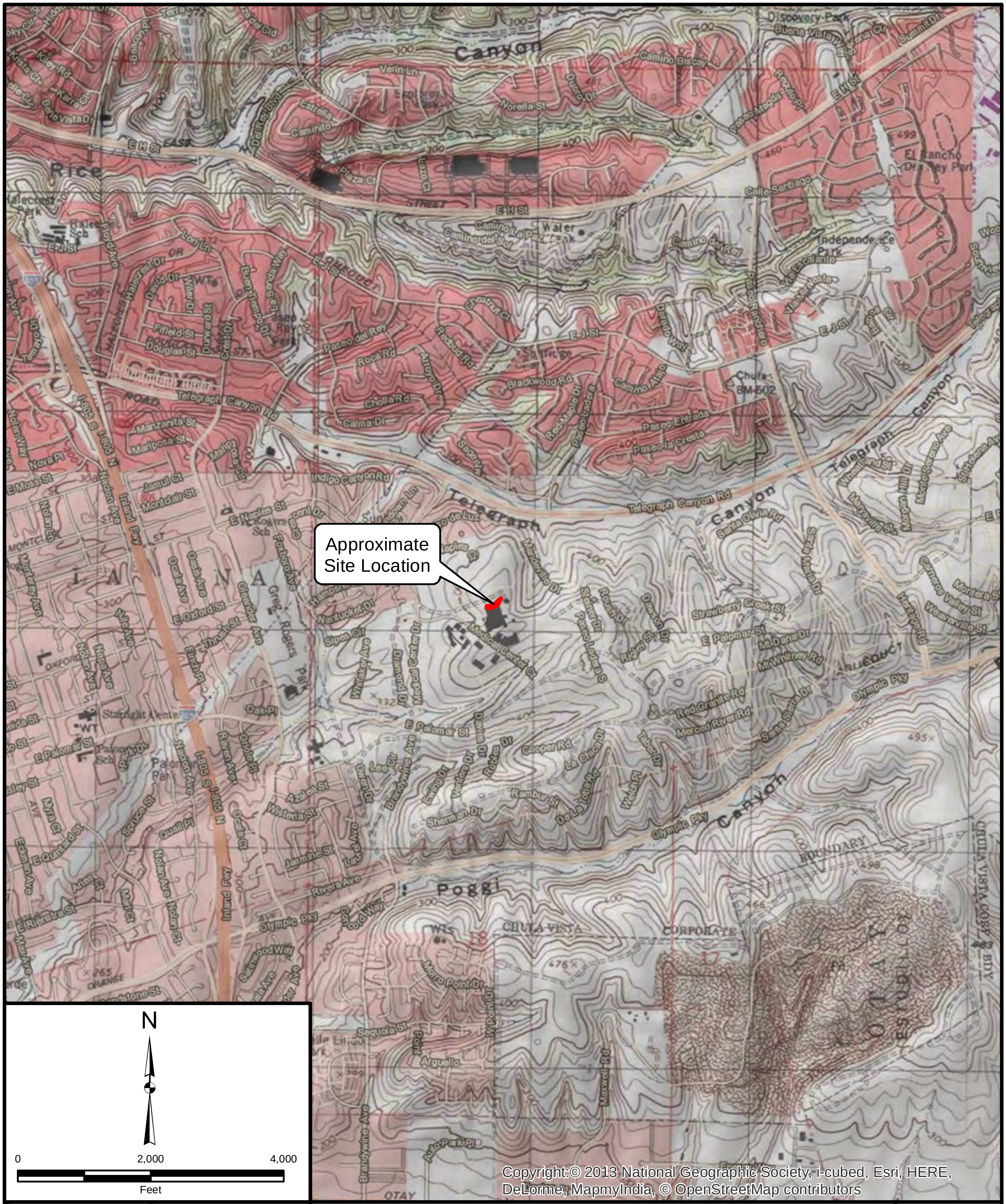
The field evaluations, and geologic analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geologic consultants performing similar tasks in the project area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report.

The nature of many sites is such that differing geological conditions can occur over small areal distances and under varying climatic conditions. The conclusions and recommendations in this report are based in part upon data that were obtained from a limited number of observations, site visits, excavations, samples, and tests. Such information is by necessity incomplete and therefore preliminary. The findings, conclusions, and recommendations presented in this report are considered preliminary and can be relied upon only if Leighton has the opportunity to observe the subsurface conditions during grading and construction in order to confirm that our preliminary findings are representative for the site.

This report was prepared for the sole use of Sharp HealthCare for use with the Entrance Building at Sharp Chula Vista Medical Center Master Plan in accordance with generally accepted California licensed geological practices at this time in California.

Please note that our evaluation was limited to assessment of the geologic aspects of the project, and did not include evaluation of structural issues, environmental concerns or the presence of hazardous materials. Our conclusions, recommendations and opinions are based on an analysis of the observed site conditions. If geologic conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request.

Figures and Plates



Copyright:© 2013 National Geographic Society, i-cubed, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Project: 603541-003	Eng/Geol: WDO/RCS
Scale: 1 " = 2,000 '	Date: December 2015

Base Map: ESRI ArcGIS Online 2015
Thematic Information: Leighton
Author: (mmurphy)

SITE LOCATION MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 1

Leighton

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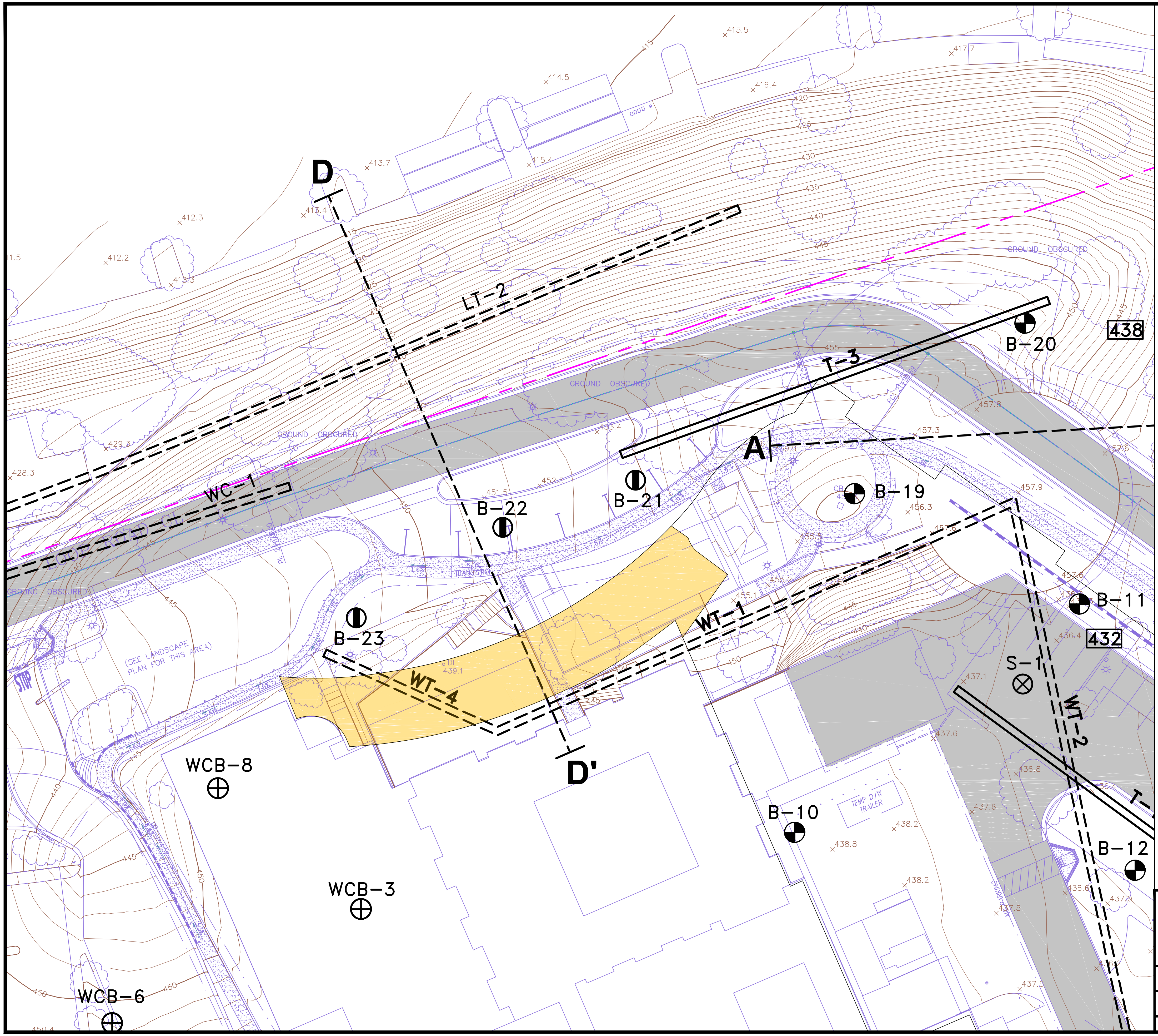

LEGEND

B–23 ◐	APPROXIMATE SMALL DIAMETER BORING LOCATION (CURRENT STUDY)
S–1 ⊗	APPROXIMATE DOWNHOLE SEISMIC BORING LOCATION (LEIGHTON, 2015)
B–20 ◕	APPROXIMATE EXPLORATION BORING LOCATION (THIS STUDY)
WCB–10 ⊕	APPROXIMATE BORING LOCATION (WOODWARD–CLYDE, 1989)
T–6 ▭	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (LEIGHTON, 2013)
WT–5 ▭	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION(WOODWARD–GIZIENSKI & ASSOCIATES, MARCH 15, 1973)
LT–2 ▭	APPROXIMATE FAULT EXPLORATION TRENCH (LEIGHTON AND ASSOCIATES, 1996)
WC–1 ▭	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (WOODWARD–CLYDE, APRIL 25, 1989, REVISED (SEPTEMBER 7, 1989)
— · —	APN 641–010–28
D ⊢– – –⊣ D'	APPROXIMATE LOCATION OF GEOLOGIC CROSS SECTION
🟨	PROPOSED ENTRANCE BUILDING

N

0 40 80
SCALE FEET

REFERENCE: BASE MAP PREPARED BY DEGENKOLB ENGINEERS, DECEMBER 2015

EXPLORATION MAP
PROPOSED ENTRANCE BUILDING
Sharp Chula Vista Master Plan
Chula Vista, California

FIGURE 2

Proj: 603541-003	Eng/Geol: SAC/RCS
Scale: 1"=40'	Date: December 2015

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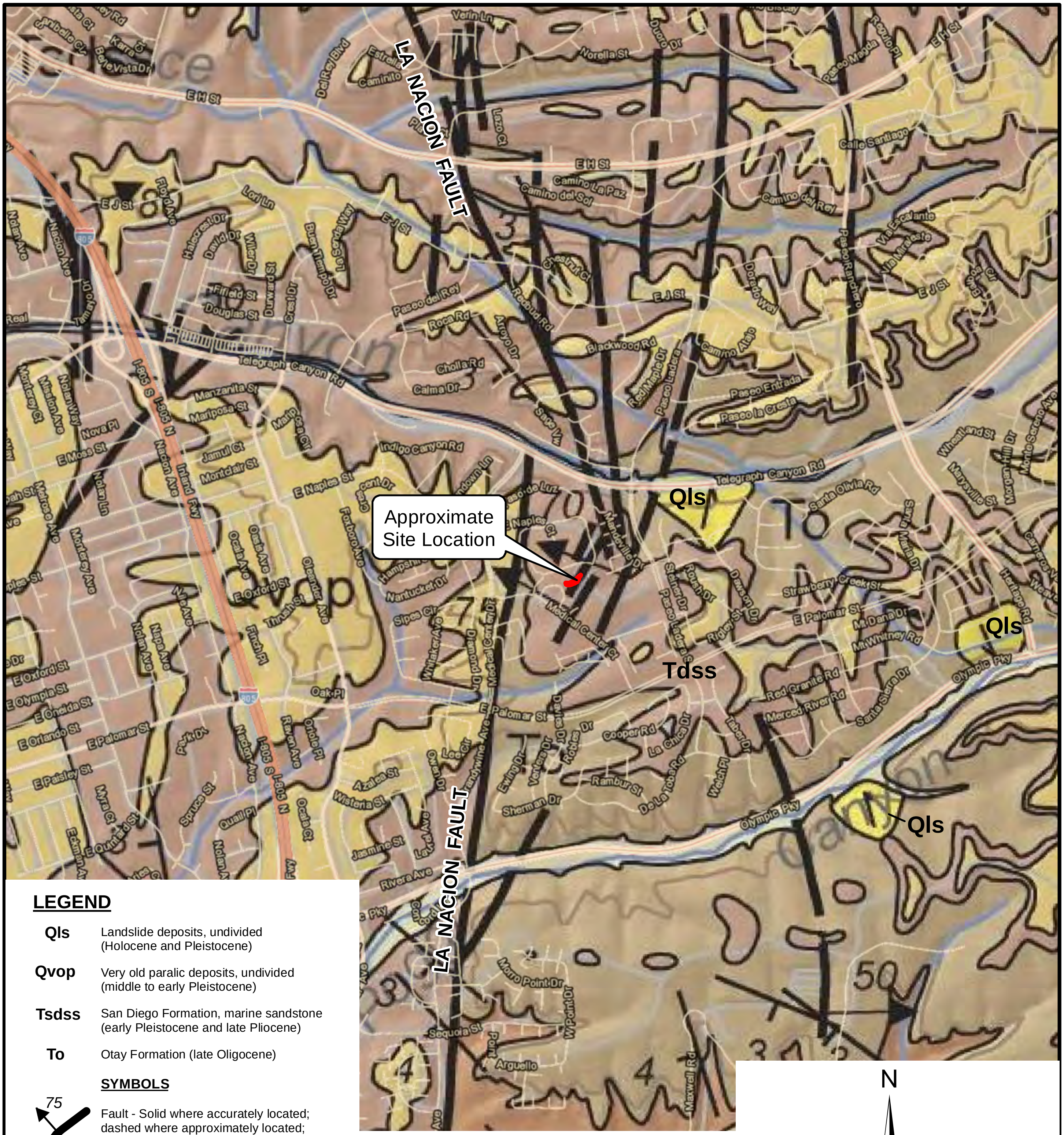
Leighton



LEGEND

Qls	Landslide deposits, undivided (Holocene and Pleistocene)
Qvop	Very old paralic deposits, undivided (middle to early Pleistocene)
Tdss	San Diego Formation, marine sandstone (early Pleistocene and late Pliocene)
To	Otay Formation (late Oligocene)

SYMBOLS

75	Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. Arrow and number indicate direction and angle of dip of fault plane
3	Strike and dip of beds
	Contact - Contact between geologic units

Project: 603541-003

Eng/Geol: SAC/RCS

Scale: 1 " = 2,000 '

Date: December 2015

Plate 1 of 2 IN: Kennedy, M.P. and Tan, S.S., 2008, Geologic map of the San Diego 30' x 60' quadrangle, California: California Geological Survey, Regional Geologic Map No. 3, scale 1:100000

Author: mmurphy (mmurphy)

REGIONAL GEOLOGY MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 3

Leighton

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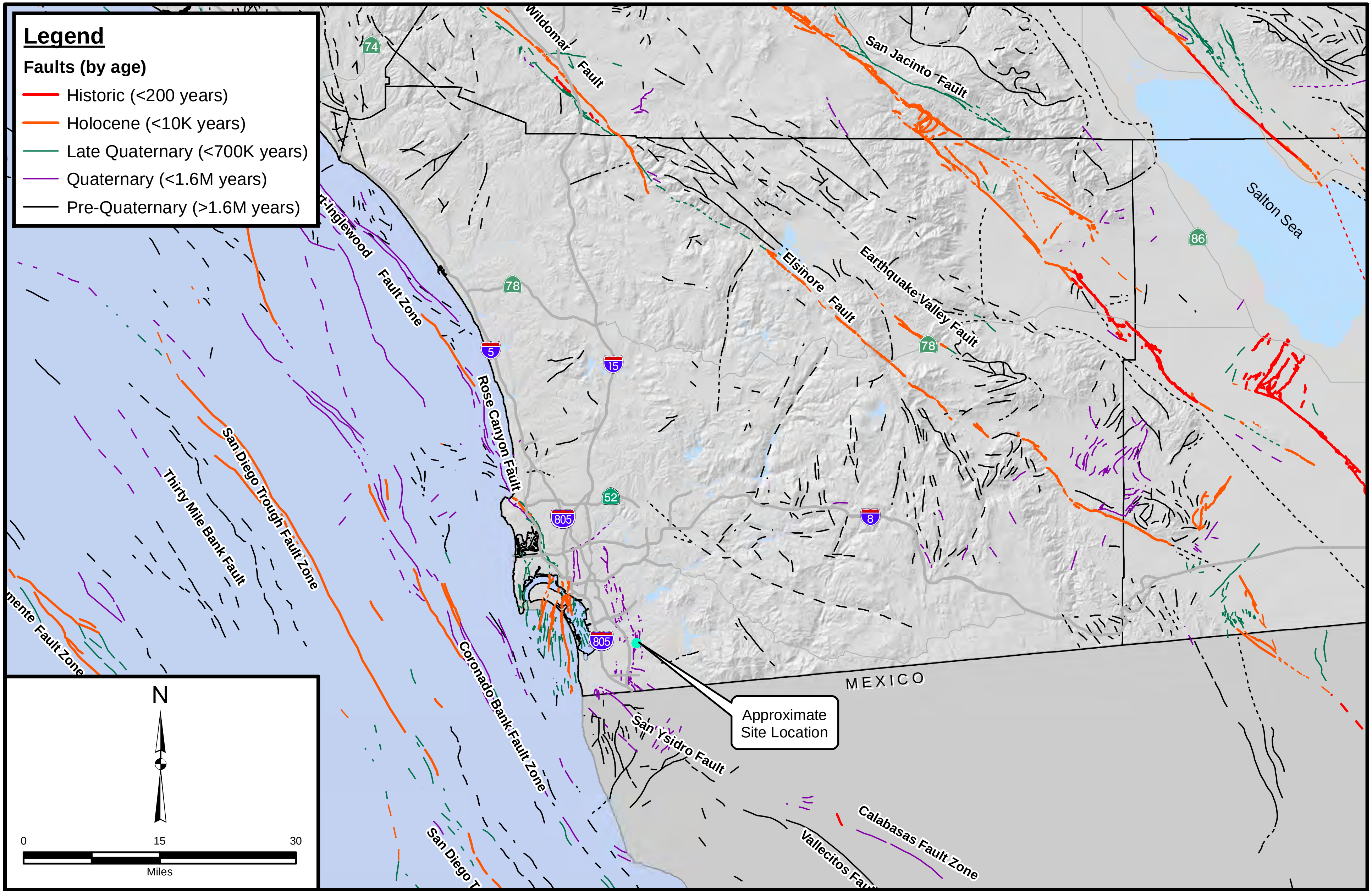

Project: 603541-003	Eng/Geol: SAC/RCS
Scale:1 " = 15 miles	Date: December 2015

Faults: Bryant, CGS 2010
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

REGIONAL FAULT MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 4

Leighton

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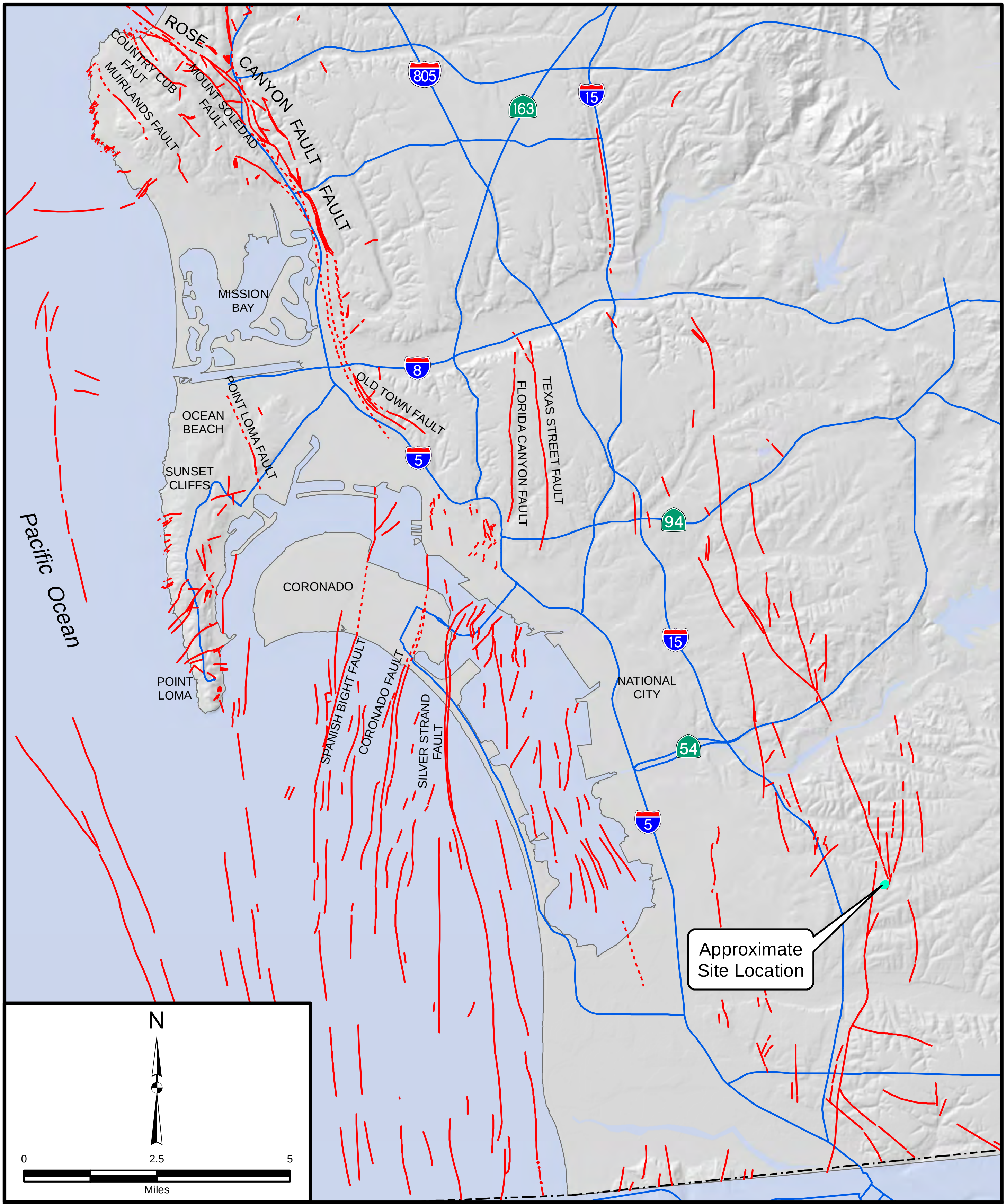

Project: 11115.002

Eng/Geol: WDO/RCS

Scale: 1 " = 3 miles

Date: December 2015

Base Map: ESRI ArcGIS Online 2015
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

ROSE CANYON FAULT MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 5

Leighton

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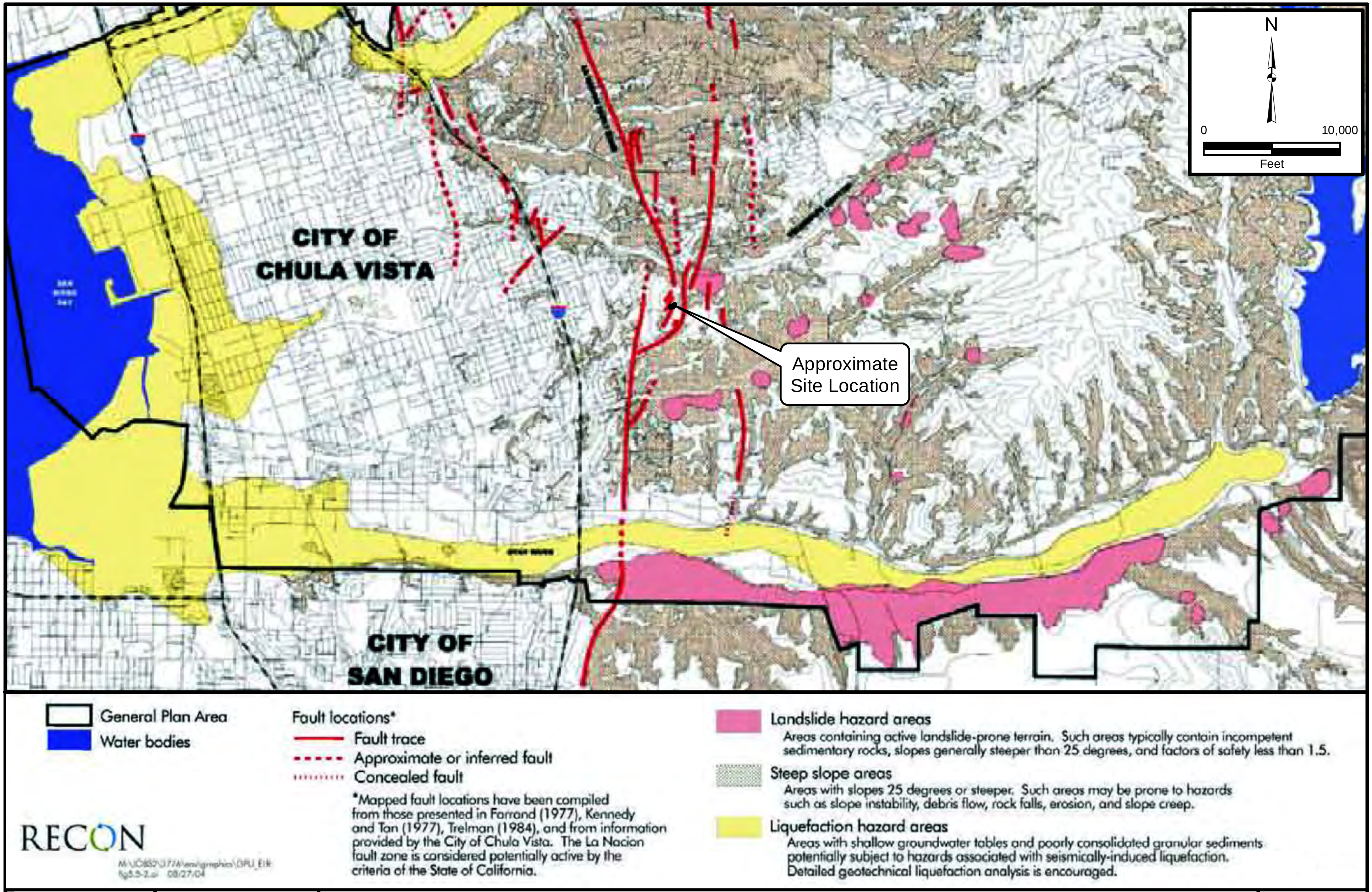

Fault locations*

- Fault trace
- Approximate or inferred fault
- Concealed fault

*Mapped fault locations have been compiled from those presented in Farrand (1977), Kennedy and Tan (1977), Treiman (1984), and from information provided by the City of Chula Vista. The La Nacion fault zone is considered potentially active by the criteria of the State of California.

Landslide hazard areas
Areas containing active landslide-prone terrain. Such areas typically contain incompetent sedimentary rocks, slopes generally steeper than 25 degrees, and factors of safety less than 1.5.

Steep slope areas
Areas with slopes 25 degrees or steeper. Such areas may be prone to hazards such as slope instability, debris flow, rock falls, erosion, and slope creep.

Liquefaction hazard areas
Areas with shallow groundwater tables and poorly consolidated granular sediments potentially subject to hazards associated with seismically-induced liquefaction. Detailed geotechnical liquefaction analysis is encouraged.

Project: 603541-003
Eng/Geol: SAC/RCS
Scale: 1 " = 6,000 '
Date: December 2015
Base Map: City of Chula Vista, The Chula Vista City General Plan, 2003.
Author: mmurphy (mmurphy)

GEOLOGIC HAZARDS MAP
PROPOSED ENTRANCE BUILDING
Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 6

Leighton

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Project: 603541-003

Eng/Geol: SAC/RCS

Scale: 1 " = 2,000 '

Date: December 2015

Base Map: ESRI ArcGIS Online 2015
Thematic Information: FEMA Q3 Flood Data, San Diego County
Author: mmurphy

FLOOD HAZARD MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 7

Leighton

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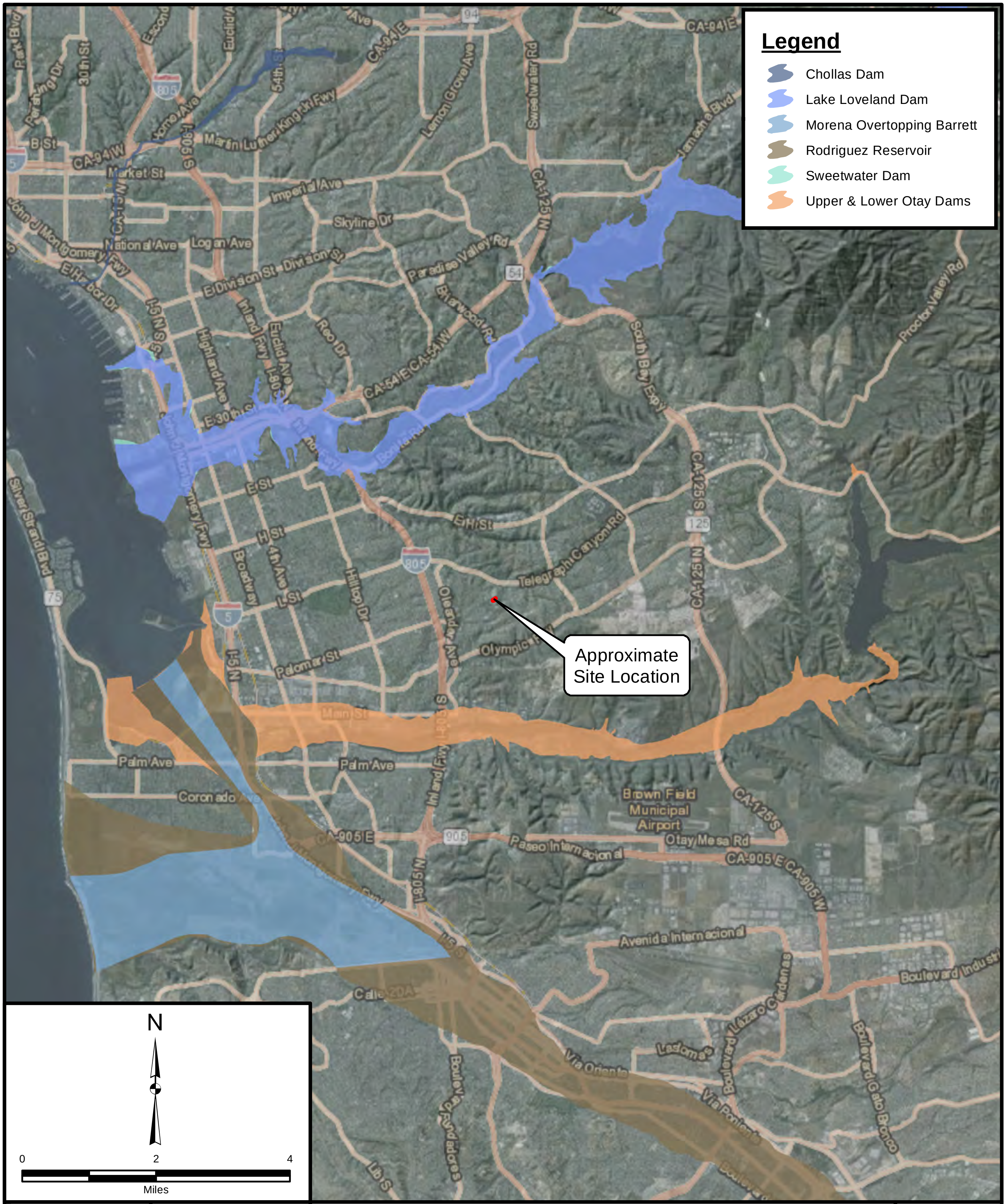

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Base Map: ESRI Resource Center 2015
Thematic Info: Leighton, San Diego County (Multi-Agency Hazard Mitigation Plan)
Author: (mmurphy)

DAM INUNDATION HAZARD ZONE MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 8

Leighton

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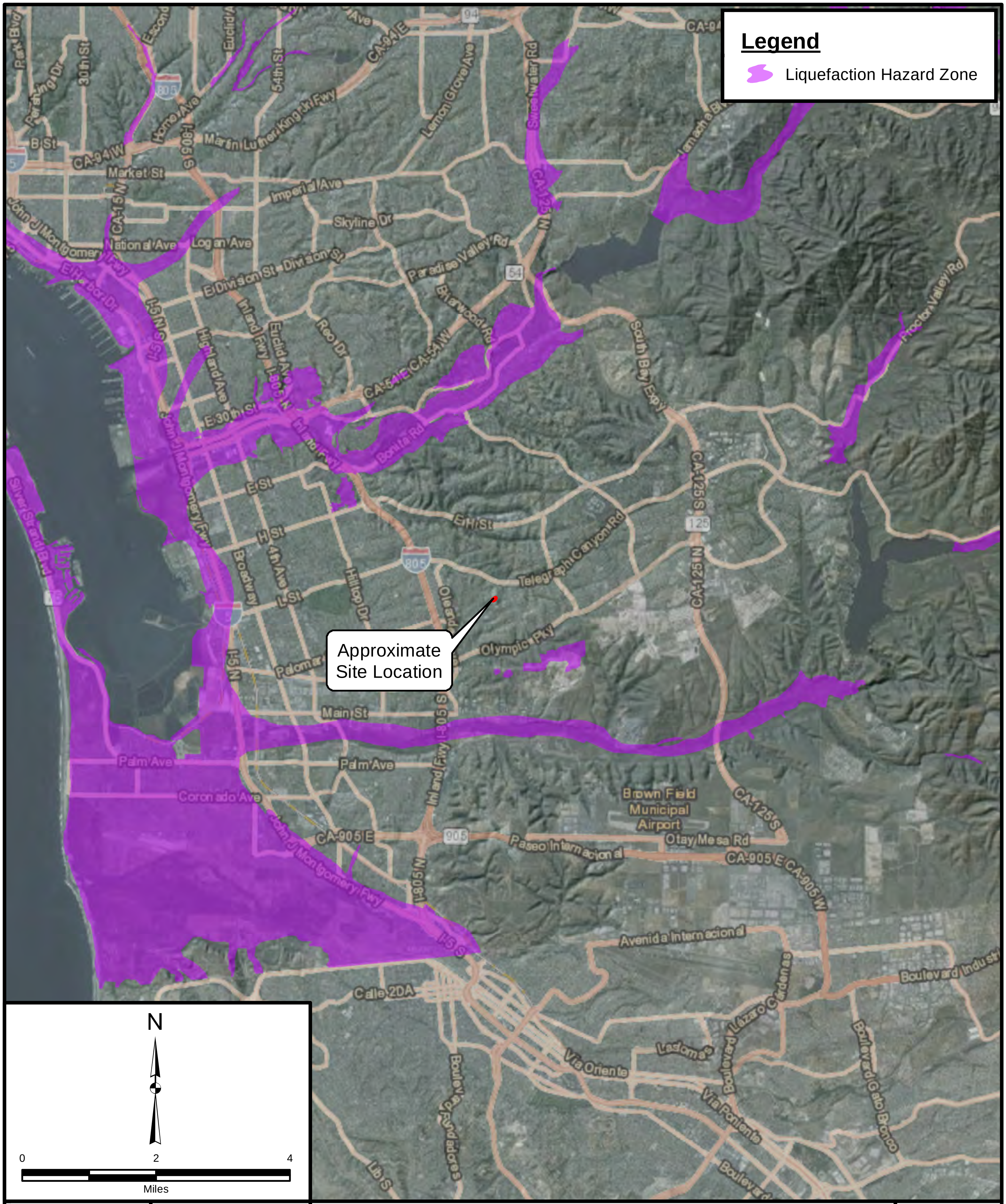

Project: 603541-003

Eng/Geol: SAC/RCS

Scale: 1 " = 2 miles

Date: December 2015

Base Map: ESRI Resource Center 2015
Thematic Info: Leighton, San Diego County (Multi-Agency Hazard Mitigation Plan)
Author: (mmurphy)

LIQUEFACTION HAZARD ZONE MAP
PROPOSED ENTRANCE BUILDING

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Figure 9

Leighton

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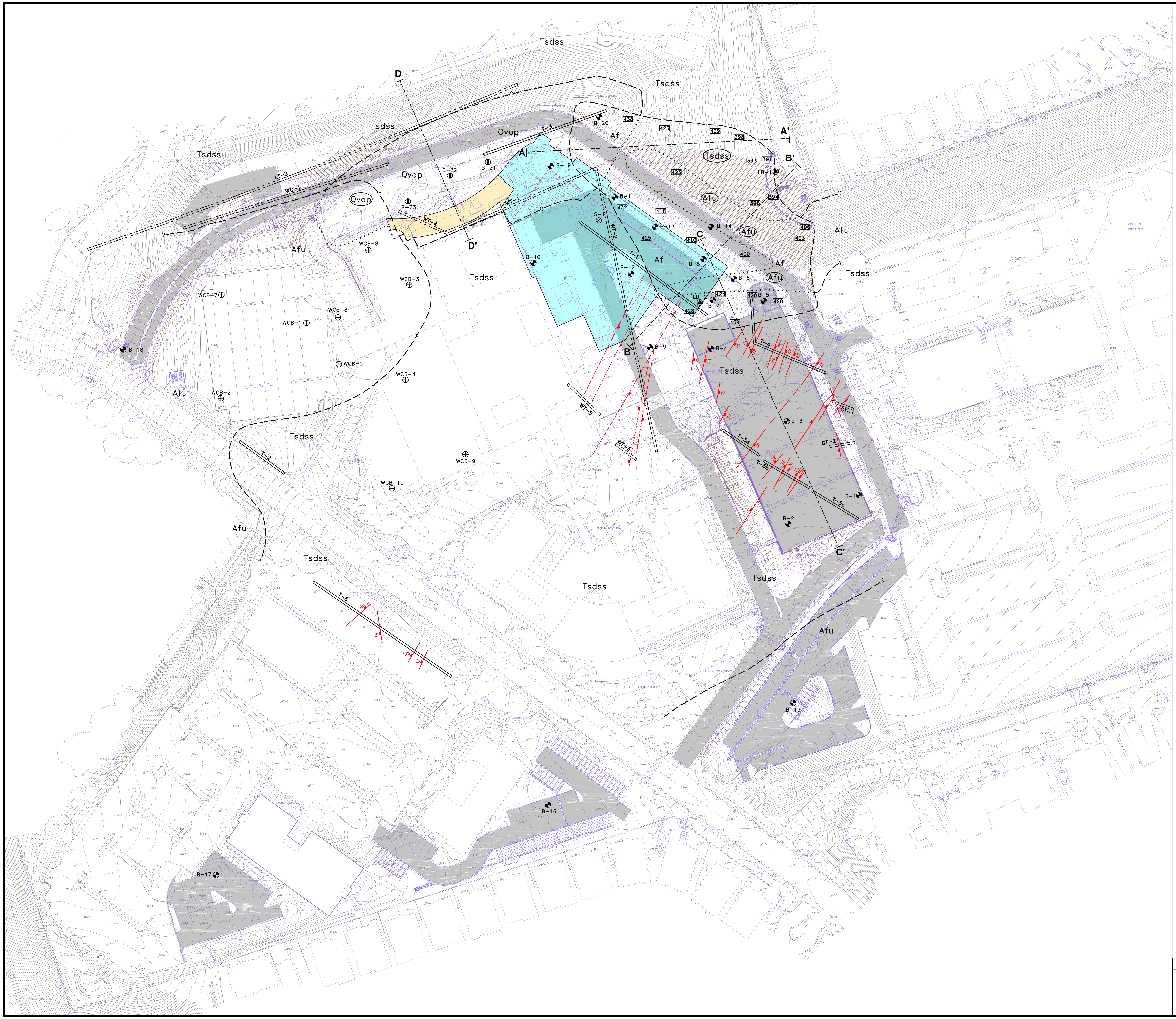
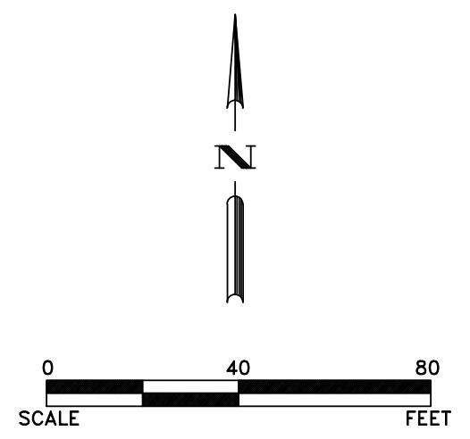


LEGEND

B-23 ◐	APPROXIMATE SMALL DIAMETER BORING LOCATION (CURRENT STUDY)
S-1 ⊗	APPROXIMATE DOWNHOLE SEISMIC BORING LOCATION (LEIGHTON, 2015)
LB-2 ▲	APPROXIMATE LARGE DIAMETER BORING LOCATION (LEIGHTON, 2014)
B-20 ◕	APPROXIMATE BORING LOCATION (LEIGHTON, 2013)
WCB-10 ⊕	APPROXIMATE BORING LOCATION (WOODWARD-CLYDE, 1989)
T-6 ▭	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (LEIGHTON, 2013)
WT-5 ⊏=⊐	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (WOODWARD-GIZIENSKI & ASSOCIATES, MARCH 15, 1973)
GT-2 ⊏=⊐	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (GEOCON INC, NOVEMBER 19, 1998)
LT-2 ⊏=⊐	APPROXIMATE FAULT EXPLORATION TRENCH (LEIGHTON AND ASSOCIATES, 1996)
WC-1 ⊏=⊐	APPROXIMATE FAULT EXPLORATION TRENCH LOCATION (WOODWARD-CLYDE, APRIL 25, 1989, REVISED (SEPTEMBER 7, 1989)
– – – –	APN 641-010-28
410	ELEVATION OF REMOVAL BOTTOM
78 —	MINOR FAULT – POTENTIALLY ACTIVE (11k-1.6k YEARS bp), DASHED WHERE APPROXIMATE, BOX AND NUMBER INDICATE DIRECTION AND AMOUNT OF DIP, WHERE KNOWN
— —— ?	APPROXIMATE GEOLOGIC CONTACT, QUERIED WHERE ASSUMED, DOTTED WHERE BURIED
A ├──┤ A'	CROSS SECTION LINE
Af	DOCUMENTED FILL (LEIGHTON, 2015)
Afu	UNDOCUMENTED FILL (GREATER THAN 5' IN THICKNESS), CIRCLED WHERE BURIED
Qvop	UNDIFFERENTIATED LATE PLEISTOCENE-AGE VERY OLD PARALIC DEPOSITS
Tsdss	SAN DIEGO FORMATION – EARLY PLEISTOCENE AND LATE PLIOCENE, MARINE SANDSTONE
🟨	PROPOSED ENTRANCE BUILDING
🟦	PROPOSED OCEAN VIEW TOWER



REFERENCE: BASE MAP PREPARED BY DEGENKOLB ENGINEERS, DECEMBER 2015

PLATE 1

Leighton

GEOTECHNICAL MAP

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

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Scale: 1"=40'	Date: December 2015

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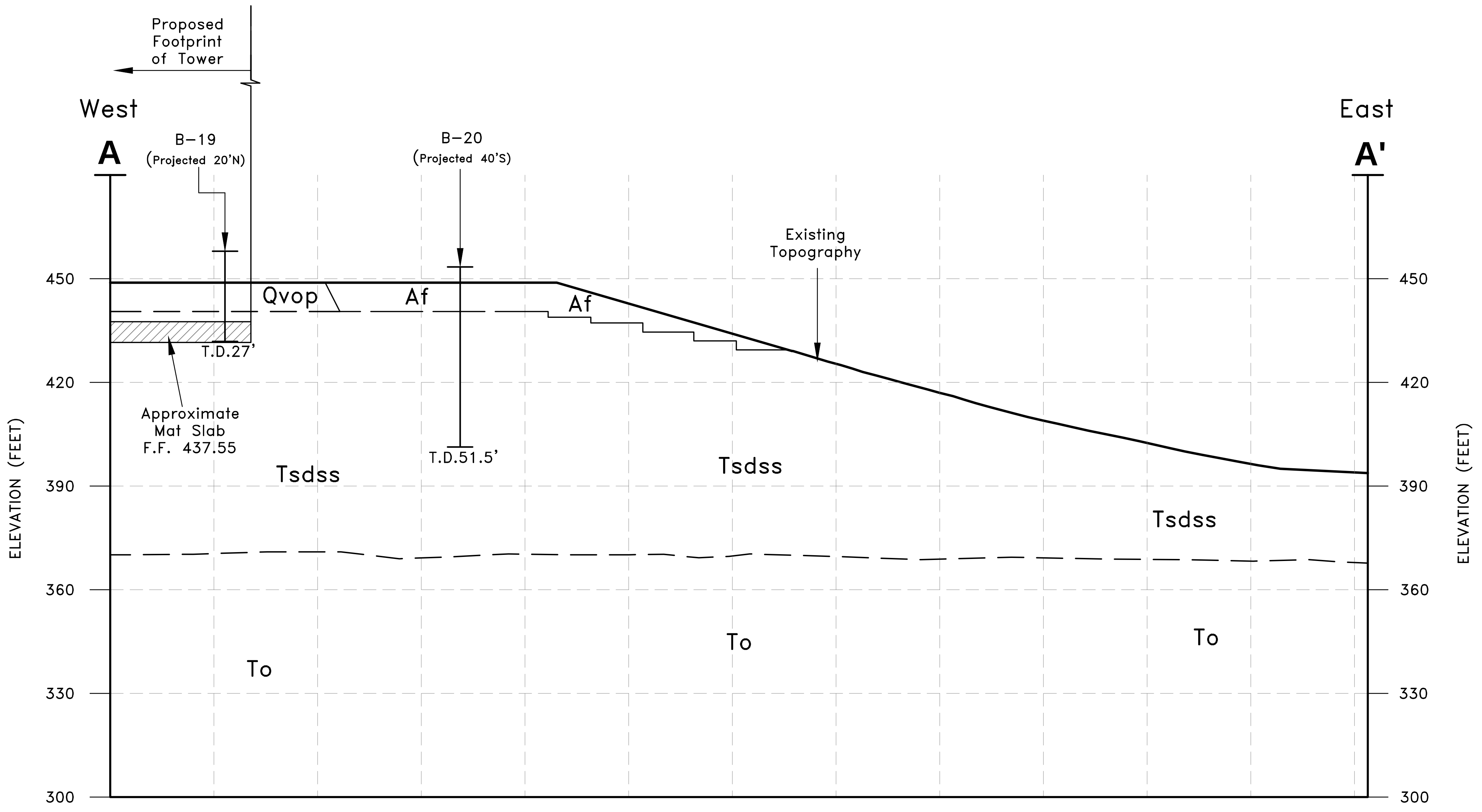
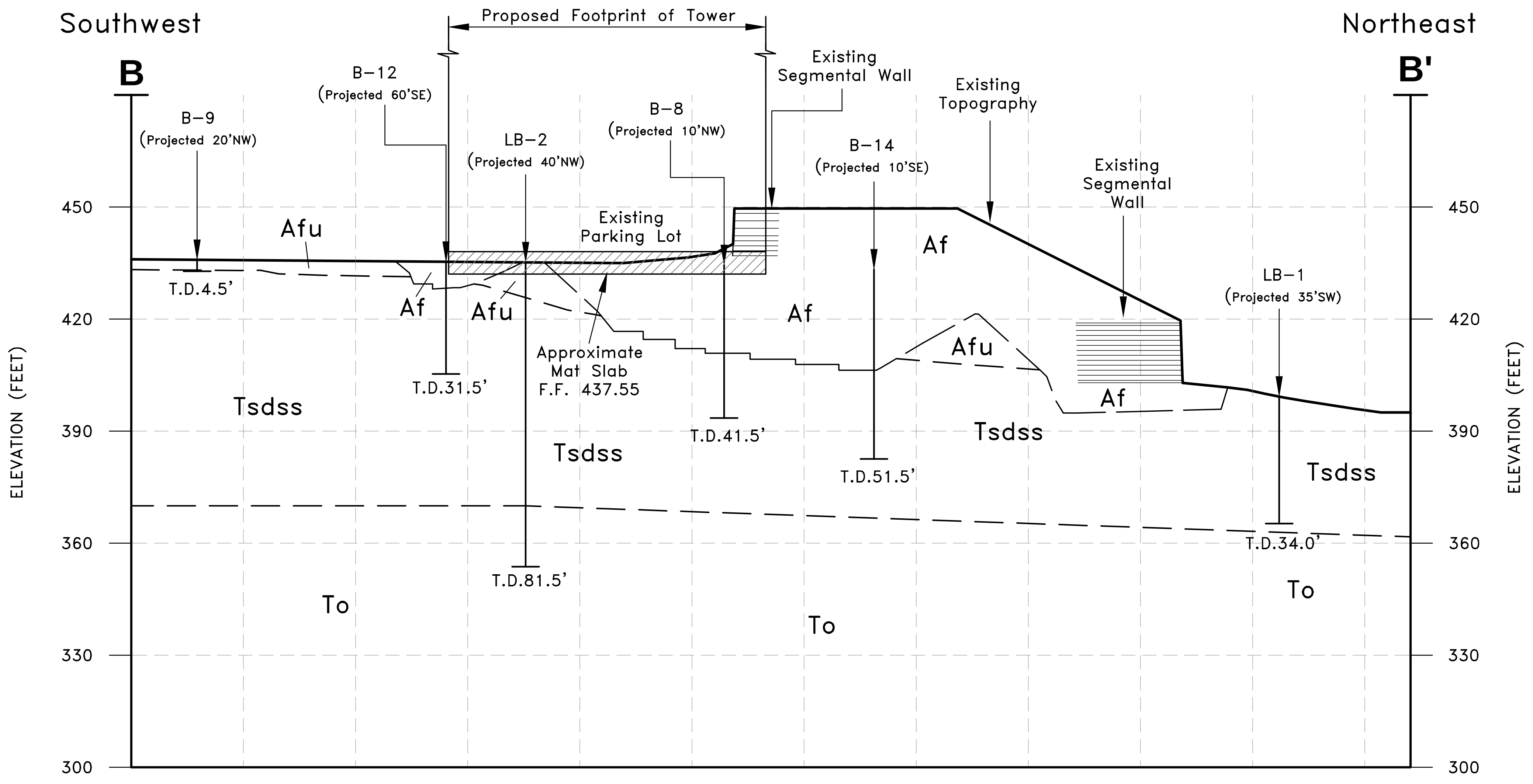
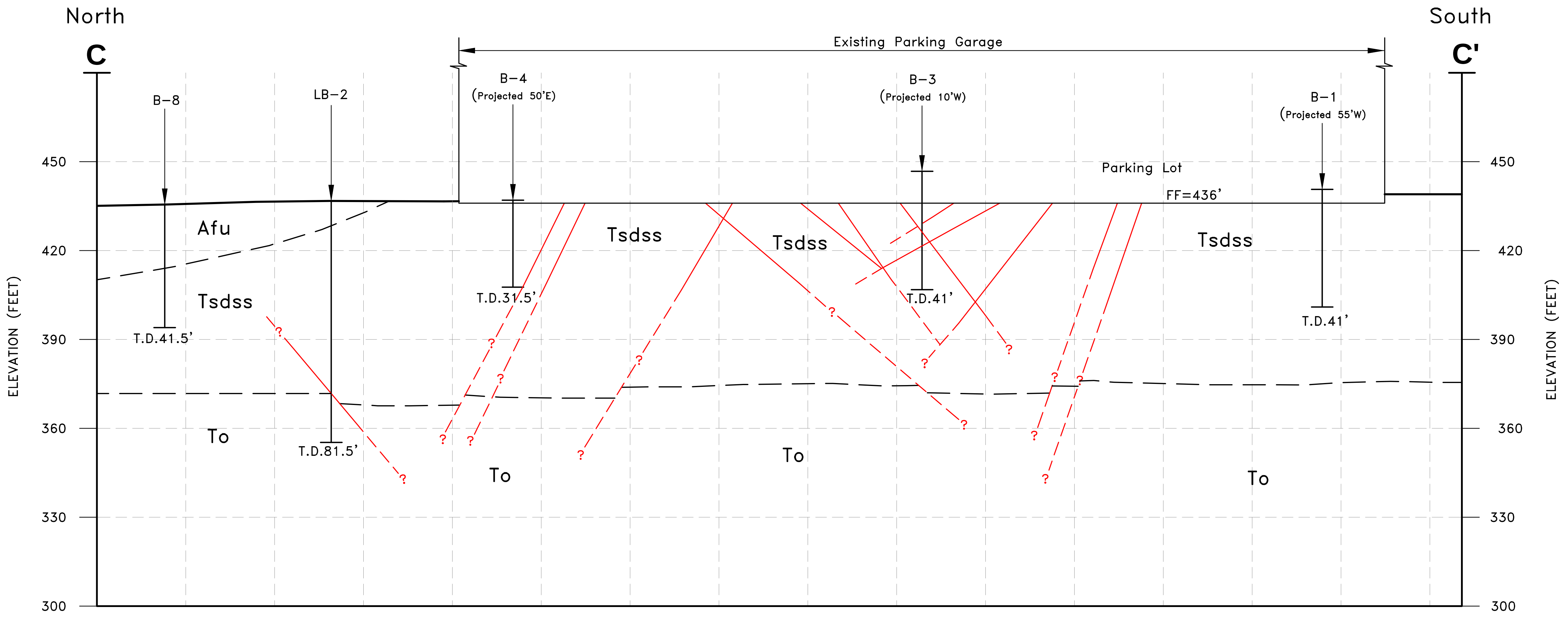
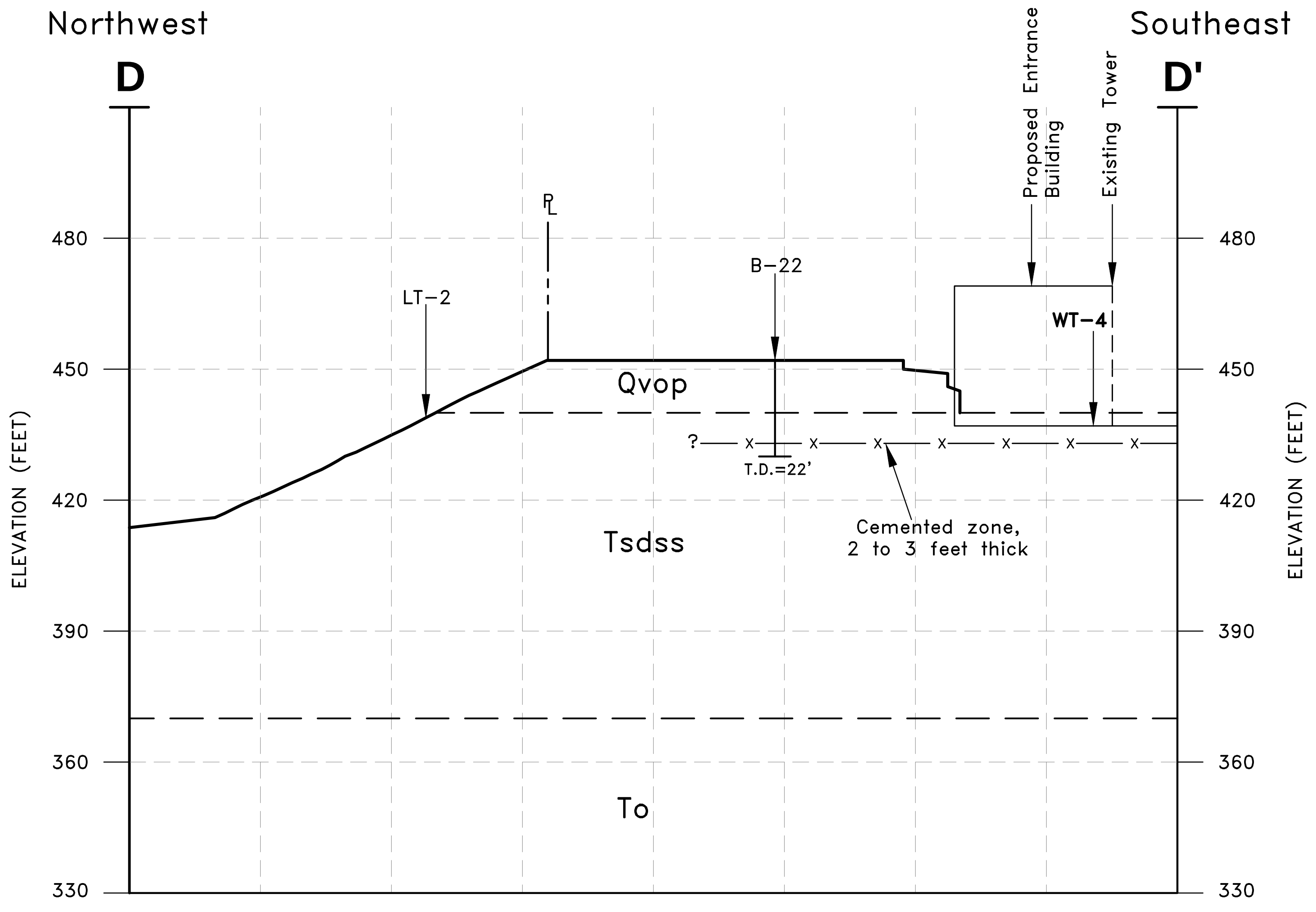




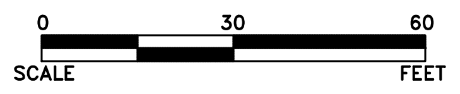




LEGEND

— — —	Geologic Contact
—— —	Approximate Location of Minor Fault - Potentially Active (11K-1.6K Years B.P.)
B-22 T.D.41'	Approximate Small Diameter Boring Location with Total Depth (Leighton, 2013, and Current Study)
LB-2 T.D.81.5'	Approximate Large Diameter Boring Location with Total Depth (Leighton, 2014)

Afu	Undocumented Fill
Qvop	Very Old Paralic Deposits
Tsdss	San Diego Formation
To	Otay Formation



GEOTECHNICAL CROSS SECTIONS
A-A' THROUGH D-D'

Sharp Chula Vista Medical Center Master Plan
Chula Vista, California

Proj: 603541-003	Eng/Geol: SAC/RCS
Scale: 1"=30'	Date: December 2015

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PLATE 2

Leighton

Appendix A

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APPENDIX A

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Appendix B

Boring Logs

GEOTECHNICAL BORING LOG KEY

Project No.

Project KEY TO BORING LOG GRAPHICS

Drilling Co.

Drilling Method

Location

Date Drilled

Logged By

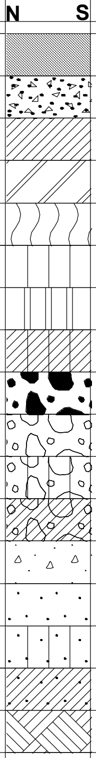
Hole Diameter

Ground Elevation

Sampled By

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								Asphaltic concrete	
									Portland cement concrete	
								CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay	
								CH	Inorganic clay; high plasticity, fat clays	
								OL	Organic clay; medium to plasticity, organic silts	
	5							ML	Inorganic silt; clayey silt with low plasticity	
								MH	Inorganic silt; diatomaceous fine sandy or silty soils; elastic silt	
								ML-CL	Clayey silt to silty clay	
								GW	Well-graded gravel; gravel-sand mixture, little or no fines	
								GP	Poorly graded gravel; gravel-sand mixture, little or no fines	
	10							GM	Silty gravel; gravel-sand-silt mixtures	
								GC	Clayey gravel; gravel-sand-clay mixtures	
								SW	Well-graded sand; gravelly sand, little or no fines	
								SP	Poorly graded sand; gravelly sand, little or no fines	
								SM	Silty sand; poorly graded sand-silt mixtures	
	15							SC	Clayey sand; sand-clay mixtures	
									Bedrock	
▽									Ground water encountered at time of drilling	
				B-1					Bulk Sample	
	20			C-1					Core Sample	
				G-1					Grab Sample	
				R-1					Modified California Sampler (3" O.D., 2.5 I.D.)	
				SH-1					Shelby Tube Sampler (3" O.D.)	
				S-1					Standard Penetration Test SPT (Sampler (2" O.D., 1.4" I.D.)	
	25			PUSH					Sampler Penetrates without Hammer Blow	
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
TR	THERMAL RESISTIVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-21

Project No.	603541-003	**Date Drilled**	10-28-15
Project	Sharp Chula Vista Ocean View Tower	**Logged By**	ERB
Drilling Co.	Baja Excavation	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	448'
Location	North Main Hospital Building	**Sampled By**	ERB

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	DOCUMENTED ARTIFICIAL FILL (Afd) @ 0': Silty SAND with COBBLES, loose to medium dense, medium brown, dry to damp, cobbles/gravels (1/2"-1") throughout	
445								SM	QUATERNARY VERY OLD PARALIC DEPOSITS (Qvop) @ 3': Silty SANDSTONE, very dense, damp, light reddish brown	
	5			R-1 B-1 5'-10'	50/6"	105	5		Density increases with depth	
440									@ 7': Color changed to light orangish-brown, increase in SILT/fine SANDSTONE	
	10			S-1	10 20 33			SM	TERTIARY SAN DIEGO FORMATION (Tsdss) @ 10': Silty SANDSTONE, dense to very dense, damp, light gray-brown, damp, very fine SANDSTONE, micaceous	-200
435									@ 13': Fossiliferous silty SANDSTONE, medium dense to dark brown, moist, fossils and carbonate blebs observed	
	15			R-2	10 28 50/4"	94	10		@ 15': Silty SANDSTONE, medium dense to very dense, medium gray, damp, micaceous, fine SANDSTONE	
430										
	20			S-2	14 23 20				@ 20': Silty SANDSTONE continues, cemented zone encountered at depth	
425									@ 24': Encountered hard cobble layer	
	25			R-3	50/5"	127	5		@ 25': Silty SANDSTONE, very dense, light whitish gray, dry to damp, coarse to fine SANDSTONE, trace micas, gravels (1/4"-1/2") throughout, trace oxidation lenses	
420									**Total Depth = 26 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 10/28/15**	
	30									

SAMPLE TYPES:

- **B BULK SAMPLE**
- **C CORE SAMPLE**
- **G GRAB SAMPLE**
- **R RING SAMPLE**
- **S SPLIT SPOON SAMPLE**
- **T TUBE SAMPLE**

TYPE OF TESTS:

-200	**% FINES PASSING**	**DS**	**DIRECT SHEAR**	**SA**	**SIEVE ANALYSIS**
AL	**ATTERBERG LIMITS**	**EI**	**EXPANSION INDEX**	**SE**	**SAND EQUIVALENT**
CN	**CONSOLIDATION**	**H**	**HYDROMETER**	**SG**	**SPECIFIC GRAVITY**
CO	**COLLAPSE**	**MD**	**MAXIMUM DENSITY**	**UC**	**UNCONFINED COMPRESSIVE STRENGTH**
CR	**CORROSION**	**PP**	**POCKET PENETROMETER**		
CU	**UNDRAINED TRIAXIAL**	**RV**	**R VALUE**		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-22

Project No. 603541-003
Project Sharp Chula Vista Ocean View Tower
Drilling Co. Baja Excavation
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location North Main Hospital Building

Date Drilled 10-28-15
Logged By ERB
Hole Diameter 8"
Ground Elevation 452'
Sampled By ERB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B-1 0-5'				SM	DOCUMENTED ARTIFICIAL FILL (Afd) @ 0': Silty SAND, light to medium brown, loose to medium dense, dry to damp, fine SAND, trace cobbles/gravels (1/2"-1") throughout	CR
450										
								SM	QUATERNARY VERY OLD PARALIC DEPOSITS (Qvop) @ 3': Silty SANDSTONE, very dense, damp to moist, light reddish brown	
	5			R-1	20 50/6"	112	10		@ 5': Density increases at depth	
445				B-2 6'-10'						
	10			S-1	10 17 16			SM	@ 10': Silty SANDSTONE, medium dense to dense, medium reddish brown, damp, medium SANDSTONE, trace micas	
440										
				B-3 13'-15'				SM	TERTIARY SAN DIEGO FORMATION (Tsdss) @ 13': Silty SANDSTONE, medium dense, light to medium gray-brown, damp to moist, medium to fine SANDSTONE, scattered shells and carbonate blebs throughout	
	15			R-2	22 50/5"				@ 15': Silty SANDSTONE, very dense, light whitish gray, damp, medium to fine SANDSTONE, trace micas, oxidation lenses throughout	DS
435										
	20			S-2 20'-21.5'	16 18 50/3"				@ 21': SANDSTONE content increases, oxidation lense/contact in Sample S-2 @ 22': Encountered very dense cobble layer encountered practical refusal	
430									**Total Depth = 22 Feet at time of drilling** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 10/28/15**	
	25									
425										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-23

Project No. 603541-003
Project Sharp Chula Vista Ocean View Tower
Drilling Co. Baja Excavation
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location North Main Hospital Building

Date Drilled 10-28-15
Logged By ERB
Hole Diameter 8"
Ground Elevation 455'
Sampled By ERB

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
455	0							SM	Hand-augered 0-5" to avoid utilities DOCUMENTED ARTIFICIAL FILL (Afd) @ 0': Silty SAND, loose to medium dense, light to medium brown, dry to moist, cobbles and gravels (1/2"-1-1/2") scattered throughout fine SAND	
								SM	QUATERNARY VERY OLD PARALIC DEPOSITS (Qvop)	
450	5			S-1 B-1 5'-10'	12 17 19				@ 6': Silty SANDSTONE, medium dense to dense, light brown-gray, damp, fine SANDSTONE, orange oxidation mottles observed @ 8': Noticeable increase in density	
445	10			R-1 B-2 10'-13.5'	26 50/3"	122	12	SP-SM	@ 10': SANDSTONE with SILTSTONE, very dense, light orange-brown, dry to damp, fine SANDSTONE, micaceous	-200
								SM	TERTIARY SAN DIEGO FORMATION (Tsdss) @ 13': Fossiliferous silty SANDSTONE, light gray-brown, medium dense, damp to moist, scattered shell fossils and carbonate blebs throughout, medium SANDSTONE @ 14': Contractor adds water to expedite drilling	
440	15			S-2 B-3 16'20'	11 16 18				@ 15': Silty SANDSTONE, medium dense to very dense, light whitish-gray, dry to damp, fine SANDSTONE, small cobbles (1/4" observed throughout), cementation observed	
435	20			R-2	50/2"	105	12	ML	@ 20': SILTSTONE, due to density/water added, Sample R-2 is disturbed	
								SM	@ 22': Very dense layer, potential cobble	
430	25			S-3	13 25 33				@ 25': Silty SANDSTONE, dense to very dense, dark olive-gray, damp, medium to fine SANDSTONE, trace micas increases fines at depth	
425	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-23

Project No. 603541-003
Project Sharp Chula Vista Ocean View Tower
Drilling Co. Baja Excavation
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location North Main Hospital Building
Date Drilled 10-28-15
Logged By ERB
Hole Diameter 8"
Ground Elevation 455'
Sampled By ERB

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
425	30			R-3	24 30 50/4"			ML	@ 30': Sandy SILTSTONE, dense to very dense, dark gray, dry to damp, trace micas, fine SANDSTONE @ 31': Auger becomes stuck, practical refusal	
									Total Depth = 31.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 10/28/15**	
420	35									
415	40									
410	45									
405	50									
400	55									
395	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-1

Project No.	603541-003	**Date Drilled**	3-18-14
Project	Sharp Chula Vista Master Plan	**Logged By**	MDJ
Drilling Co.	Pacifc Drilling	**Hole Diameter**	30"
Drilling Method	Bucket Auger - Down Hole	**Ground Elevation**	395'
Location	Toe of NE Fill Slope	**Sampled By**	BCP

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
395	0							SM	QUATERNARY COLLUVIUM (Qcol) @ 0': Surface grass @ 1': Brown silty SAND, some gravel, dry, loose Logging west side of hole S40W	
				B-1 @1'4'						
390	5								@ 5.5': Medium to light brown silty SAND, increased clay, dry, medium dense	
			gb:N40-60W 8-12NE c:N50W 8-12NE						@ 8.3'-9.1': Light brown silty SAND with clay, slightly moist, dense, contact between Qcol and Tsdss	
				B-2 @9'-10'						
385	10							SM	TERTIARY SAN DIEGO FORMATION (Tsdss) @ 9.1': Light brown silty fine SANDSTONE, dry to damp, medium dense, slightly friable	
380	15		b:N40W 5-10NE						@ 15': Light brown silty fine SANDSTONE, dry to damp, medium dense, bedding on dark brown bed, attitude at 15'	
									@ 18.3'-18.5': Light brown silty medium SANDSTONE with gravel, dry to damp, medium dense, rootlets, medium dense, northeast dip, subround 1/4" to 1.5" gravel	
375	20								@ 19': Reddish brown silty SANDSTONE with gravel, moist, dense, fine grained SANDSTONE, cobble size increase 1" to 3.5"	
				B-3 @22'-23'						
			gb:N20-40W 8-10NE						@ 23.8': Yellow-brown, silty SANDSTONE, less gravel, damp to moist, medium dense, very fine-grained SAND, friable, wavy erosional contact, less weathered, density increases at 23.8'	
370	25			B-4 @25'-26'					@ 25': Light brown, silty SANDSTONE, trace cobbles, dry, less dense, very fine SANDSTONE, less fines	
365	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-1

Project No. 603541-003
Project Sharp Chula Vista Master Plan
Drilling Co. Pacifc Drilling
Drilling Method Bucket Auger - Down Hole
Location Toe of NE Fill Slope

Date Drilled 3-18-14
Logged By MDJ
Hole Diameter 30"
Ground Elevation 395'
Sampled By BCP

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
365	30							SM	@ 31': Orangish brown silty SANDSTONE, trace clay, dry dense, with very fine SANDSTONE	
360	35								**Geologically Logged to 31 Feet** **Total Depth = 34 Feet** **No groundwater encountered at time of drilling** **Backfilled with Bentonite and Soil per DEH LDB**	
355	40									
350	45									
345	50									
340	55									
335	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
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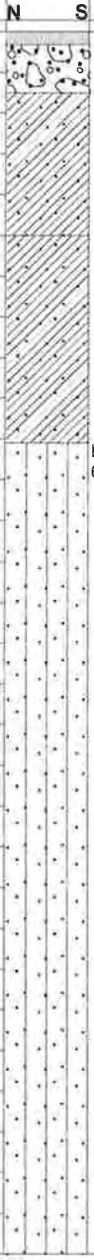
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-2

Project No.	603541-003	**Date Drilled**	3-19-14
Project	Sharp Chula Vista Master Plan	**Logged By**	MDJ
Drilling Co.	Pacific Drilling	**Hole Diameter**	30"
Drilling Method	Bucket Auger - Down Hole	**Ground Elevation**	435'
Location	Toe of NE Fill Slope	**Sampled By**	BCP



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
435	0								3" Asphalt, 12" Aggregate Base 3"-6" Disturbed colluvium processed/scarify	
								SC	QUATERNARY/COLLUVIUM (Qcol) @ 1.5': Brown, silty SAND with clay, trace clay, dry, dense, fine-grained SAND, gravel 1"-3" at base Tsdss/Qcol contract	
				B-1 @2'-4'						
430	5							SC	TERTIARY SAN DIEGO FORMATION (Tsdss) @ 5.2': Light brown silty SANDSTONE, damp to moist, medium dense to dense @ 7.4'-10.1': Light gray-brown SANDSTONE, friable	
425	10		b:N65E 6NW	B-2 @10'-11'				SM	@ 10': Light brown, silty SANDSTONE, dry, dense, very fine-grained SAND @ 10.1'-10.3': Light brown silty SANDSTONE, damp to moist, medium dense to dense, oxidized, attitude on bedding @ 13.3': Calcium-carbonate lined fracture on one side of hole with no vertical offset	
420	15								@ 15': Light brown silty SANDSTONE, dry, dense, very fine-grained, slightly friable	
415	20								@ 20' and 23' NW dip iron-oxide blebs @ 20': Boring belled out at 20' to 32', very friable, medium grained SANDSTONE	
410	25								@ 25': Very friable	
405	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No. 603541-003
Project Sharp Chula Vista Master Plan
Drilling Co. Pacific Drilling
Drilling Method Bucket Auger - Down Hole
Location Toe of NE Fill Slope
Date Drilled 3-19-14
Logged By MDJ
Hole Diameter 30"
Ground Elevation 435'
Sampled By BCP

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
405	30							SM	@ 30': Light brown silty SANDSTONE, dry, dense, very fine-grained, slightly friable, consistent northwest dipping beds	
400	35								@ 35': Light brown silty SANDSTONE, dry, dense, very fine-grained, slightly friable	
395	40								@ 40': Light brown silty SANDSTONE, dry, dense, very fine-grained, except very friable, consistent northwest dipping beds	
390	45		b:N30-35E 6-7NW						@ 45': Light brown silty SANDSTONE, dry, dense, very fine-grained SAND, except very friable, consistent northwest dipping beds	
									@ 48'-56.1': Minor fault that offsets bedding 1 to 2 feet, exists hole at 56.1', lined with silty and calcium carbonate	
385	50									
			Fr:N30W 80NE							
380	55		B:N10W 4-6NW						@ 55': Light brown silty SANDSTONE, light brown to orange-brown, damp, dense; slightly friable	
375	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS		
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT		
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY		
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH		
CR	CORROSION	PP	POCKET PENETROMETER				
CU	UNDRAINED TRIAXIAL	RV	R VALUE				

GEOTECHNICAL BORING LOG LB-2

Project No. 603541-003
Project Sharp Chula Vista Master Plan
Drilling Co. Pacific Drilling
Drilling Method Bucket Auger - Down Hole
Location Toe of NE Fill Slope
Date Drilled 3-19-14
Logged By MDJ
Hole Diameter 30"
Ground Elevation 435'
Sampled By BCP

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
375	60		Fr:N15W 47NE					SM	@ 60': Less friable at 60' @ 61': Medium to coarse grained SANDSTONE Cobble at base of San Diego Formation	
370	65		F:N35E 45SE STR:44SE 35SE	B-3 @66'-69'				CL	TERTIARY OTAY FORMATION (To) @ 64': Minor fault with San Diego Formation above and Otay Formation below. Minor fault is polished with no apparent remolded plastic clay along fracture @ 64': Sandy silty CLAYSTONE, brown-gray, damp, stiff to hard @ 65.2': Polished striated fault/fracture that the above fracture connect to at 68', moderately plastic clay along fault/fracture exits the hole at 72'. Bedding below fault has northeast strike and northwest dip	
365	70		b:N55E 14NW							
360	75		b:N50E 8-10NW					SM CL	@ 73': Silty SANDSTONE, light gray-brown, damp, very dense @ 76': Fault with San Diego Formation above and Otay Formation below. Fault is polished with no apparent remolded plastic clay along fracture @ 76': Sandy silty CLAYSTONE, brown-gray, damp, stiff to hard	
355	80								**Geologically Logged to 79 Feet** **Total Depth = 81.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with Bentonite and Soil per DEH LDB**	
350	85									
345	90									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

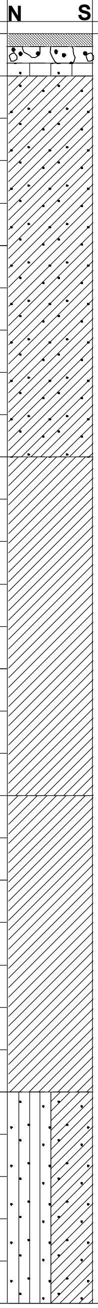
-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-1

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-1-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 441'
Sampled By FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.



Elevation Feet	Depth Feet	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							0-3" Asphalt Concrete	
440								3"-7" Class II Aggregate Base	
							SM	ARTIFICIAL FILL (Afu) @ 7"-1': Light brown silty SAND, moist, medium dense, fine to medium grained	
							SC	SAN DIEGO FORMATION (Tsdss) @ 1': Light olive to light brown clayey SANDSTONE, moist, very dense, fine grained, trace gravel	
435	5								
430	10		R-1 B-1 @10'-15'	28 50/5"	103	12	CL	@ 10': Light brown to light olive-brown sandy CLAYSTONE with some interbedded sandstone, moist, hard	EI, SA, AL
425	15		S-1	14 24 35					
								OTAY FORMATION (To) @ 18': Light brown silty CLAYSTONE, moist, hard, with trace fine sand	
420	20		R-2	15 50/6"			CL		
415	25		S-1	15 25 26			SC-SM	@ 25': Light brown to gray silty clayey SANDSTONE, moist, very dense, fine grained, trace gravel	
	30								

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-1

Project No.	603541-002	**Date Drilled**	5-1-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	441'
Location	See Boring Location Map	**Sampled By**	FJW

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R-3	21			SC-SM		
410					50/6"			CL	@ 30.5': Light brown to reddish brown, sandy silty CLAYSTONE, damp to moist, hard, trace gravel	
	35			S-3	14 25 36			SM	@ 35': Gray silty SANDSTONE, dry to damp, very dense, friable	
405										
	40			R-4	18 50/5"					
400									**Total Depth = 41 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 5/1/13**	
	45									
395										
	50									
390										
	55									
385										
	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-2

Project No.	603541-002	**Date Drilled**	5-1-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	440'
Location	See Boring Location Map	**Sampled By**	FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
440	0								0-2" Asphalt Concrete	
								SM	2"-5" Class II Aggregate Base	
								SC-ML	ARTIFICIAL FILL (Afu) @ 5"-1': Light brown silty SAND, moist, medium dense	
									SAN DIEGO FORMATION (Tsdss) @ 1': Olive to light brown clayey SANDSTONE to clayey SILTSTONE, damp to moist, dense, friable, micaceous	
435	5									
430	10			R-1	22 50/6"	98	24		@ 10': Moist, very dense	
425	15			S-1	9 22 29			SC	@ 15': Olive to light brown clayey SANDSTONE, moist, very dense, friable, micaceous	
								CL	OTAY FORMATION (To) @ 18': Brown, sandy silty CLAYSTONE, damp to moist, very stiff	
420	20			R-2	29 50/5"			SC	@ 20': Brown clayey SANDSTONE with SILTSTONE, moist, very dense, micaceous	
415	25			S-2	11 25 40			CL	@ 25': Red-brown to light brown sandy CLAYSTONE, moist, hard, micaceous	
410	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

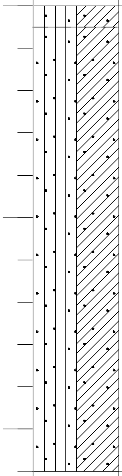
TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-2

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-1-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 440'
Sampled By FJW



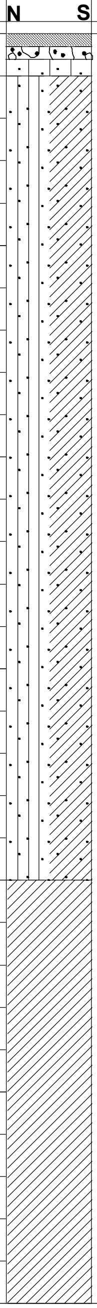
Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
410	30			R-3	30 50/4"			SC-SM	@ 30.5': Gray silty clayey SANDSTONE, moist, very dense, micaceous	
405	35			S-3					@ 35': Partial sample	
400	40			R-4	50/5"					
									Total Depth = 41 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 5/1/13**	
395	45									
390	50									
385	55									
380	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-3

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-1-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 447'
Sampled By FJW



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-3" Asphalt Concrete	
								SM	3"-6" Class II Aggregate Base	
445								SM-SC	ARTIFICIAL FILL (Afu) @ 6"-1': Gray silty SAND fine grained, dry to damp, friable, micaceous	
									SAN DIEGO FORMATION (Tsdss) @ 1': Grayish to olive-brown, silty clayey SANDSTONE, dense, micaceous, friable	
	5									
440										
	10			R-1	25 50/5"				@ 10': Very dense	DS
435										
	15			S-1	11 14 16				@ 15': Dense	
430										
	20			R-2 B-1 @20'-25'	16 18 23	91	15	SM	@ 20': Light brown to olive silty SANDSTONE, moist, dense, micaceous	
425										
	25			S-2	16 19 21				@ 25': Light brown silty SANDSTONE, moist, very dense	
420										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-3

Project No.	603541-002	**Date Drilled**	5-1-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	447'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30	▨		R-3	22 50/8"			SC	OTAY FORMATION (To) @ 30': Light brown to olive silty clayey SANDSTONE, moist, very dense, micaceous, friable	
415		▨								
	35	▨		S-3	10 11 14				@ 35': Light brown, silty clayey SANDSTONE, moist, dense	
410		▨								
	40	▨		R-4	36 50/4"				@ 40': Very dense	
405									**Total Depth = 41 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 5/1/13**	
	45									
400										
	50									
395										
	55									
390										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-4

Project No.	603541-002	**Date Drilled**	5-2-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	438'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	0-2" Asphalt Concrete 2"-5" Class II Aggregate Base SAN DIEGO FORMATION (Tsdss) @ 5": Light gray silty SANDSTONE, damp to dry, dense, friable, fine gained	
435										
	5			R-1 B-1 @5'-10'	11 16 31	92	8		@ 5': Light gray to light brown silty SANDSTONE, damp to moist, dense, micaceous, friable	DS
430										
	10			S-1	8 16 17					
425										
	15			R-2	11 15 21					
420										
	20			S-2	8 10 11				@ 20': Medium dense to dense	
415										
	25			R-3	12 21 30				@ 25': Dense	
410								SC	OTAY FORMATION (To) @ 28': Light brown with interbedded orange clayey SANDSTONE, damp, dense to very dense, friable, micaceous	
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-4

Project No.	603541-002	**Date Drilled**	5-2-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	438'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30	▨		S-3	16 17 21			SC		
405									**Total Depth = 31.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/2/13**	
	35									
400										
	40									
395										
	45									
390										
	50									
385										
	55									
380										
	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

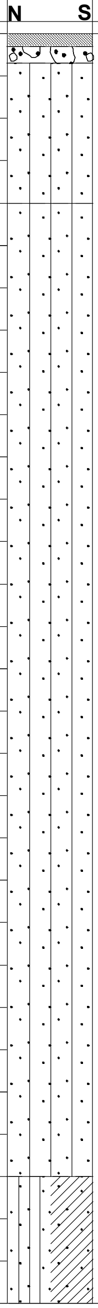
TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-5

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW



Elevation Feet	Depth Feet	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							0-3" Asphalt Concrete 3"-7" Class II Aggregate Base	
435			B-1 @1'-4'				SM	ARTIFICIAL FILL (Afu) @ 7"-4': Brown silty SAND with gravel, dry to damp, dense, friable	CR
								SAN DIEGO FORMATION (Tsdss) @ 4': Gray to light brown silty SANDSTONE, damp, dense, friable, micaceous	
430	5		R-1	10 17 26			SM		
425	10		S-1	11 14 15					
420	15		R-2	30 50/5"	97	4		@ 15': Very dense	
415	20		S-2	10 13 17				@ 20': Dense	
410	25		R-3	9 20 34					
							SM-SC	OTAY FORMATION (To) @ 27': Gray to light brown to orange clayey to silty SANDSTONE, damp to moist, dense, friable, micaceous	
	30								

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-5

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30	▨		S-3	15 15 17			SM-SC		
405										
									Total Depth = 31.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/2/13**	
	35									
400										
	40									
395										
	45									
390										
	50									
385										
	55									
380										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-6

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
435	0							SM	0-2" Asphalt Concrete 2"-5" Class II Aggregate Base ARTIFICIAL FILL (Afu) @ 5"-6': Medium brown silty SAND with gravel, moist, medium dense	
430	5			R-1	8 15 17			SM	@ 6': Gray to brown with orange silty SAND with trace gravel, moist, medium dense	
425	10			S-1	8 9 12					
420	15			R-3	10 14 20	108	13			
415	20			S-2	7 7 8				SAN DIEGO FORMATION (Tsdss) @ 22': Light brown to reddish brown silty SANDSTONE, moist, medium dense, micaceous, fine grained	
410	25			R-3	10 16 23			SM		
405	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-6

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
405	30			S-3	7 8 9			SM	@ 30': Light brown to gray silty SANDSTONE, damp, medium dense, fine grained, friable	
400	35			R-4	8 20 26				@ 35': Dense	
395	40			S-4	10 12 13				@ 40': Dense	
									Total Depth = 41.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/2/13**	
390	45									
385	50									
380	55									
375	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-7

Project No.	603541-002	**Date Drilled**	5-7-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	435'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
435	0							SM	0-4" Asphalt Concrete 4"-8" Class II Aggregate Base ARTIFICIAL FILL (Afu) @ 8": Medium brown silty SAND, damp to moist, medium dense, with trace gravel	
430	5			R-1	7 16 31	114	14	SM-ML	SAN DIEGO FORMATION (Tsdss) @ 5': Olive to light brown silty SANDSTONE to sandy SILTSTONE, damp, dense, friable, micaceous, fine	
425	10			S-1 B-1 @10'-13'	7 16 18			SC-CL	@ 10': Gray sandy silty CLAYSTONE to clayey SANDSTONE, moist, dense to very dense, hard	
420	15			R-2	12 26 50			SC	@ 15': Gray to light brown clayey SANDSTONE, moist, very dense, friable, micaceous	
415	20			S-2	10 13 11			SC-SM	@ 20': Gray to light reddish brown clayey to silty SANDSTONE, moist, medium dense, micaceous, friable	
									Total Depth = 21.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/7/13**	
410	25									
405	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG B-8

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
435	0								0-2" Asphalt Concrete	
								SM	2"-5" Class II Aggregate Base ARTIFICIAL FILL (Afu) @ 5": Medium brown silty SAND with clay and trace gravel, moist, medium dense	
430	5			R-1	8 14 16	102	13			
								SC	@ 6': Medium brown to dark gray clayey SAND with trace gravel, moist, medium dense, micaceous	
425	10			S-1	7 8 9			SM	@ 10': Gray to medium brown silty SAND with trace gravel, moist, medium dense, micaceous, friable	
420	15			R-2	3 4 4	108	15		@ 15': Loose	
415	20			S-2 B-1 @20'-25'	3 2 2					
								SM	OTAY FORMATION (To)	EI
410	25			R-3	7 11 16				@ 26': Light brown silty SANDSTONE with trace gravel, moist, medium dense, micaceous, friable	
405	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-8

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
405	30			S-3	8 8 8			SM		
400	35			R-4	15 27 33				@ 35': Gray to light brown silty SANDSTONE, moist, dense, micaceous, friable, fine grained	
395	40			S-4	8 14 16					
									Total Depth = 41.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
390	45									
385	50									
380	55									
375	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-9

Project No.	603541-002	**Date Drilled**	5-8-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	438'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-4" Asphalt Concrete 4-9" Class II Aggregate Base	
				B-1 @1.5'-2'				SM	ARTIFICIAL FILL (Afu) @ 9"-1.5': Medium brown silty SAND with gravel, damp, medium dense @ 1.5': Gray silty SAND, damp to moist, micaceous, friable, trace clay and gravel	
435									@ 4.5': Refusal on concrete	
	5								**Total Depth = 4.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
430										
	10									
425										
	15									
420										
	20									
415										
	25									
410										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

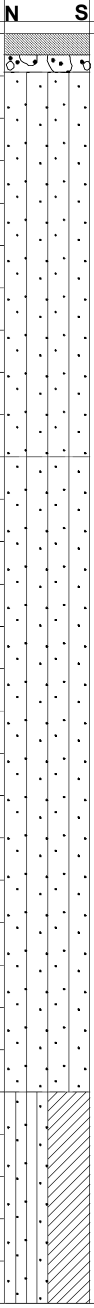
TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-10

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-7-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 439'
Sampled By FJW



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0							SM	0-5" Asphalt Concrete 5"-9" Class II Aggregate Base ARTIFICIAL FILL (Afu) @ 9": Medium to dark brown silty SAND with gravel and cobbles, crushed aggregate, damp to moist, loose (trench or wall backfill)	
435										
	5			R-1	3 3 3	94	9			
430										
	10			S-1 B-1 @10'-12'	9 17 20			SM	SAN DIEGO FORMATION (Tsdss) @ 10': Olive to light brown fine silty SANDSTONE, damp, medium dense, friable, micaceous	SA, CR
425										
	15			R-2	34 37 50/5"	114	5		@ 15': Very dense	
420										
	20			S-2	9 11 13				@ 20': Dense	
415										
	25			R-3	26 50/6"			SM/CL	OTAY FORMATION (To) @ 25': Olive to light brown to gray silty SANDSTONE to sandy silty CLAYSTONE, moist, very dense to hard, micaceous	
410										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG B-10

Project No.	603541-002	**Date Drilled**	5-7-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	439'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-3	8 16 22			SM/CL	@ 30': Very dense to hard	
									Total Depth = 31.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/7/13**	
405										
	35									
400										
	40									
395										
	45									
390										
	50									
385										
	55									
380										
	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-11

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-6-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								0-5" Asphalt Concrete	
435									5"-9" Class II Aggregate Base	
								SM	ARTIFICIAL FILL (Afu) @ 9"-2.5': Medium brown, silty SAND with gravel, damp, medium dense @ 2.5'-4': Medium brown to olive silty SAND, damp to moist, medium dense, trace gravel, fine grained	
								SM	SAN DIEGO FORMATION (Tsdss) @ 4': Olive to light brown silty SANDSTONE, damp to moist, very dense, micaceous	
430	5			R-1	21 50/4"					
				B-1 @8'-10'						
425	10			S-1	13 13 18				@ 11': Olive to gray to light brown silty SANDSTONE, moist, dense, calcite deposits, fine grained, friable	
420	15			R-2	11 29 50/4"	98	13		@ 15': Very dense	
415	20			S-2	13 16 20				@ 20': Very dense	
410	25			R-3	19 33 50/3"	98	13	SM	@ 25': Olive to light brown silty SANDSTONE, moist, very dense, micaceous, friable, fine grained, with some interbedded SILTSTONE	
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG B-11

Project No.	603541-002	**Date Drilled**	5-6-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	436'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-3	14 28 40			SM	OTAY FORMATION (To) @ 30': Gray silty SANDSTONE, moist, very dense, friable, fine grained	
405										
	35			R-4	18 50/5"	93	12		@ 35': Gray to light brown	
400										
	40			S-4	13 25 31					
395										
	45			R-5	13 43 50/2"	95	7		@ 45': Gray silty SANDSTONE, damp to moist, very dense, micaceous, friable, fine grained	
390										
	50			S-5 B-2 @50'-55'	14 20 26				@ 50': Gray to light brown, fine to medium grained	
385										
	55			S-6	16 22 27				@ 55': Interbedded gray to light brown to orange, silty SANDSTONE, damp to moist, very dense, friable, fine grained	
380										
	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-11

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-6-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	60			S-7	12 20 22			SM		
375										
	65			S-8	16 19 34					
370										
	70			S-9	10 19 19				@ 70': Gray to yellowish brown silty SANDSTONE with trace of interbedded sandy CLAYSTONE, moist, very dense to hard, friable	
365										
	75			S-10	15 20 20					
360										
	80			S-11	15 25 50/6"			CL	@ 80': Gray sandy silty CLAYSTONE, moist, hard	
355										
	85			S-12	50/2"				@ 85': No sample recovered	
350										
									@ 88': Harder drilling	
	90									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-11

Project No.	603541-002	**Date Drilled**	5-6-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	436'
Location	See Boring Location Map	**Sampled By**	FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
345	90			S-13 ☒	38 50/4"			SM	@ 90': Reddish brown to orange-brown silty SANDSTONE, moist, very dense, fine to medium grained	
340	95			S-14 ☒	39 50/3"			CL	@ 95': Gray to reddish brown CLAYSTONE, moist, hard	
335	100			S-15 ☒	30 50/3"					
									Total Depth = 101 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and cement on 5/6/13**	
330	105									
325	110									
320	115									
	120									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-12

Project No.	603541-002	**Date Drilled**	5-7-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	436'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-4" Asphalt Concrete	
									4"-8" Class II Aggregate Base	
435								SM	ARTIFICIAL FILL (Afu) @ 8"-5': Medium brown silty SAND with gravel, dry to moist, medium dense	
	5			R-1 B-1 @5'-10'	19 41 32	115	9	ML	SAN DIEGO FORMATION (Tsdss) @ 5': Light brown to gray sandy SILTSTONE, with trace gravel, dense to very dense , micaceous	SA
430										
	10			S-1	7 11 11			SM-ML	@ 10': Gray to olive fine silty SANDSTONE to sandy SILTSTONE, dry to damp, dense, micaceous	
425										
	15			R-2	16 25 50			SM	OTAY FORMATION (To) @ 15': Gray silty SANDSTONE, moist, very dense, micaceous	
420										
	20			S-2	13 22 25					
415										
	25			R-3	19 50/6"					
410										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-12

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-7-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
405	30			S-3	16 22 20			SM	@ 30': Gray to light brown, silty clayey SANDSTONE, moist, very dense, fine grained	
									Total Depth = 31.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/7/13**	
	35									
400										
	40									
395										
	45									
390										
	50									
385										
	55									
380										
	60									

SAMPLE TYPES:
B BULK SAMPLE
C CORE SAMPLE
G GRAB SAMPLE
R RING SAMPLE
S SPLIT SPOON SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
-200 % FINES PASSING
AL ATTERBERG LIMITS
CN CONSOLIDATION
CO COLLAPSE
CR CORROSION
CU UNDRAINED TRIAXIAL
DS DIRECT SHEAR
EI EXPANSION INDEX
H HYDROMETER
MD MAXIMUM DENSITY
PP POCKET PENETROMETER
RV R VALUE
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
SG SPECIFIC GRAVITY
UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-13

Project No.	603541-002	**Date Drilled**	5-2-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	436'
Location	See Boring Location Map	**Sampled By**	FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								0-2" Asphalt Concrete	
									2"-6" Class II Aggregate Base	
435								SM	ARTIFICIAL FILL (Afu) @ 6": Medium brown silty SAND with trace gravel, moist micaceous, medium dense	
	5			R-1	7 13 22	111	14			
430										
	10			R-2	7 5 7	110	10		@ 10': Loose	
425										
	15			S-1	11 10 7			SM	OTAY FORMATION (To) @ 15': Gray to light medium brown silty SANDSTONE, moist, medium dense	
420										
	20			R-3	10 22 40				@ 20': Gray to light brown, silty SANDSTONE with trace clay, dense to very dense, moist, micaceous, friable, fine-grained	
415										
	25			S-2	10 17 18				@ 25': Very dense	
410										
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-13

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-2-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 436'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			R-4	50/5"			SM	@ 30': Gray to light brown silty SANDSTONE, moist, very dense, micaceous, friable	
405										
	35			S-3	10 19 22				@ 35': Very dense	
400										
	40			R-5	13 36 50/5"				@ 40': Very dense	
395										
									Total Depth = 41.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/2/13**	
	45									
390										
	50									
385										
	55									
380										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG B-14

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-7-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
435	0								0-4" Topsoil	
								SM	ARTIFICIAL FILL (Afu) @ 4"-5': Medium brown silty SAND with gravel, moist, medium dense	
430	5			R-1	26 41 50/3"				@ 5': Gray to light brown silty SAND with gravel, moist, very dense, micaceous	DS
425	10			S-1	10 12 16				@ 10': Dense	
				B-1 @12'-15'						MD
420	15			R-2	12 28 43	102	10		@ 15': Very dense	
415	20			S-2	1 2 2				@ 20': Light to medium reddish brown, silty SAND with trace gravel, moist, loose, micaceous	AL, SA, H
410	25			R-3	5 9 18	96	8	SM	OTAY FORMATION (To) @ 25': Light brown to olive silty SANDSTONE, damp, medium dense	DS
405	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-14

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-7-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 435'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
405	30			S-3	9 15 15			SM	@ 30.5': Light brown to gray clayey silty SANDSTONE, damp, dense	
400	35			R-4 B-2 @35'-40'	8 16 28					
395	40			S-4	10 14 19				@ 40': Light brown to gray silty SANDSTONE, damp to moist, dense, micaceous	
390	45			R-5	18 32 50/3"				@ 45': Light brown to olive, very dense	
385	50			S-5	16 19 22				@ 50': Very dense	
									Total Depth = 51.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/7/13**	
380	55									
375	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

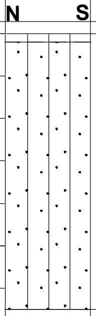
TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-15

Project No.	603541-002	**Date Drilled**	5-8-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	443'
Location	See Boring Location Map	**Sampled By**	FJW



Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-2" Topsoil with organics	
								SM	ARTIFICIAL FILL (Afu) @ 2": Olive to light brown to gray, fine silty SAND with clay, damp, dense, micaceous, friable	SE
440				B-1 @2'-5'						
	5			R-1	12 17 29					
435									**Total Depth = 6.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
	10									
430										
	15									
425										
	20									
420										
	25									
415										
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-16

Project No.	603541-002	**Date Drilled**	5-8-13
Project	Sharp Chula Vista/Geotechnical Investigation	**Logged By**	FJW
Drilling Co.	Baja Exploration	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	436'
Location	See Boring Location Map	**Sampled By**	FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-3" Topsoil	
435								SM	SAN DIEGO FORMATION (Tsdss) @ 3": Olive to light brown to gray silty SANDSTONE, very dense, fine grained, micaceous, friable	
				B-1 @2'-5'						RV, SE
	5			R-1	15 32 50/5"					
430										
									Total Depth = 6.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
	10									
425										
	15									
420										
	20									
415										
	25									
410										
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-17

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-8-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 426'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-3" Topsoil	
425								SM	SAN DIEGO FORMATION (Tsdss) @ 3": Olive to light brown silty SANDSTONE, damp, dense, micaceous, friable, fine grained	
				B-1 @2'-5'						SE
	5			R-1	12 15 26					
420										
									Total Depth = 6.5 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
	10									
415										
	15									
410										
	20									
405										
	25									
400										
	30									

SAMPLE TYPES:
B BULK SAMPLE
C CORE SAMPLE
G GRAB SAMPLE
R RING SAMPLE
S SPLIT SPOON SAMPLE
T TUBE SAMPLE

TYPE OF TESTS:
-200 % FINES PASSING
AL ATTERBERG LIMITS
CN CONSOLIDATION
CO COLLAPSE
CR CORROSION
CU UNDRAINED TRIAXIAL
DS DIRECT SHEAR
EI EXPANSION INDEX
H HYDROMETER
MD MAXIMUM DENSITY
PP POCKET PENETROMETER
RV R VALUE
SA SIEVE ANALYSIS
SE SAND EQUIVALENT
SG SPECIFIC GRAVITY
UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-18

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-8-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 407'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-3" Asphalt Concrete	
									3"-6" Class II Aggregate Base	
								SM	ARTIFICIAL FILL (Afu) @ 6': Olive to light brown silty SAND, damp to moist, medium dense, with clay chunks, trace gravel	
405				B-1 @2'-5'						SE
	5			R-1	7 9 17				@ 5': Olive to gray silty SAND, damp to moist, medium dense, micaceous, trace gravel	
400									**Total Depth = 6.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/8/13**	
	10									
395										
	15									
390										
	20									
385										
	25									
380										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-19

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map
Date Drilled 5-3-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 456'
Sampled By FJW

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	VERY OLD PARALIC DEPOSITS (Qvop) @ 0': Light to medium brown silty SANDSTONE with GRAVEL-COBBLE CONGLOMERATE, dry to damp, very dense, micaceous, medium grained	
455										
	5			B-1 @4'-8' R-1	50/3"	76	7			
450								SM	SAN DIEGO FORMATION (Tsdss) @ 6': Gray to light brown silty SANDSTONE, damp to moist, very dense, micaceous, friable, fine-grained	
	10			S-1	24 50/5"					
445										
	15			R-2	50/6"	93	11		@ 15': Moist	
440										
	20			S-2	50/6"					
435										
	25			R-3	24 50/6"					
430									@ 27': Refusal on very dense SANDSTONE	
									Total Depth = 27 Feet **No groundwater encountered at time of drilling** **Backfilled with bentonite grout and concrete on 5/3/13**	
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG B-20

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-3-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 452'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log N S	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0								0-6" Topsoil	
								SM	<u>SAN DIEGO FORMATION (Tsdss)</u> @ 6": Light brown to grayish brown silty SANDSTONE with trace gravel, dry to damp, very dense, friable, micaceous	
450										
	5			R-1	50/5"				@ 5': Damp to moist	
445										
	10			S-1 B-1 @10'-15'	28 50/5"					
440										
	15			R-2	28 50/1"					DS
435										
	20			S-2	15 21 27					
430										
	25			R-3	30 50/3"	97	2		@ 25': Dry	
425										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG B-20

Project No. 603541-002
Project Sharp Chula Vista/Geotechnical Investigation
Drilling Co. Baja Exploration
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Boring Location Map

Date Drilled 5-3-13
Logged By FJW
Hole Diameter 8"
Ground Elevation 452'
Sampled By FJW

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	**SOIL DESCRIPTION** *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-3	20 29 50/5"			SM	<u>OTAY FORMATION (To)</u> @ 30': Light brown to olive fine silty SANDSTONE with trace clay, damp to moist, very dense, friable, micaceous	
420										
	35			R-4	16 23 30				@ 35': Gray to olive to light brown	
415										
	40			S-4	11 20 28					
410										
	45			R-5	16 23 50	98	12		@ 45': Gray to olive fine silty SANDSTONE, moist, very dense, micaceous, friable	
405										
	50			S-5	15 18 20					
400									**Total Depth = 51.5 Feet** **No groundwater encountered at time of drilling** **Backfilled with bentonite grout on 5/3/13**	
	55									
395										
	60									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING
AL	ATTERBERG LIMITS
CN	CONSOLIDATION
CO	COLLAPSE
CR	CORROSION
CU	UNDRAINED TRIAXIAL
DS	DIRECT SHEAR
EI	EXPANSION INDEX
H	HYDROMETER
MD	MAXIMUM DENSITY
PP	POCKET PENETROMETER
RV	R VALUE
SA	SIEVE ANALYSIS
SE	SAND EQUIVALENT
SG	SPECIFIC GRAVITY
UC	UNCONFINED COMPRESSIVE STRENGTH

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Appendix B

Woodward-Clyde Borings, 1989

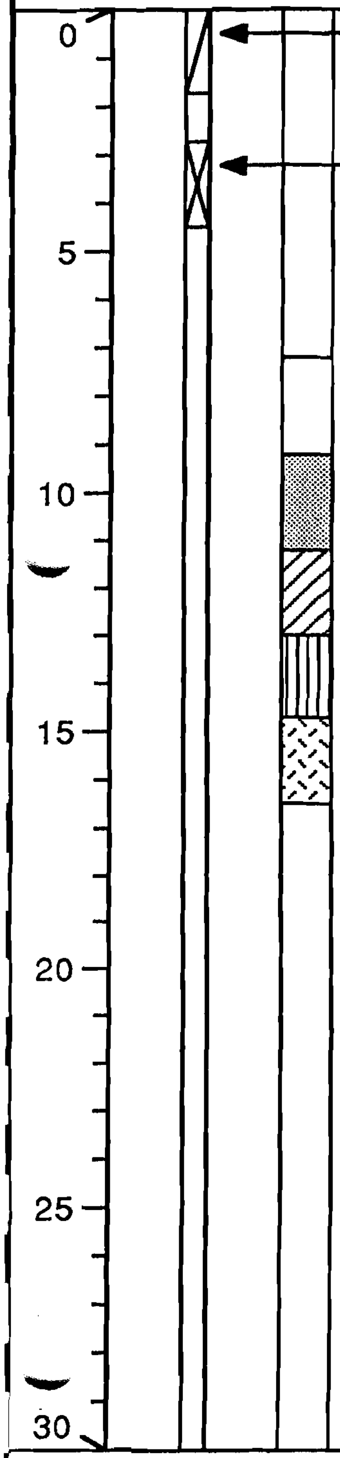
Project: CHULA VISTA HOSPITAL

KEY TO LOGS

Date Drilled:
Water Depth:
Measured:

Type of Boring:
Type of Drill Rig:
Hammer:

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
			Surface Elevation:			



DISTURBED SAMPLE LOCATION
Sample was obtained by collecting auger cuttings in a plastic bag.

DRIVE SAMPLE LOCATION
Sample with recorded blows per foot was obtained by using a Modified California drive sampler (2" inside diameter, 2.5" outside diameter). The sampler was driven into the soil at the bottom of the hole with a 140 pound hammer falling 30 inches.

Fill

Sand

Clay

Silt

Sand/Clay

*GS - Grain Size Distribution Analysis
DS - Direct Shear Test
'R' - R-Value Test

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure A-1

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL

Log of Boring No: 1

Date Drilled: 3-27-89
Water Depth:Dry
Measured:At time of drilling
pe of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
			Surface Elevation: Approximately 431.5'			
0			**FILL** 1.5" Asphalt concrete over moist, greenish gray, very silty fine sand with some gravel			
	1-1					
5						
	1-2	25	Increased gravels	17	100	
			Moist, greenish gray and brown mottled, silty fine sand			
10						
	1-3	28		13	106	
			Some gravels			
15						
	1-4	24		21	103	
20						
	1-5	35		19	100	
			RESIDUAL SOIL Very stiff to hard, moist, dark brown, sandy lean clay (CL) with some gravels and roots (porous)			
25						
	1-6	13		15	107	UCS= 1466psf
			SAN DIEGO FORMATION Very dense, moist, yellowish brown, silty fine sand with orange laminated staining (SM)			
30	1-7	59		13	107	

Project No: 8951127W-SI01

Woodward-Clyde Consultants

Figure A-2

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL

Log of Boring No: 1 (Cont'd)

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	1-7 ☒	59	(Continued) very dense, moist, yellowish brown, silty fine sand with orange laminated staining (SM)			
35	1-8 ☒	82				
			Bottom of Boring at 36.5 feet			
40						
45						
50						
55						
60						
65						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-8

The data developed and conclusions and recommendations reported in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No: 2**

Date Drilled: 3-27-89
Water Depth:Dry
Measured:At time of drilling
Type of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
			Surface Elevation: Approximately 426.5'			
0			**FILL** 1.5" Asphalt concrete over moist, dark brown to red brown, silty fine sand with some gravels			
5	2-1	24	Moist, greenish brown, silty fine sand (micaceous)	11	97	
10	2-2	57/6"	Moist, brown-gray, silty fine sand with gravels and localized pockets of rusty brown silty sand	12	94	
15	2-3	29	Moist, red-brown and green-brown mottled, silty to clayey sand with gravel	16	110	
20	2-4	28		21	98	
			Moist, yellowish brown and dark brown mottled, silty sand			
			Moist, yellow-brown, silty sand (mottled)			
25	2-5	36		13	95	
			SAN DIEGO FORMATION Very dense, moist, yellow- brown, silty fine sand (SM) with orange laminated staining			
30						

Project No: 8951127W-SI01 | Woodward-Clyde Consultants | Figure: A-4

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No: 2 (Cont'd)**

h, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	2-6 ☒	92	(Continued) very dense, moist, yellowish brown, silty fine sand with orange laminated staining (SM)	11	94	
35	2-7 ☒	83				
			Bottom of Boring at 36.5 feet			
40						
45						
50						
55						
60						
65						

Project No: 8951247W-SI01 | **Woodward-Clyde Consultants** | Figure: A-5

The data developed and conclusions and recommendations reached in this/these correspondence(s) was for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No: 3**

Date Drilled: 3-27-89 Water Depth:Dry Measured:At time of drilling

pe of Boring: 8" HSA Type of Drill Rig: CME-55 Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
			Surface Elevation: Approximately 450.5'			
0			**FILL** Moist, red-brown and gray mottled, silty sand with gravels			
	3-1					GS
5	3-2	29		15	102	
10	3-3	24		11	100	
15	3-4	25		13	103	
			Moist, yellow brown to gray, poorly graded medium sand with gravel and localized clay balls			
20	3-5	12				
25	3-6	58	Increased gravel	14	85	
			Refusal on gravel at 25.5 feet			
30						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure A-6

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No: 4**

Date Drilled: 3-27-89
Water Depth:Dry
Measured:At time of drilling

Type of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 450'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** Moist, yellow brown and dark brown mottled, silty fine sand with gravels and mica			
			Increased gravel			
5	4-1	24		14	102	
			Moist, greenish gray and dark brown, silty sand with localized black, clay balls and gravel			
10	4-2	15		13	99	
			Moist, yellowish brown, silty sand with gravel			
15	4-3	41		10	106	
20	4-4	32	Moist, greenish brown, silty sand with mica and poorly graded sand pockets and gravels	16	104	
25	4-5	15	**RESIDUAL SOIL** Hard, moist, dark brown, clayey fine sand to lean clay with some gravels (SC-CL)	18	110	UNC= 384psf
			SAN DIEGO FORMATION Dense, moist, greenish gray, silty sand with yellow gray staining (SM), micaceous			
30						

The data developed and [illegible] correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No: 4 (Cont'd)**

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	4-6	30	(Continued) dense, moist, greenish gray, silty sand with yellow gray staining (SM), micaceous			
35	4-7	32				
40	4-8	55	Very dense, moist, greenish gray, silty fine sand (SM) with mica and calcium carbonates			
	4-9	68	Gravel			
45			Bottom of Boring at 44 feet			
50						
55						
60						
65						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure A-8

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL | **Log of Boring No: 5**

Date Drilled: 3-28-89
Water Depth:Dry
Measured:At time of drilling
pe of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 446'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** Moist, yellow brown and dark brown mottled, silty fine sand with gravels			
	5-1					GS,"R'
5	5-2	39		10	101	
			Moist, green brown and green gray, silty fine sand with medium grained sand pockets, gravel and mica			
10	5-3	44		13	106	
15	5-4	35		13	98	
			Moist, green gray, light and dark brown mottled, silty fine sand with gravels, orange staining and mica			
20	5-5	34		12	100	
25	5-6	36		16	99	
			Very moist to wet, green gray and brown, silty fine sand with gravels and orange stained			
30						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-9

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No:** 5 (Cont'd)

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	5-7	52	(Continued) very moist to wet, green gray and brown, silty fine sand with gravels and orange stained	18	104	
35	5-8	9	Moist, dark brown, silty fine sand with wood debris and organic odor and gravels			
			RESIDUAL SOIL Hard, moist, dark gray brown, sandy lean clay (CL) some gravels			
	5-9	50/5.5"	**SAN DIEGO FORMATION** Very dense, moist, gray green, silty fine sand (SM) with abundant gravel and some orange staining			
40						
			Dense to very dense yellow brown silty fine sand (micaceous)			
45	5-10	40				
50	5-11	68				
			Bottom of Boring at 50.5 feet			
55						
60						
65						

Project No: 8951127W-9101	**Woodward-Clyde Consultants**	Figure: A-10

The data developed and conclusions and recommendations reported in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No:** 6

Date Drilled: 3-28-89
Water Depth: 24' (perched)
Measured: At time of drilling
pe of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
			Surface Elevation: Approximately 441'			
0			**FILL** Moist, dark and light brown and gray mottled, silty fine sand with orange sandy pockets and some gravels, micaceous			
5	6-1 ☒	48		12	100	
10	6-2 ☒	36		12	95	
			Moist, yellow brown, light brown mottled, silty fine sand with gravels and orange pockets(micaceous)			
15	6-3 ☒	33		10	97	
			Moist, light yellow and dark brown, silty sand with dark brown, clayey sand pockets, gravel and micas			
20	6-4 ☒	38		16	104	
			▼ increased gravels			
25	6-5 ☒	26	Wet, green-gray and brown mottled, silty sand with dark brown and green pockets, some gravels and wood	20	105	
			▨ **RESIDUAL SOIL** Dense, moist, dark brown, clayey fine sand with gravel and root fibers (SC)			
30						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-11

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No:** 6 (Cont'd)

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	6-6	34	(Continued) dense, moist, dark brown, clayey fine sand with gravel and root fibers (SC)	15	105	UCS= 1002psf
			SAN DIEGO FORMATION Dense, moist, yellow brown, sandy silt with brown staining (ML)			
35	6-7	37	Very hard drilling at 37 feet			
			Medium dense, moist, green-gray, silty fine sand (SM). (micaceous)			
40	6-8	24		22	95	
45	6-9	80				
			Bottom of Boring at 46.5 feet			
50						
55						
60						
65						

Project No: 8951127W-SI01 | **Woodward-Clyde Consultants** | Figure: A-12

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL	**Log of Boring No:** 7

Date Drilled: 3-28-89

Water Depth: Dry

Measured: At time of drilling

pe of Boring: 8" HSA

Type of Drill Rig: CME-55

Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 423'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** 1.5" asphalt concrete over moist yellow-gray, silty sand with gravels and shell fragments (micaceous)			
5	7-1	40				
			Grading to			
			Moist, greenish brown and yellow brown mottled, silty fine sand with orange medium grained sand pockets, gravel and shell fragments			
10	7-2	30		18	99	
			Moist, yellow brown, silty fine sand with gravel, mica and shell fragments			
15	7-3	27		15	100	
			Moist, green-brown and yellow brown, silty sand with dark brown, lean clay pockets with gravel and wood			
20	7-4	44		16	103	
			Moist, red-brown, silty fine sand to sandy silt	20	105	
25	7-5	42	Becomes very hard drilling at 26.5 feet			
			SAN DIEGO FORMATION Very dense, moist, yellow brown silt with orange staining (ML)			
	7-6	65/6"				
			Refusal at 28.5 feet			
30						

Project No: 8951127W-SI01

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Figure A-13

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Project: CHULA VISTA HOSPITAL		**Log of Boring No: 8**
Date Drilled: 3-29-89	Water Depth:Dry	Measured:At time of drilling
Type of Boring: 8" HSA	Type of Drill Rig: CME-55	Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 441'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** Moist, green-brown and brown mottled, silty sand with orange medium grained sand pockets and gravels			
5	8-1	24		13	103	
10	8-2	29		15	105	
			RESIDUAL SOIL Stiff to hard, moist, dark brown, sandy lean clay (CL) with gravels			
15	8-3	23	**TERRACE DEPOSITS** Medium dense, moist, red-brown, poorly graded medium sand with silt (SM/ML)			
			↓ Dense gravels			
20	8-4	76/ 5.5"				
			SAN DIEGO FORMATION Very dense, moist, gray, silty very fine sand with cemented zones and micas (SM) with some orange staining			
25	8-5	53				
30						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-14

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL | **Log of Boring No: 8 (Cont'd)**

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	8-6 ☒	53	(Continued) very dense, moist, gray, silty very fine sand with cemented zones and mica (SM)			
35	8-7 ☒	51				
40	8-8 ☒	52				
			Bottom of Boring at 41.5 feet			
45						
50						
55						
60						
65						

Project No: 8951127W-SI01 | **Woodward-Clyde Consultants** | Figure: A-15

The data developed and conclusions and recommendations reported in this/these correspondence(s) were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL

Log of Boring No: 9

Date Drilled: 3-29-89
Water Depth:Dry
Measured:At time of drilling
[illegible]e of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 451'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** Moist, dark brown, clayey fine sand with roots and gravel			
	9-1					GS
5	9-2	35		17	106	
			Moist, brown, silty sand with yellow-brown pockets and gravel			
10	9-3	33		12	99	
			Moist, green-gray, silty fine sand with some gravels and micas			
15	9-4	32		8	93	
			Very hard drilling at 17.5 feet			
			TERRACE DEPOSITS Very dense, moist, reddish brown, medium to coarse poorly graded sand (SP)	4	109	
20	9-5	63				
25	9-6	93				
			SAN DIEGO FORMATION Dense, moist, gray, silty fine sand with some orange staining and micas (SM)			
30						

Project No: 8951[illegible]

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Figure: A-16

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL | **Log of Boring No: 9 (Cont'd)**

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	9-7	42	(Continued) dense, moist, gray, silty fine sand some orange staining and micas (SM)			
35	9-8	40				
40	9-9	34				
45	9-10	60				
			Bottom of Boring at 46.5 feet			
50						
55						
60						
65						

Project No: 8951127W-SI01 | Woodward-Clyde Consultants | Figure: A-17

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL | **Log of Boring No: 10**

Date Drilled: 3-29-89
Water Depth:DRY
Measured:AT TIME OF DRILLING
..e of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Surface Elevation: Approximately 446'

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
0			**FILL** Moist, yellow brown and red brown mottled, silty sand with black spots			
5	10-1	53		11	93	
			Moist, green brown, silty fine sand, micaceous			
10	10-2	20		12	91	
			TERRACE DEPOSITS Very dense, moist, reddish brown, medium to coarse poorly graded sand with gravel (SP)			
15	10-3	69				
			SAN DIEGO FORMATION Very dense, moist, yellow brown, silty fine sand with micas (SM)			
20	10-4	99				
			Grades to Very dense, moist, green gray, silty fine sand with micas (SM)			
25	10-5	53				
			Bottom of Boring at 26.5 feet			
30						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-18

This was developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Project: CHULA VISTA HOSPITAL

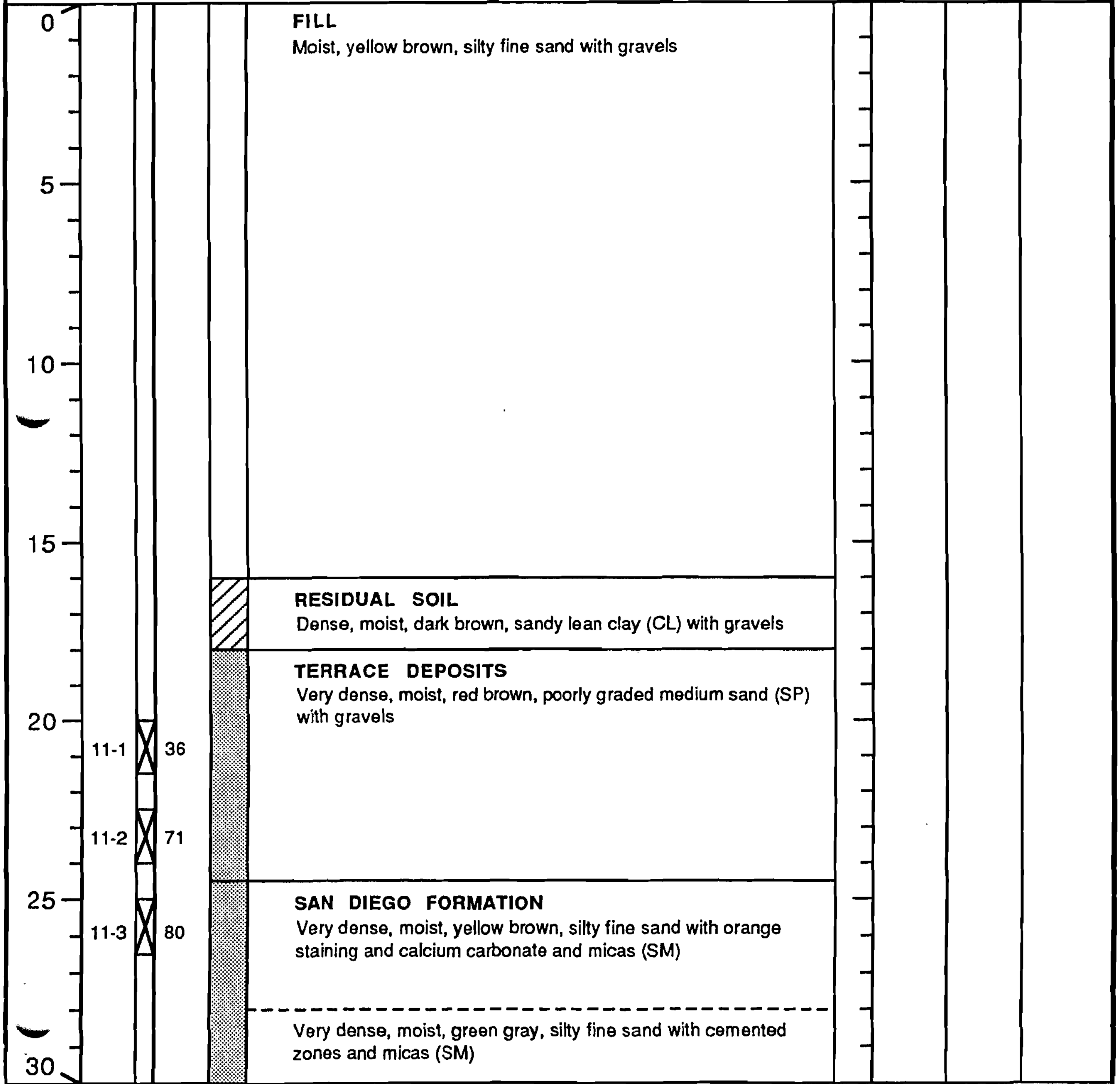
Log of Boring No: 11

Date Drilled: 3-29-89
Water Depth:Dry
Measured:At time of drilling
Type of Boring: 8" HSA
Type of Drill Rig: CME-55
Hammer: 140 lbs at 30" drop

* see Key to Logs, Fig. A-1

Depth, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*

Surface Elevation: Approximately 450.5'



FILL
Moist, yellow brown, silty fine sand with gravels

RESIDUAL SOIL
Dense, moist, dark brown, sandy lean clay (CL) with gravels

TERRACE DEPOSITS
Very dense, moist, red brown, poorly graded medium sand (SP) with gravels

Samples	Blows/ft
11-1	36
11-2	71
11-3	80

SAN DIEGO FORMATION
Very dense, moist, yellow brown, silty fine sand with orange staining and calcium carbonate and micas (SM)

Very dense, moist, green gray, silty fine sand with cemented zones and micas (SM)

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Project: CHULA VISTA HOSPITAL	Log of Boring No: 11 (Cont'd)

th, ft	Samples	Blows/ft	Material Description	Moisture Content, %	Dry Density, pcf	Other Tests*
30	10-4	83	(Continued) very dense, moist, green gray, silty fine sand with cemented zones and micas (SM)			
	10-5	74				
35			Bottom of Boring at 34.5 feet			
40						
45						
50						
55						
60						
65						

Project No: 8951127W-SI01 **Woodward-Clyde Consultants** Figure: A-20

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Appendix C

Laboratory Testing Procedures and Test Results

APPENDIX C

Laboratory Testing Procedures and Test Results

Moisture Determination Tests: Moisture content determinations were performed on relatively undisturbed samples obtained from the boring excavations. The results of these tests are presented on the boring logs.

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Text, ASTM Test Method 4829. Specimens are molded under a given compactive energy to approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Description	Expansion Index	Expansion Potential
B-1, 10-15 feet	Light Brown to Light Olive Brown to sandy lean CLAY	62	Medium
B-8, 20-25 feet	Medium Brown to Brown silty SAND with a trace of GRAVEL	9	Very Low

Maximum Dry Density and Optimum Moisture Content Tests: The maximum dry density and optimum moisture content of selected representative soil samples were evaluated in general accordance with ASTM D 1557. The test results are presented in the table below and the plotted curve is presented in the test data.

Sample Location	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-14, 12-15 feet	Light Brown to Medium Reddish Brown clayey silty SAND with a trace of GRAVEL	123.2	12.0

Direct Shear/Soil Strength Tests: Direct shear test was performed on selected remolded sample which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing

APPENDIX C (Continued)

force. The samples were tested under various normal loads, using a motor-driven, strain-controlled, direct-shear testing apparatus. The test results are presented in the test data.

Sample			Peak Shear		Ultimate Shear	
Sample Location	Unit	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)	Friction Angle (degrees)	Apparent Cohesion (psf)
B-3 @ 10-11 feet	Tsdss	Grayish to Olive-Brown silty clayey SANDSTONE	37.0	158.5	32.5	157.5
B-4 @ 5-6 feet	Tsdss	Light Gray to Light Brown silty SANDSTONE	37.4	47	36.8	0
B-14 @ 5-6 feet	Afu	Gray to Light Brown silty SAND	42.6	3.5	28.1	390
B-14 @ 25-26 feet	To	Light Brown to Olive silty SANDSTONE	38.3	639	35.8	130.5
B-20 @ 15-16 feet	Tsdss	Light Brown to Grayish Brown silty SANDSTONE	40.4	105	39.5	114.5
B-22 @ 15-16 feet	Tsdss	Light Brown to Grayish Brown silty SANDSTONE with Trace Gravel	44	0	40	0

APPENDIX C (Continued)

Soluble Sulfates: The soluble contents of selected samples were determined by standard geochemical methods. The test results are presented in the table below:

Sample Location	Sulfate Content (%)
B-5 @ 1 to 4 feet	0.0375
B-10 @ 10 to 12 feet	0.0150
B-22 @ 0 to 5 feet	Less than 0.0150

Chloride Content: Chloride content was tested in accordance with DOT Test Method No. 422. The results are presented below:

Sample Location	Chloride Content, ppm
B-5 @ 1 to 4 feet	24
B-10 @ 10 to 12 feet	12
B-22 @ 0 to 5 feet	124.9

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with California Test Method 643. The results are presented in the table below:

Sample Location	pH	Minimum Resistivity (ohms-cm)
B-5 @ 1 to 4 feet	7.71	878
B-10 @ 10 to 12 feet	8.01	3,044
B-22 @ 0 to 5 feet	7.17	1,117

APPENDIX C (Continued)

Particle/Grain Size Analysis (ASTM D422): Particle size analysis was performed by mechanical sieving, wash sieving, and hydrometer methods according to ASTM D422, D 1140, D4318, and D6913. The percent fine particles from these analyses are summarized below. Plots of the sieve and hydrometer results are provided on the figures at the end of this Appendix.

Sample	Percent Passing No. 200 Sieve
B-1 @ 10-15 feet	60
B-10 @ 10-12 feet	27
B-12 @ @ 5-10 feet	52
B-14 @ 20-21 feet	45
B-21 @ 10-11.5 feet	31
B-23 @ 10-13.5 feet	33

Atterberg Limits (ASTM D 4318): The Atterberg Limits were determined in accordance with ASTM Test Method D4318 for engineering classification of the fine-grained materials and presented in the table below:

Sample	Plasticity Index	Liquid Limit (%)	Plastic Limit (%)	USCS Soil Classification
B-1 @ 10-15 feet	17	31	14	CL
B-14 @ 20-21.5 feet	3	23	20	ML

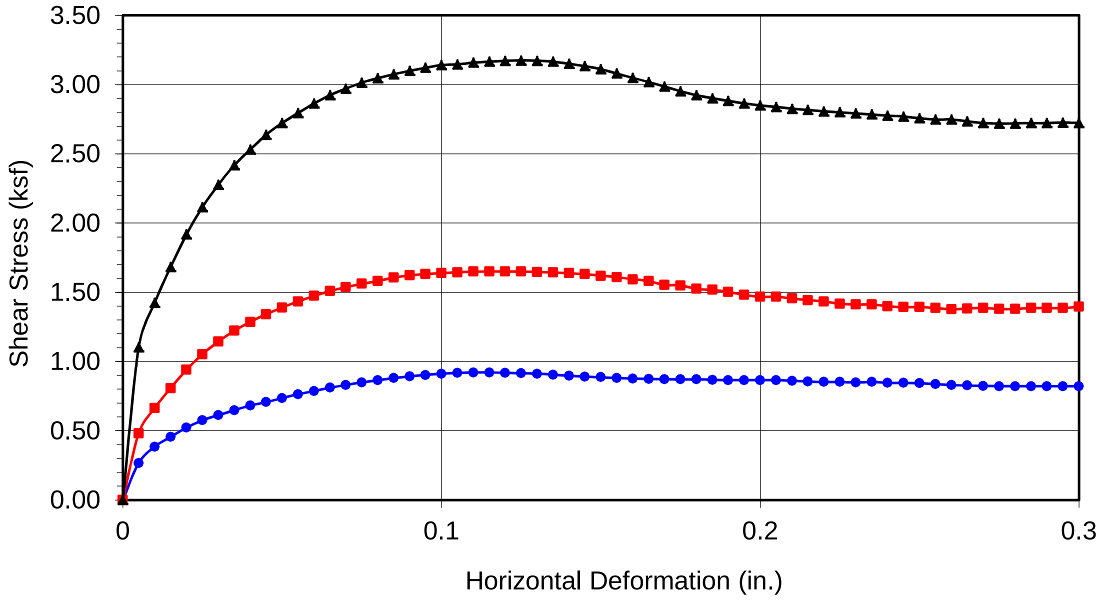
"R"-Value: The resistance "R"-value was determined by the California Materials Method CT301 for base, subbase, and basement soils. The samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"-value at exudation pressure of 300 psi is reported.

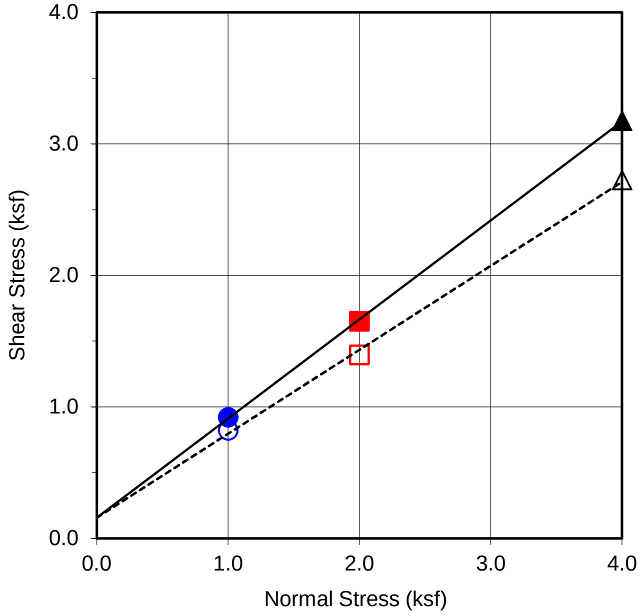
Sample Location	Sample Description	R-Value
B-16 @ 2 to 5 feet	Olive to Light Brown to Gray silty SANDSTONE	63

APPENDIX C (Continued)

Sand Equivalent Test (ASTM D 2419): Sand equivalent (SE) tests were performed on selected representative samples. The SE value is the ratio of the coarse- to fine-grained particles in the selected samples.

Sample	Average SE
B-15 @ 2 to 5 feet	25
B-16 @ 2 to 5 feet	34
B-17 @ 2 to 5 feet	45
B-18 @ 2 to 5 feet	18





Boring No.	**B-3**
Sample No.	**R-1**
Depth (ft)	**10-11**
Sample Type:	Ring

Soil Identification:

Pale olive silty sand (SM)

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	158.5	37.0
Ultimate	157.5	32.5

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.921	■ 1.650	▲ 3.175
Shear Stress @ End of Test (ksf)	○ 0.821	☐ 1.396	△ 2.723
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	6.47	6.47	6.47
Dry Density (pcf)	84.7	90.1	88.6
Saturation (%)	17.6	20.0	19.3
Soil Height Before Shearing (in.)	0.9883	0.9862	0.9780
Final Moisture Content (%)	30.7	30.2	30.0

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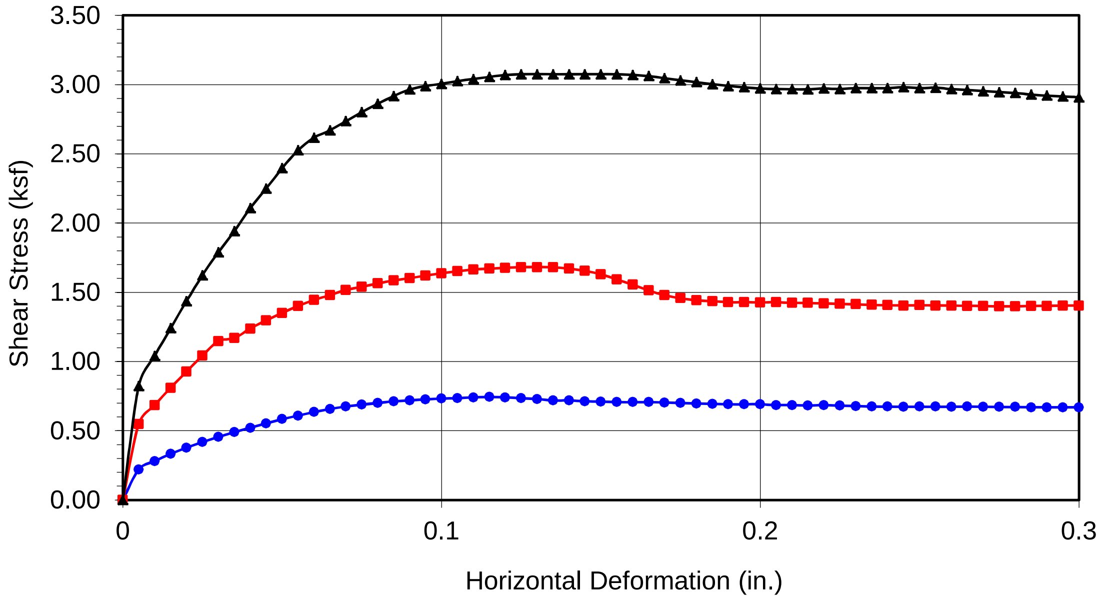
DIRECT SHEAR TEST RESULTS

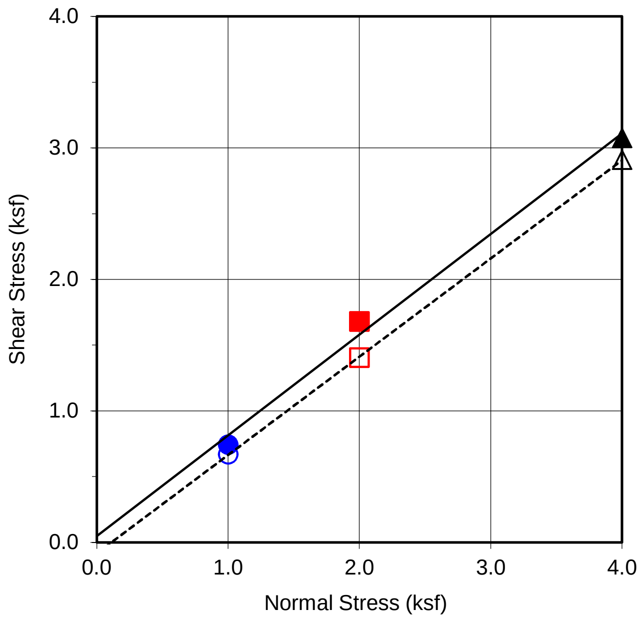
Consolidated Drained - ASTM D 3080

Project No.: 603541-002

SHARP CHULA VISTA MEDICAL CENTER
MASTER PLAN

05-13





Boring No.	**B-4**
Sample No.	**R-1**
Depth (ft)	**5-6.0**
Sample Type:	RING

Soil Identification:

POORLY GRADED SAND WITH SILT
(SP-SM), light grayish brown.

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	47.0	37.4
Ultimate	-83.5	36.8

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.744	■ 1.681	▲ 3.075
Shear Stress @ End of Test (ksf)	○ 0.669	□ 1.404	△ 2.909
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	10.78	10.86	10.33
Dry Density (pcf)	91.1	90.4	87.7
Saturation (%)	34.2	33.9	30.3
Soil Height Before Shearing (in.)	0.9824	0.9825	0.9618
Final Moisture Content (%)	29.4	28.5	29.0

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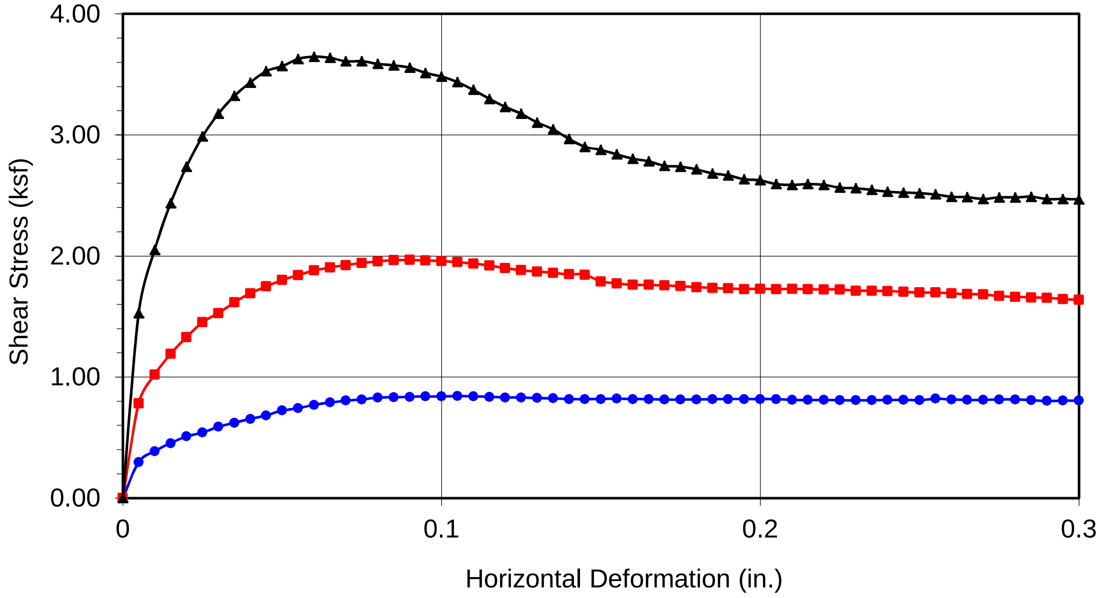
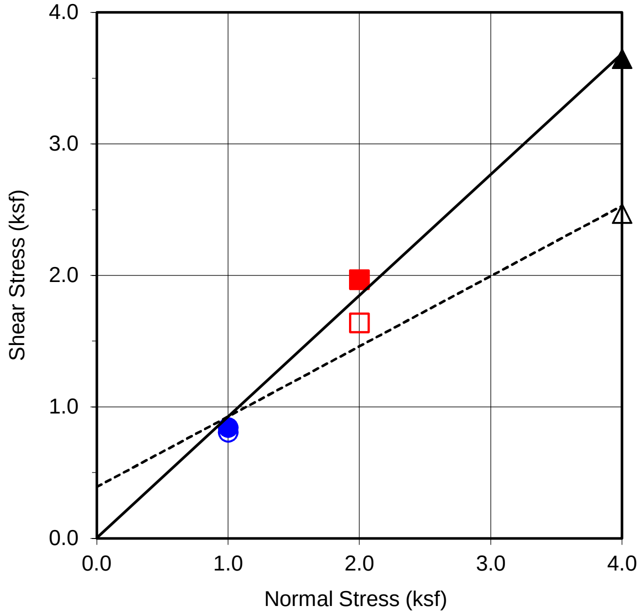
DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

Project No.: 603541-002
SHARP CHULA VISTA MEDICAL CENTER
MASTER PLAN

05-13





Boring No.	**B-14**
Sample No.	**R-1**
Depth (ft)	**5-6**
Sample Type:	Ring

Soil Identification:
Yellowish brown silty, clayey sand with gravel (SC-SM)g

Strength Parameters

	C (psf)	ϕ (°)
Peak	3.5	42.6
Ultimate	390.0	28.1

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.843	■ 1.968	▲ 3.647
Shear Stress @ End of Test (ksf)	○ 0.805	□ 1.638	△ 2.468
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.50	7.50	7.50
Dry Density (pcf)	99.2	105.2	112.7
Saturation (%)	29.0	33.6	40.9
Soil Height Before Shearing (in.)	0.9646	0.9775	0.9861
Final Moisture Content (%)	17.3	18.6	17.6

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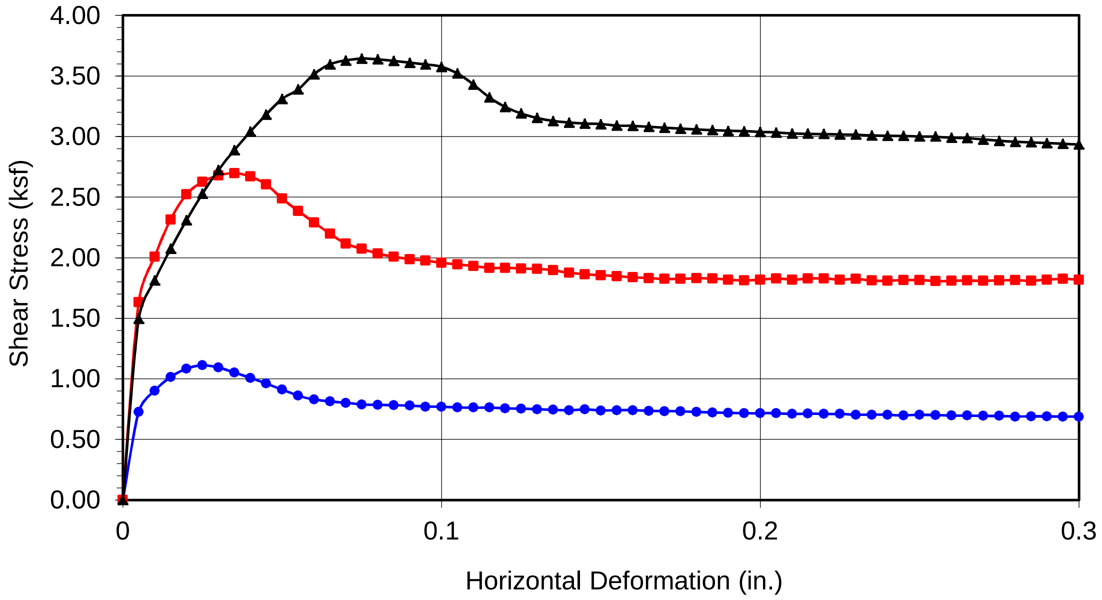
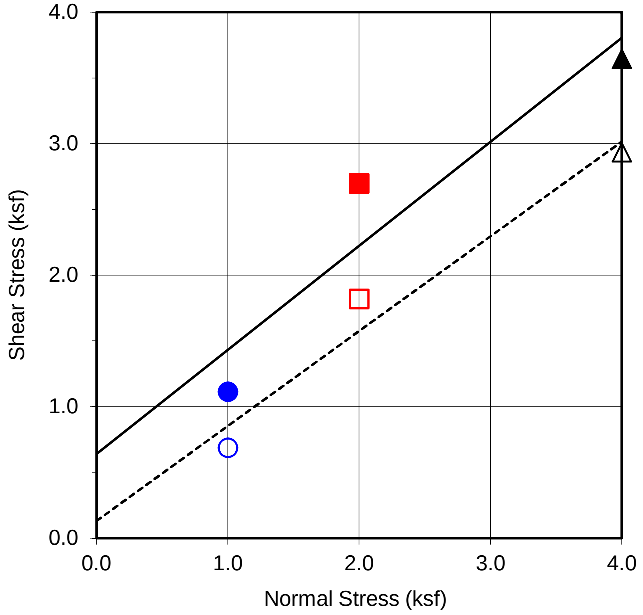
DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 603541-002
SHARP CHULA VISTA MEDICAL CENTER
MASTER PLAN

05-13





Boring No.	**B-14**
Sample No.	**R-3**
Depth (ft)	**25-26.0**
Sample Type:	RING

Soil Identification:

POORLY GRADED SAND WITH SILT
(SP-SM), light grayish brown.

Strength Parameters

	C (psf)	ϕ (°)
Peak	639.0	38.3
Ultimate	130.5	35.8

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.112	■ 2.698	▲ 3.644
Shear Stress @ End of Test (ksf)	○ 0.688	□ 1.819	△ 2.934
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	13.29	14.01	11.03
Dry Density (pcf)	93.2	95.6	91.2
Saturation (%)	44.4	49.5	35.1
Soil Height Before Shearing (in.)	0.9962	0.9935	0.9706
Final Moisture Content (%)	29.3	26.8	28.3

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DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

Project No.: 603541-002

SHARP CHULA VISTA MEDICAL CENTER
MASTER PLAN

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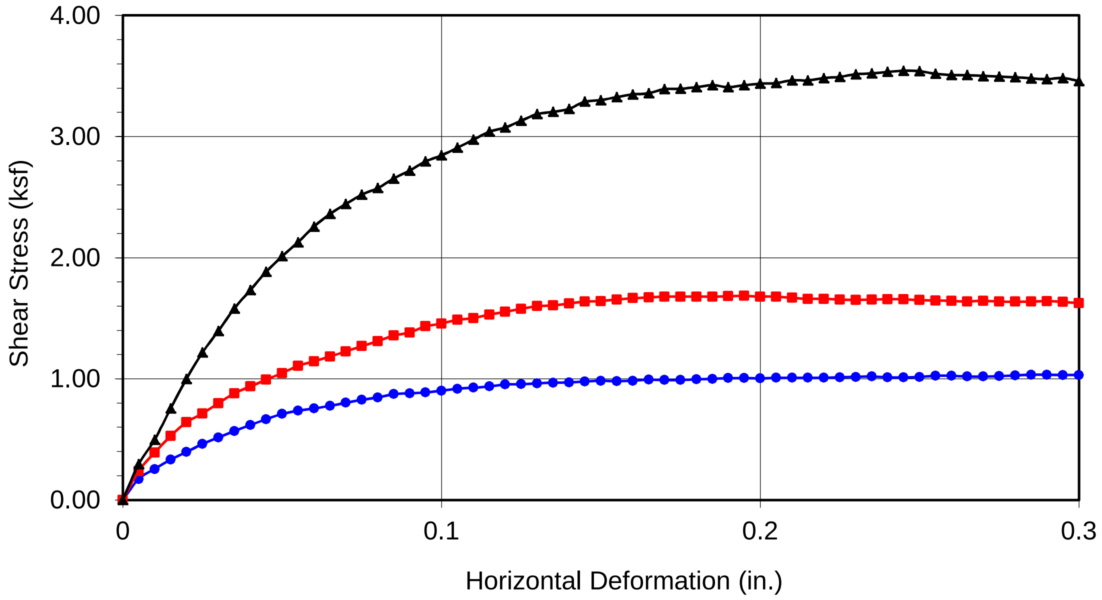

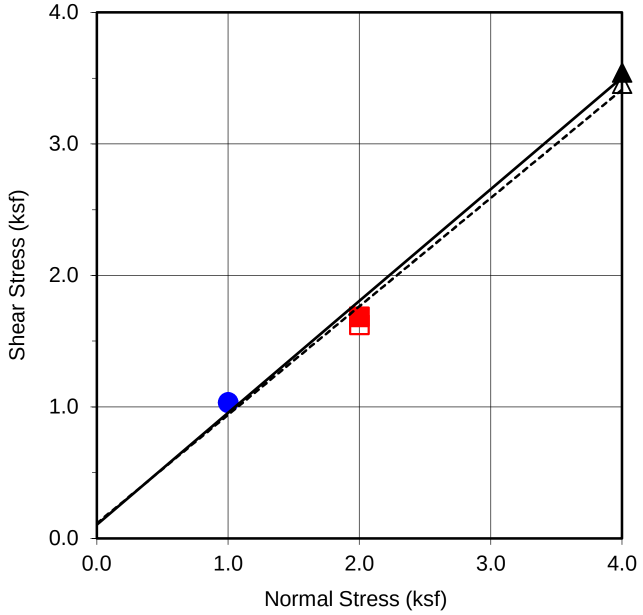

Boring No.	**B-20**
Sample No.	**R-2**
Depth (ft)	**15-16**
Sample Type:	Ring

Soil Identification:

Light olive brown sandy silt
s(ML)

Strength Parameters

	C (psf)	ϕ (°)
Peak	105.0	40.4
Ultimate	114.5	39.5

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.034	■ 1.685	▲ 3.543
Shear Stress @ End of Test (ksf)	○ 1.031	□ 1.625	△ 3.458
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.39	7.39	7.39
Dry Density (pcf)	86.5	86.4	87.9
Saturation (%)	21.0	21.0	21.7
Soil Height Before Shearing (in.)	0.9773	0.9539	0.9584
Final Moisture Content (%)	24.5	25.5	24.9

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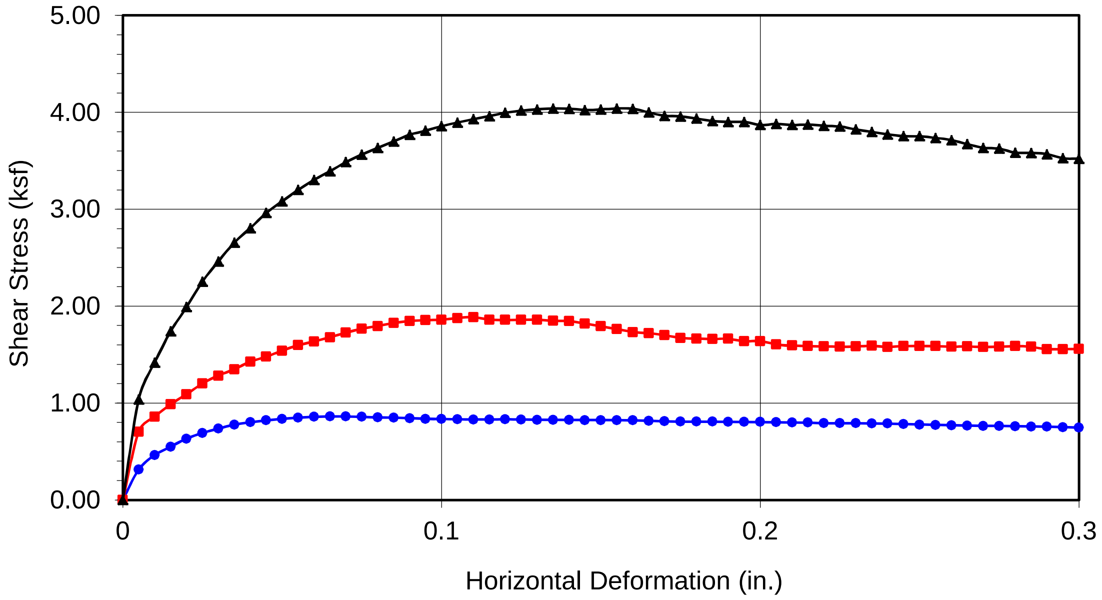
DIRECT SHEAR TEST RESULTS

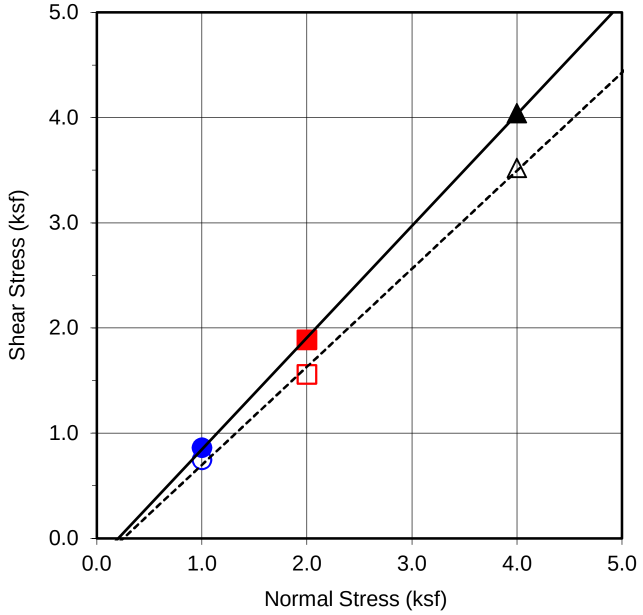
Consolidated Drained - ASTM D 3080

Project No.: 603541-002

SHARP CHULA VISTA MEDICAL CENTER
MASTER PLAN

05-13





Boring No.	**B-22**
Sample No.	**R-2**
Depth (ft)	**15-16**
Sample Type:	RING

Soil Identification:
(SM)g: GRAYISH BROWN SILTY SAND WITH GRAVEL

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	-216.0	46.7
Ultimate	-236.0	43.0

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.861	■ 1.886	▲ 4.040
Shear Stress @ End of Test (ksf)	○ 0.745	□ 1.559	△ 3.521
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	4.71	4.71	4.71
Dry Density (pcf)	97.2	106.6	110.7
Saturation (%)	17.3	21.8	24.3
Soil Height Before Shearing (in.)	0.9950	0.9862	0.9805
Final Moisture Content (%)	24.2	18.1	15.9

Leighton

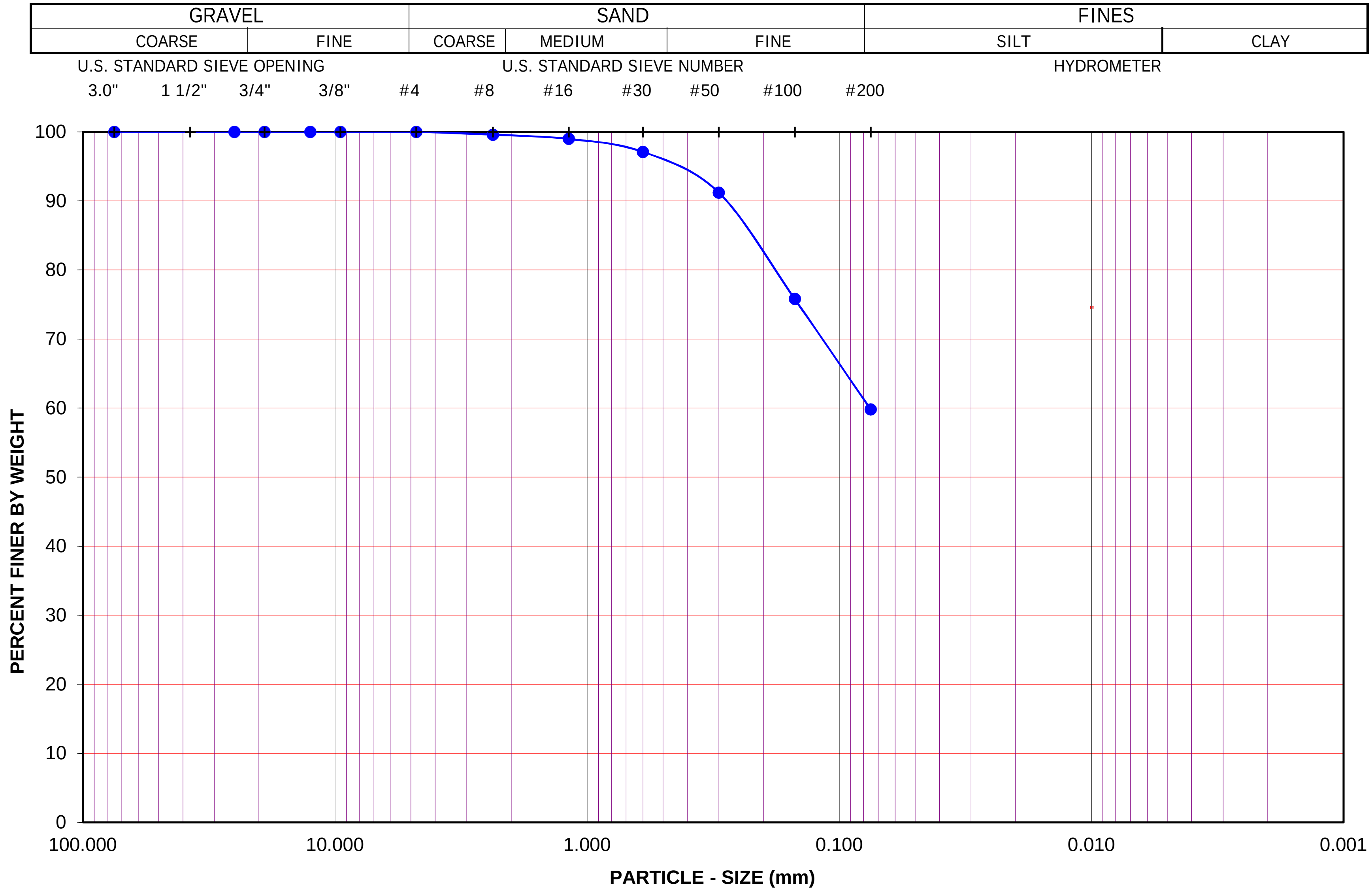
DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 603541.003

SHARP CHULA VISTA GEOT. STUDY

11-15



Project Name: SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN

Project No.: 603541-002

Exploration No.: B-1

Sample No.: B-1

Depth (feet): 10-15.0

Soil Type : s(CL)

Soil Identification: SANDY LEAN CLAY s(CL), light olive brown.

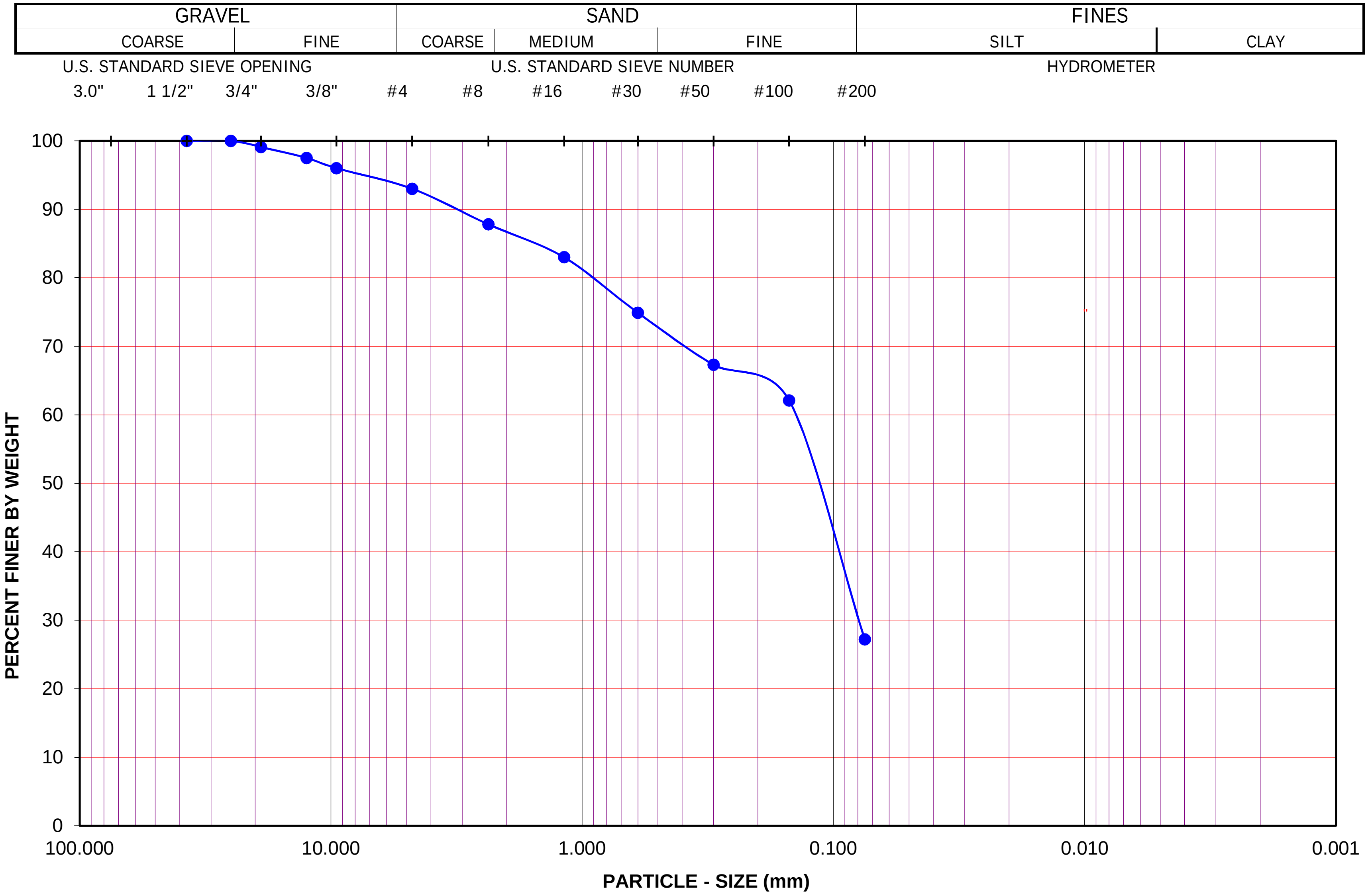
Leighton

PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913

GR:SA:FI : (%) 0 : 40 : 60

May-13

Sieve Landscape; B-1, B-1 (5-1-13)



Project Name: SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN

Project No.: 603541-002

Exploration No.: B-10

Sample No.: B-1

Depth (feet): 10-12.0

Soil Type : SM

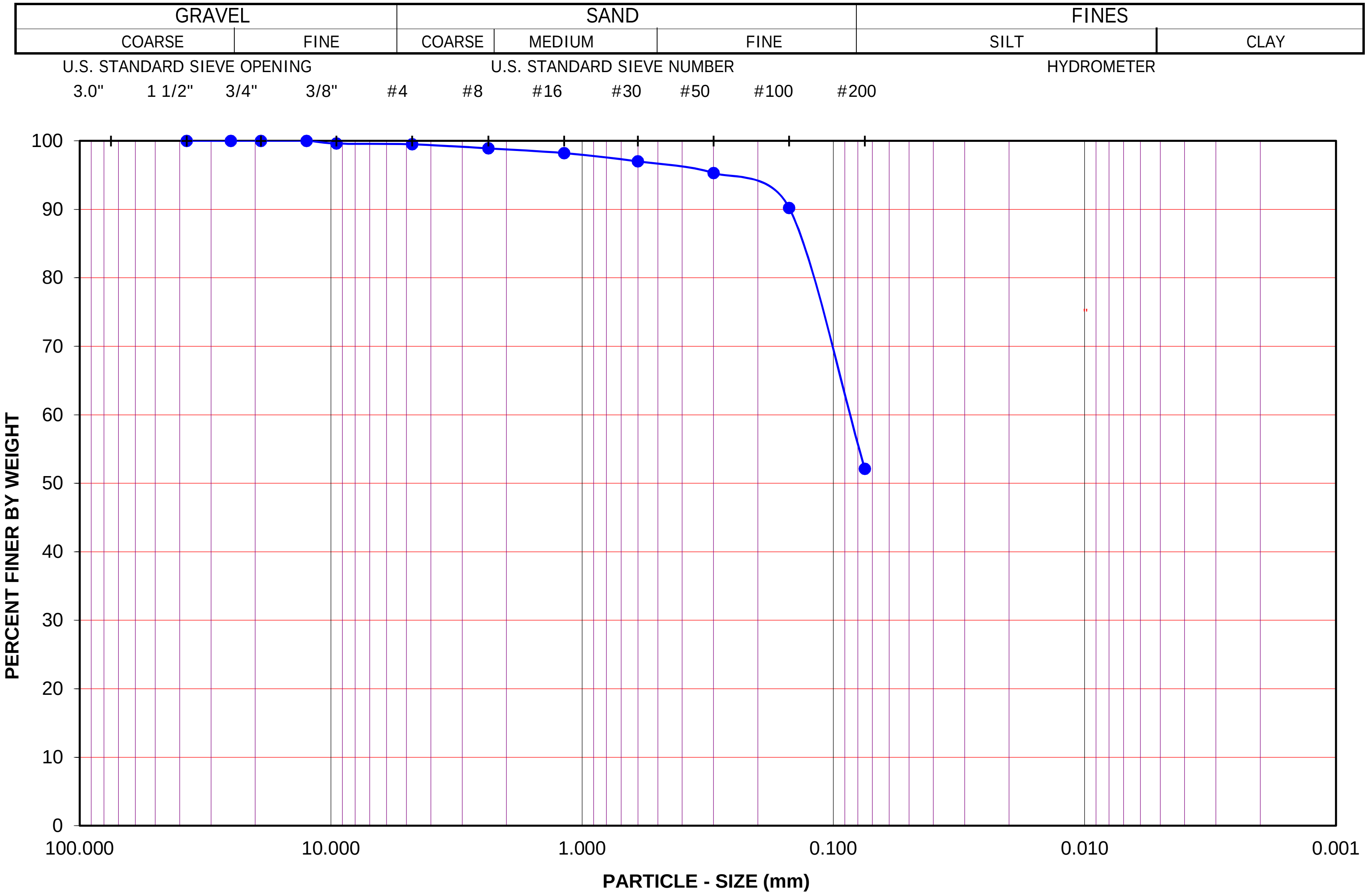
Soil Identification: SILTY SAND WITH FEW GRAVEL (SM), olive brown.

Leighton

PARTICLE - SIZE
DISTRIBUTION
ASTM D 6913

GR:SA:FI : (%) 7 : 66 : 27

May-13



Project Name: SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN

Project No.: 603541-002

Exploration No.: B-12

Sample No.: B-1

Depth (feet): 5-10.0

Soil Type : s(ML)

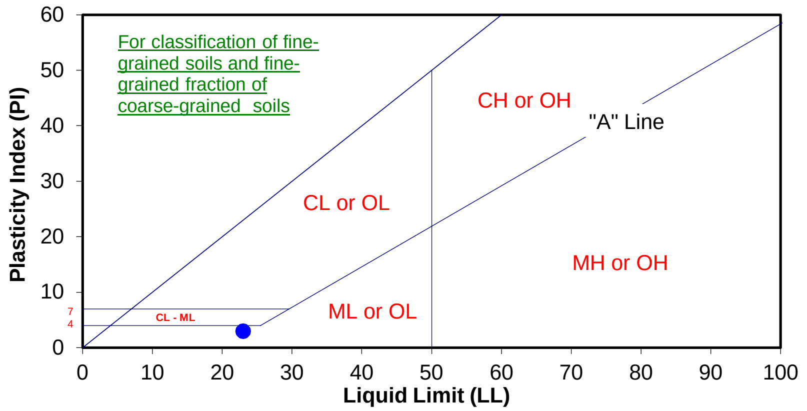
Leighton

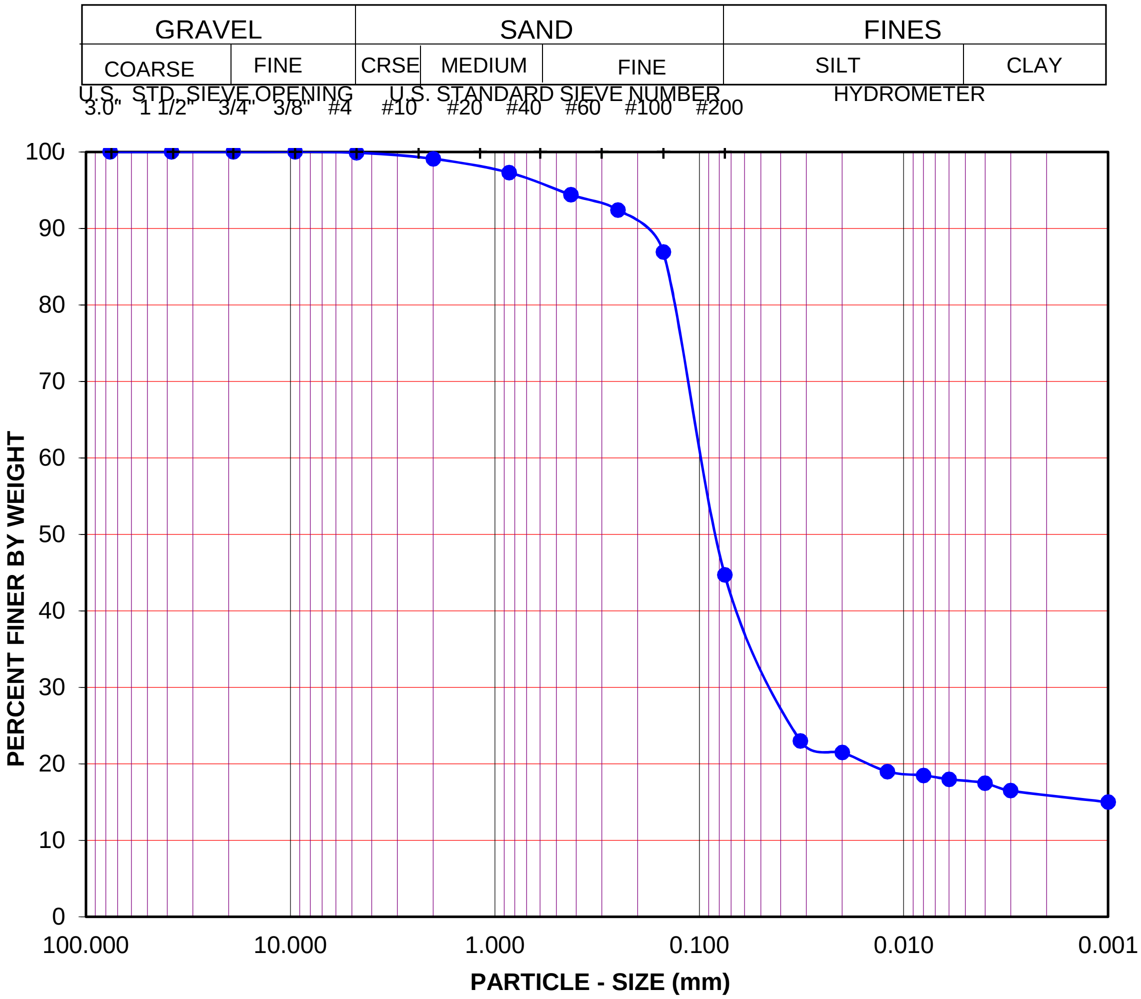
PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Soil Identification: SANDY SILT WITH TRACE GRAVEL s(ML), yellowish brown.

GR:SA:FI : (%) 1 : 47 : 52

May-13





Boring No.	Sample No.	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	**S-2**	20-21.5	SM	0:55:45	23,20,3

Sample Description:

SILTY SAND WITH TRACE GRAVEL (SM), brown.

Leighton

Project No.: 603541-002
SHARP CHULA VISTA MEDICAL
CENTER MASTER PLAN

ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Boring No.	B-21	B-23						
Sample No.	S-1	S-2						
Depth (ft.)	10.0-11.5	10.0-13.5						
Sample Type	SPT	SPT						
Visual Soil Classification	SM	SM						
Moisture Correction								
Wet Weight of Soil + Container (g)	111.0	109.0						
Dry Weight of Soil + Container (g)	103.8	95.8						
Weight of Container (g)	0.0	0.0						
Moisture Content (%)	6.9	13.8						
Container No.:	**	**						
Sample Dry Weight Determination								
Weight of Sample + Container (g)	111.0	109.0						
Weight of Container (g)	0.0	0.0						
Weight of Dry Sample (g)	103.8	95.8						
Container No.:	**	**						
After Wash								
Dry Weight of Sample + Container (g)	71.9	64.4						
Weight of Container (g)	0.0	0.0						
Dry Weight of Sample (g)	71.9	64.4						
% Passing No. 200 Sieve	**31**	**33**						
% Retained No. 200 Sieve	69	67						

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton

Project Name: SHARP CHULA VISTA GEOT. STUDY

Project No.: 603541.003

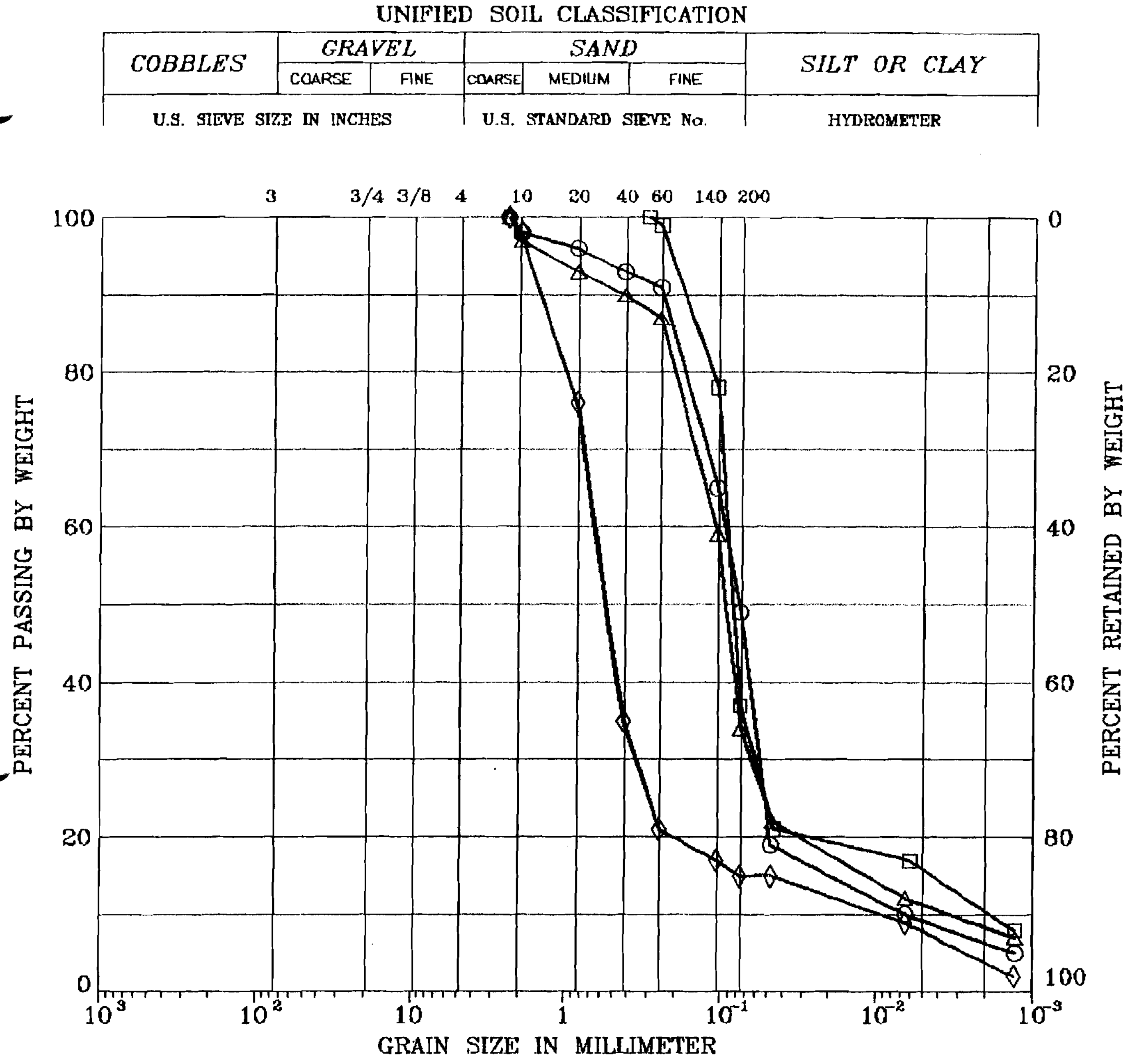
Tested By: BCC Date: 11/11/2015

Rev. 10-04

200 WASH B21,B23 (rev 12-09-15)

Appendix C

Woodward-Clyde Laboratory Testing, 1989



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	3-1				SILTY FINE SAND (SM)
□	4-6-4				SILTY FINE SAND (SM)
△	5-1				SILTY FINE SAND (SM)
◇	8-3-4				SILTY SAND (SM)

Remark :

951127W SI01

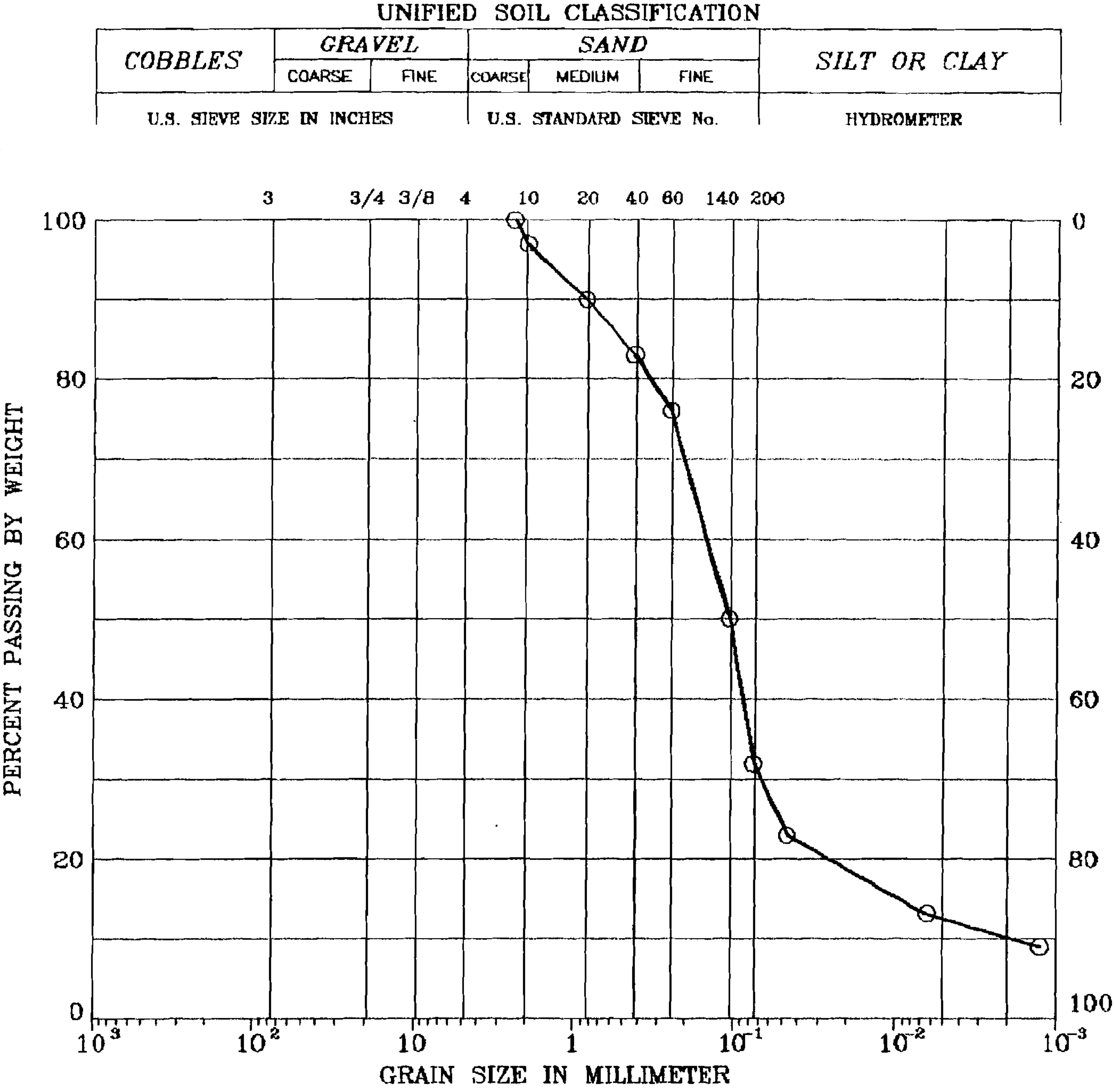
CHULA VISTA COMMUNITY HOSPITAL

Woodward Clyde
Consultants
San Diego, CA

GRAIN SIZE DISTRIBUTION

Figure No. B-1

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

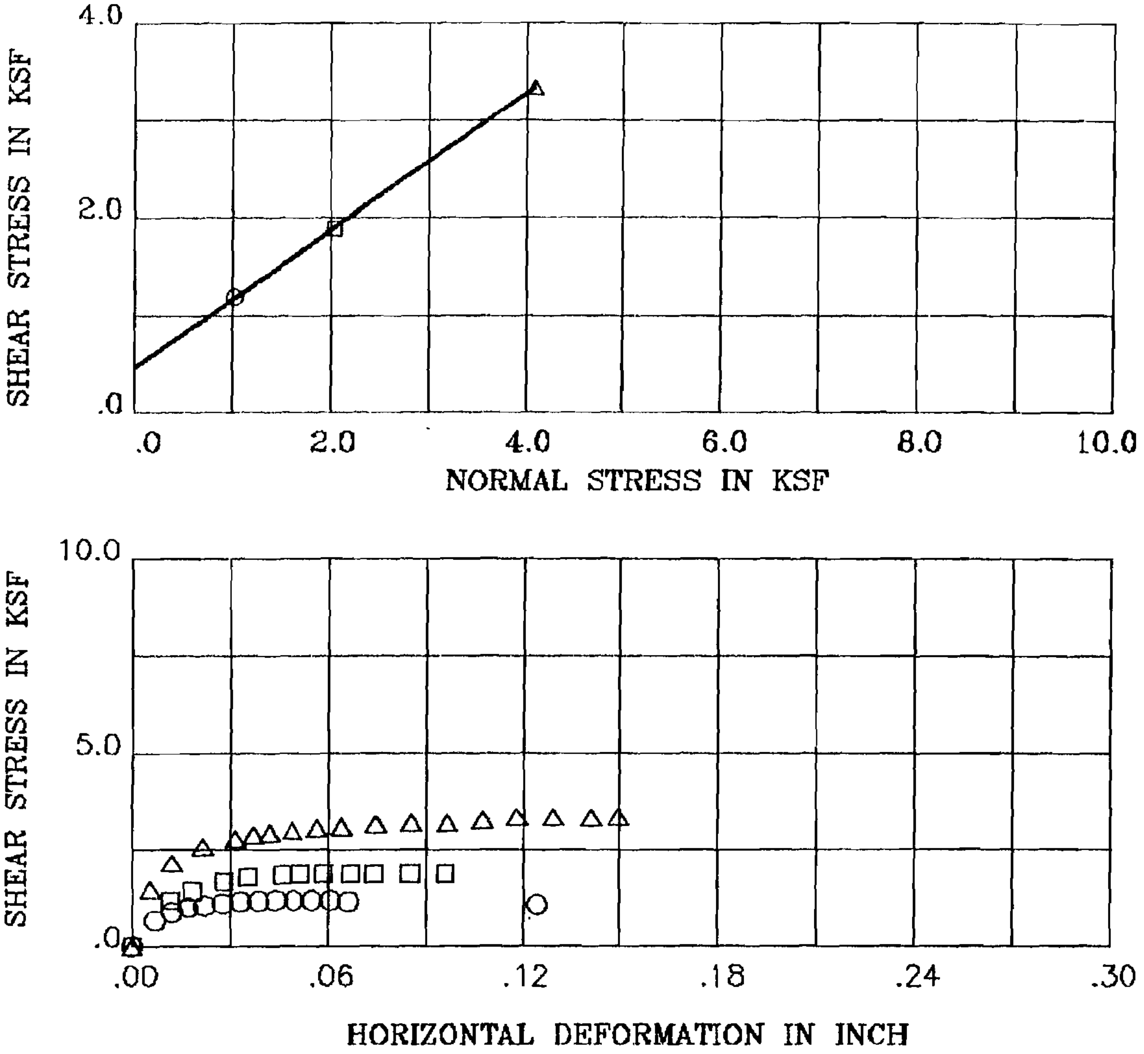


SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	9-1				SILTY FINE SAND (SM)

Remark :

8951127W SI01	CHULA VISTA COMMUNITY HOSPITAL
Woodward Clyde Consultants San Diego, CA	**GRAIN SIZE DISTRIBUTION** Figure No. B-2

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).



BORING/SAMPLE : 4-6-4 DEPTH (ft) :

DESCRIPTION : SILTY FINE SAND (SM)

STRENGTH INTERCEPT (C) : .467 KSF

FRICTION ANGLE (PHI) : 35.0 DEG

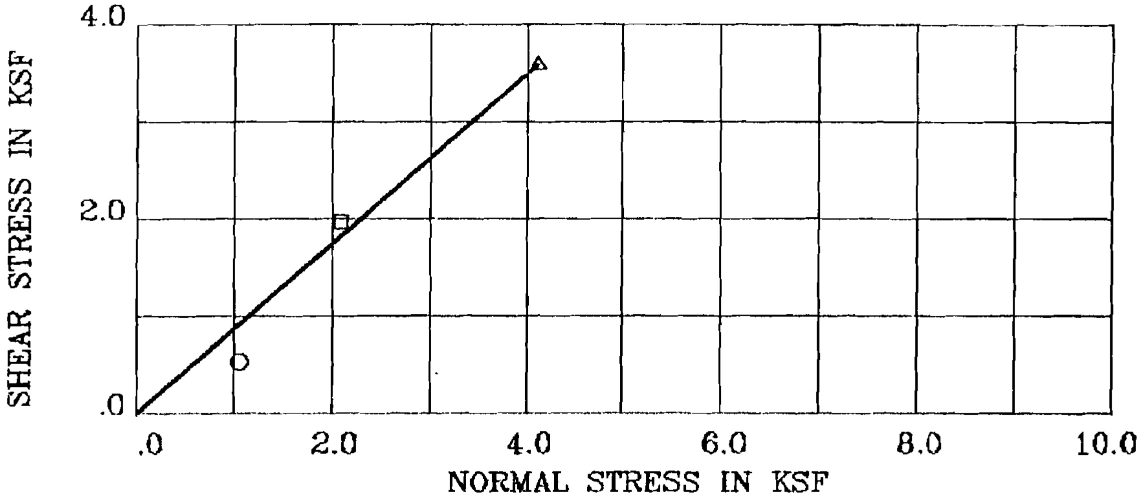
(PEAK STRENGTH)

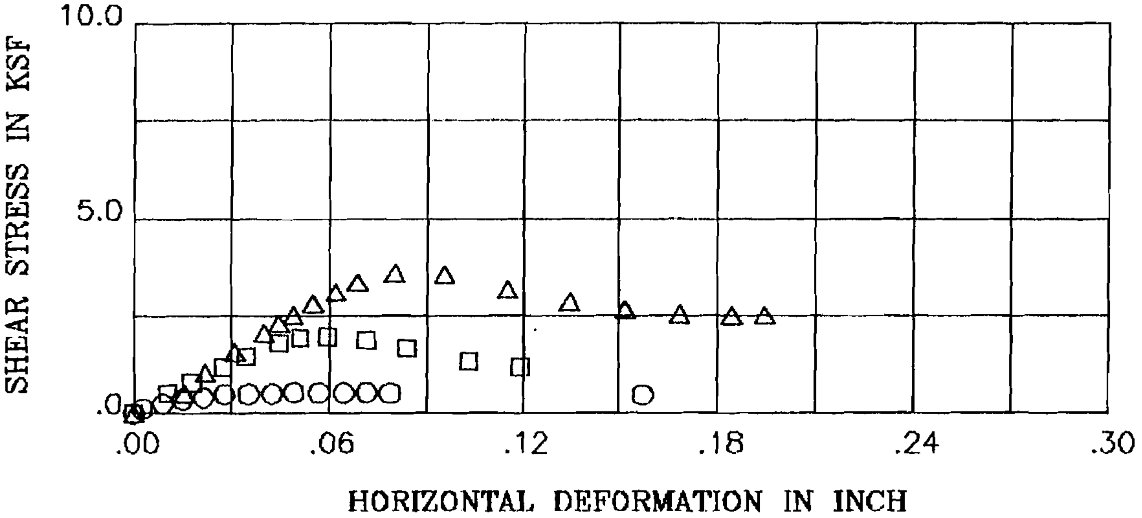
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	27.8	96.3	.724	1.02	1.19	1.07
□	25.6	98.4	.687	2.05	1.89	1.87
△	28.3	95.8	.732	4.10	3.34	3.32

Remark : AVERAGE;INITIAL MC : 18.6 %; INITIAL DD : 96.2 PCF

8951127W SI01	CHULA VISTA COMMUNITY HOSPITAL
Woodward Clyde Consultants San Diego, CA	DIRECT SHEAR TEST Figure No. B-3

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).





BORING/SAMPLE : 8-3-4 DEPTH (ft) :

DESCRIPTION : SILTY SAND (SM)

STRENGTH INTERCEPT (C) : .000 KSF

FRICTION ANGLE (PHI) : 41.1 DEG

(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	17.0	114.4	.446	1.05	.53	.46
□	16.0	112.4	.471	2.09	1.97	1.19
△	16.3	113.0	.463	4.12	3.61	2.50

Remark : AVERAGE;INITIAL MC : 8.1%; INITIAL DD : 111.4PCF

3951127W SI01

CHULA VISTA COMMUNITY HOSPITAL

Woodward Clyde
Consultants
San Diego, CA

DIRECT SHEAR TEST

Figure No. B-4

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Testing Engineers—San Diego
3467 Kurtz Street, P.O. Box 80985, San Diego, CA 92138 (619) 225-9641
2956 Industry St., Oceanside, CA 92054 (619) 757-0248

Job No: 001285 00
Job Name: WOODWARD - CLYDE CONSUL.
Job Address: 1550 HOTEL CIRCLE NORTH
SAN DIEGO
CA 92108

WOODWARD - CLYDE CONSUL.
1550 HOTEL CIRCLE NORTH
SAN DIEGO
CA 92108

WOODWARD - CLYDE CONSUL.
Testing Engineers - San Diego

Project: WOODWARD - CLYDE CONSUL.
Engineer: RENDINI, DAVID

Report: 56243
Date: 4/11/89

R VALUE DATA

	A	B	C	D
Compactor Pressure - P.S.I.	350	350	350	
Moisture @ Compaction - Percent	13.4	13.8	14.2	
Density - Pounds/Cubic Foot	117.9	116.0	116.2	
R-Value - Stabilometer	70	59	52	
Exude. Pressure - P.S.I.	430	270	220	
Stabilometer Thickness - Feet	.43	.59	.69	
Expansion Pressure Thickness - Feet	0	0	0	
T. I. (Assumed)	4.5			
By Stabilometer @ 300 PSI, Exud.	61			
By Expansion Pressure	/			
At Equilibrium	61			
Sand Equivalent	/			

Material Supplied by: Client

Submitted to Laboratory On: 4/04/89

Described As: Medium brown fine silty sand
R-Value #254/Lab #89-420

Sampled From: Sample #SAK/ 5-1 Depth 0.5
PROJECT: Chula vista Community Hospital 8955127W SI01

The data developed and conclusions and recommendations reached in this/these correspondence(s) was/were for a specific project. Additionally, we wish to advise you that since this/these correspondence(s) was/were issued, there have been substantial changes in the state of the art and state of practice of the profession, as well as in the degree of risk considered acceptable by society and the profession. Thus, the opinion, recommendations, and conclusions contained therein must be reevaluated. We recommend that you retain a qualified firm to do this before proceeding with any plans that might be influenced by the contents of this/these correspondence(s).

Figure B-5

Appendix D

Slope Stability Calculations

Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements

by Jonathan D. Bray and Thaleia Travasarou

Journal of Geotechnical and Geonvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007

SEE NOTES BELOW FOR GUIDANCE IN THE USE OF SPREADSHEET

Input Parameters

Yield Coefficient (ky)	0.207		Based on pseudostatic analysis
Initial Fundamental Period (Ts)	0.14	seconds	1D: Ts=4H/Vs 2D: Ts=2.6H/Vs
Degraded Period (1.5Ts)	0.20	seconds	
Moment Magnitude (M_w)	6.7		
Spectral Acceleration (Sa(1.5Ts))	0.63	g	

Additional Input Parameters

Probability of Exceedance #1 (P1)	84	%
Probability of Exceedance #2 (P2)	50	%
Probability of Exceedance #3 (P3)	16	%
Displacement Threshold (d_threshold)	5	cm

Intermediate Calculated Parameters

Non-Zero Seismic Displacement Est (D)	4.98	cm	eq. (5) or (6)
Standard Deviation of Non-Zero Seismic D	0.66		

Results

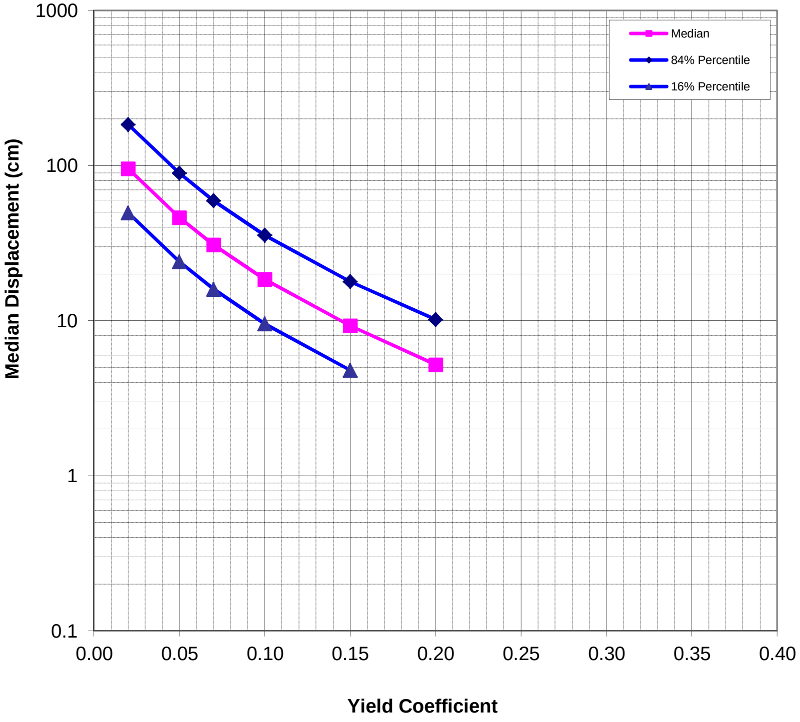
Probability of Negligible Displ. (P(D=0))	0.037		eq. (3)
D1	2.35	cm	calc. using eq. (7)
D2	4.83	cm	calc. using eq. (7)
D3	9.45	cm	calc. using eq. (7)
P(D>d_threshold)	0.479		eq. (7)

Notes

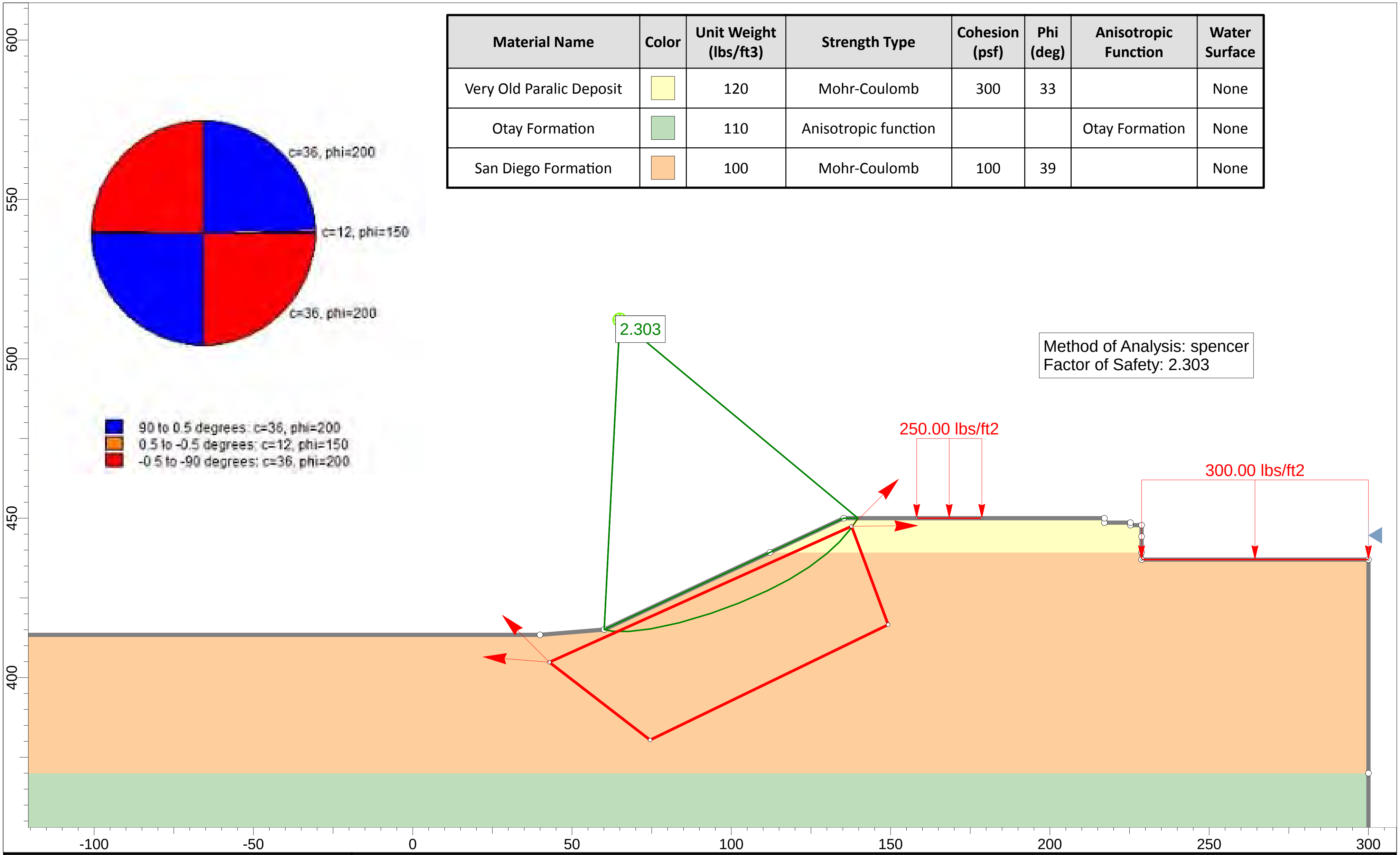
1. Values highlighted in blue are input parameters
2. Probability of Exceedance is the desired probability of exceeding a particular displacement value.
3. Displacements D1, D2, and D3 correspond to P1, P2, and P3, respectively.
   (e.g., the probability of exceeding displacement D1 is P1)
4. Calculated seismic displacements are due to deviatoric deformation only (add in volumetrically induced movement).
5. ky may range between 0.01 and 0.5, Ts between 0 and 2 s, Sa between 0.002 and 2.7 g, M between 4.5 and 9
6. Rigid slope is assumed for Ts < 0.05 s
7. When a value for D is not calculated, D is < 1cm
8. ky may be estimated using the simplified equations shown below.
9. Examples of how Ts is estimated are shown below.
10. Vs = weighted avg. shear wave velocity for the sliding mass, e.g., for 2 layers, Vs = [(h1)(Vs1) + (h2)(Vs2)]/(h1 + h2)

Dependence on ky

ky	P(D="0")	D (cm)	Dmedian (cm)	D1 (cm)	D3 (cm)
0.020	0.00	95.6	95.6	184.3	49.6
0.05	0.00	46.3	46.3	89.3	24.0
0.07	0.00	30.8	30.8	59.4	16.0
0.1	0.00	18.5	18.5	35.6	9.6
0.15	0.00	9.3	9.3	17.9	4.8
0.2	0.03	5.3	5.2	10.2	2.6
0.3	0.28	2.2	1.6	3.7	<1
0.4	0.65	1.1	<1	1.2	<1



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Anisotropic Function	Water Surface
Very Old Paralic Deposit	🟨	120	Mohr-Coulomb	300	33		None
Otay Formation	🟩	110	Anisotropic function			Otay Formation	None
San Diego Formation	🟧	100	Mohr-Coulomb	100	39		None



Method of Analysis: spencer
Factor of Safety: 2.303

SLIDEINTERPRET 6.037

Project
Sharp Chula Vista Review

Analysis Description
Section D- D'

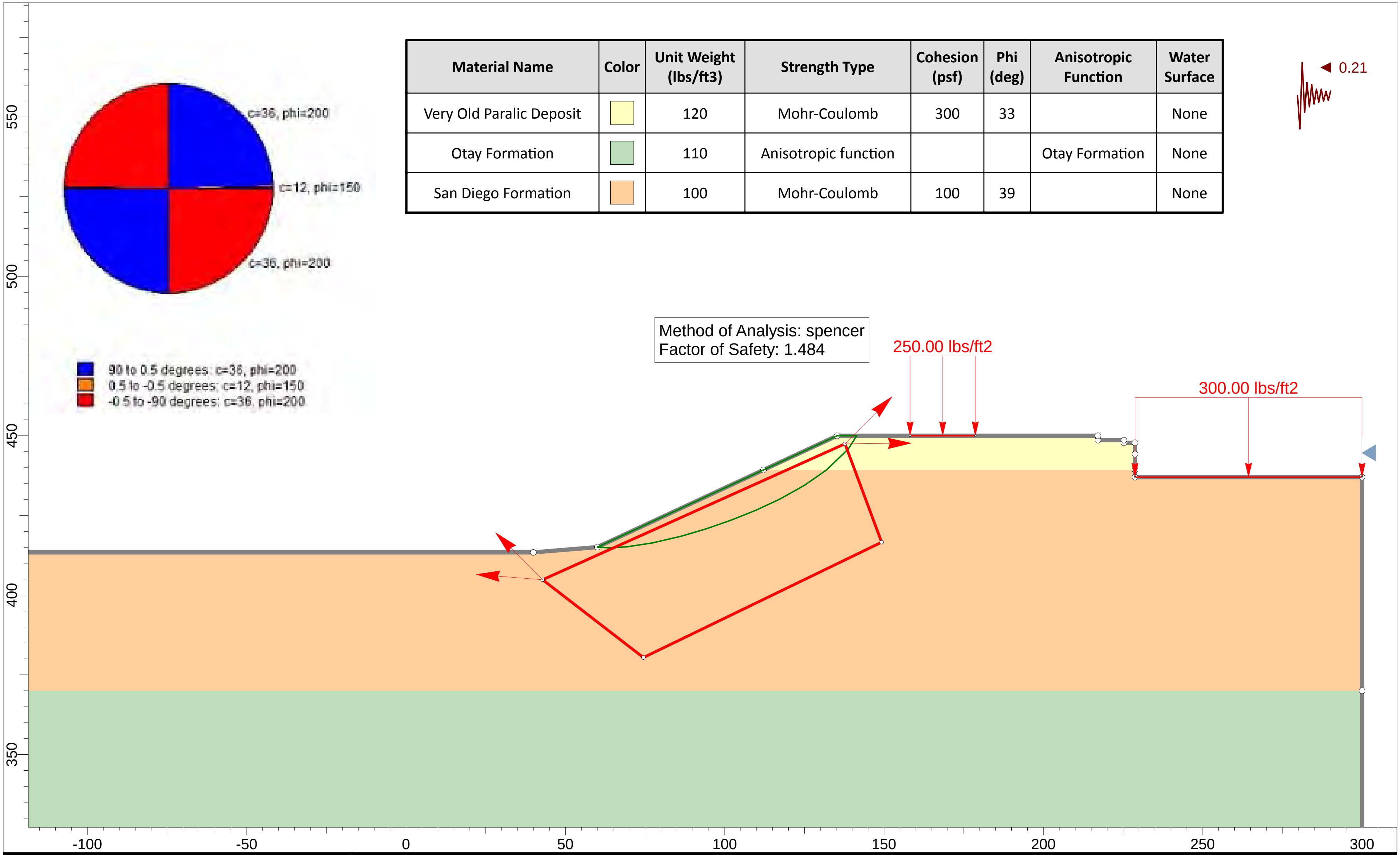
Drawn By SMM

Scale 1:500

Company Leighton Consulting

12/18/2015

File Name Section D-D'.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Anisotropic Function	Water Surface
Very Old Paralic Deposit	🟨	120	Mohr-Coulomb	300	33		None
Otay Formation	🟩	110	Anisotropic function			Otay Formation	None
San Diego Formation	🟧	100	Mohr-Coulomb	100	39		None

Method of Analysis: spencer
Factor of Safety: 1.484

Leighton

SLIDEINTERPRET 6.037

Project
Sharp Chula Vista Review

Analysis Description
Section D- D'

Drawn By SMM
Scale 1:500
Company Leighton Consulting

12/18/2015
File Name Section D-D' Seismic.slim

Appendix E

Downhole PS Suspension Survey

SUSPENSION P & S VELOCITIES

AND Vs30

CHULA VISTA HOSPITAL

BORING B-1

Report 14242-01 rev 0

September 16, 2014

SUSPENSION P & S VELOCITIES
AND Vs30
CHULA VISTA HOSPITAL
BORING B-1

Report 14242-01 rev 0

September 16, 2014

Prepared for:

Leighton Consulting, Inc.
3934 Murphy Canyon Road, Suite B-205
San Diego, California 92123
(858) 300-4090

Prepared by

GEOVision Geophysical Services
1124 Olympic Drive
Corona, California 92881
(951) 549-1234

TABLE OF CONTENTS

Table of Figures

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APPENDICES

INTRODUCTION

Boring geophysical measurements were collected in one 4 inch diameter uncased boring at the Chula Vista Hospital in Chula Vista, California. Geophysical data acquisition was performed on August 29, 2014 by Victor Gonzalez of **GEO***Vision*. Data analysis and report preparation was performed by Emily Feldman and reviewed by John Diehl of **GEO***Vision*. The work was performed under subcontract with Leighton Consulting, Inc. (Leighton), with Bob Stroh serving as the point of contact.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of suspension velocity measurements in one uncased boring, as detailed in Table 1. The purpose of the study was to supplement stratigraphic information obtained during Leighton’s soil sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, as well as to determine Vs30 for the site.

BORING DESIGNATION	DATES LOGGED	BORING DEPTH (FEET)	LOCATION* (ESTIMATED ON GOOGLE EARTH)
B-1	8/29/2014	140	32^o 37.168’ N, 117^o 1.364’ W

Table 1: Boring locations and logging dates
*Location data not available at time of report issuance

The OYO Suspension Logging System was used to obtain in-situ horizontal shear and compressional wave velocity measurements at 1.6-foot intervals. The acquired data were analyzed and a profile of velocity versus depth was produced for both compressional and horizontally polarized shear waves.

A detailed reference for the velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

INSTRUMENTATION

Suspension soil velocity measurements were performed using the PS suspension logging system, manufactured by OYO Corporation, and their subsidiary, Robertson Geologging. This system directly determines the average velocity of a 3.3-foot high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The typical total length of the probe is 21 feet, with the center point of the receiver pair 12.5 feet above the bottom end of the probe.

The probe receives control signals from, and sends the receiver signals to, instrumentation on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28-foot circumference sheave fitted with a digital rotary encoder.

The entire probe is suspended in the boring by the cable, therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it impinges upon the wall of the boring. These waves propagate through the soil and rock surrounding the boring, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3-foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
4. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe, preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Suspension PS system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data are displayed as six channels with a common time scale. Data are stored on disk for further processing. Up to 8 sampling sequences can be summed to improve the signal to noise ratio of the signals.

Review of the displayed data on the recorder or computer screen allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and summing number to optimize the quality of the data before recording. Verification of the calibration of the Suspension PS digital recorder is performed at least every twelve months using a NIST traceable frequency source and counter, as presented in Appendix B.

MEASUREMENT PROCEDURES

The boring was logged uncased, filled with bentonite based drilling mud. Measurements followed the **GEO***Vision* Procedure for P-S Suspension Seismic Velocity Logging, revision 1.5. Prior to each logging run, the suspension probe was positioned with the mid-point of the receiver spacing at grade, and the mechanical and electronic depth counters were set to zero. The probe was lowered to the bottom of the boring or until probe descent was inhibited, stopping at 1.6-foot intervals to collect data, as summarized in Table 2.

At each measurement depth, the measurement sequence of two opposite horizontal records and one vertical record was performed and the gains were adjusted as required. The data from each depth were viewed on the computer display, checked, and recorded on disk before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at the stationary reference point was verified and recorded on the field logs prior to removal from the boring. Field data were backed up to USB flash drive upon completion of data acquisition.

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	DEPTH TO BOTTOM OF BORING (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
B-1	SUSPENSION PS 1	4.92 – 125.0	140	1.6	8/29/2014

Table 2: Logging dates and depth ranges

DATA ANALYSIS

Using the proprietary OYO program PSLOG.EXE version 1.0, the recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 3.3-foot segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into a Microsoft Excel® template (version 2003 SP2) to complete the velocity calculations based on the arrival time picks made in PSLOG.

The P-wave velocity over the 6.3-foot interval from source to receiver 1 (S-R1) was also picked using PSLOG, and calculated and plotted in Microsoft Excel®, for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 5.15 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact, typically 4 milliseconds. This delay corresponds to the duration of acceleration of the solenoid before impact.

As with the P-wave records, using PSLOG, the recorded digital waveforms were analyzed to locate the presence of clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT - IFFT low-pass filtering can be used to remove the higher frequency P-wave signal from the S_H-wave signal.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.33-foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 5.15 feet to correspond to the mid-point of the 6.3-foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact, typically 4 milliseconds.

These data and analysis were reviewed by John Diehl as a component of **GEO***Vision*'s in-house QA-QC program.

Figure 2 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 2, the time difference over the 3.3-foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1,745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with a 1400 Hz FFT - IFFT digital low-pass filter, illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

Vs30 was calculated by summing the calculated travel times over each 1.64 ft interval from 0 ft (0 m) to a depth of 98.4 ft (30.0 m).

RESULTS

Suspension P- and S_H-wave velocities for boring B-1 are plotted with the calculated Vs30 of 396 m/sec (1300 ft/sec) in Figure 4. The calculated suspension travel time curves for boring B-1 are presented with the calculated Vs30 in Figure 5. Tabulated measurement depths, pick times and velocities are presented in Table 3. These plots and data are included in the Microsoft Excel® analysis files accompanying this report.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figure A-1 to aid in visual comparison. It should be noted that R1-R2 data are an average velocity over a 3.3-foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in Table A-1, and included in the Microsoft Excel® analysis files.

Calibration procedures and records for the suspension PS measurement system are presented in Appendix B.

SUMMARY

Discussion of Suspension Results

Suspension PS velocity data are ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods, as this boring was.

Suspension PS velocity data quality is judged based upon 5 criteria:

1. Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.
2. Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
3. Consistency between data from adjacent depth intervals.
4. Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.
5. Consistency of profile between adjacent borings, if available.

These data show excellent correlation between R1 – R2 and S – R1 data, as well as good correlation between P-wave and S_H-wave velocities. P-wave and S_H-wave onsets are generally clear, and later oscillations are well damped. These are excellent quality velocity data. Both borings provide velocity profiles indicative of soft rock transitioning into hard rock, overlain by a layer of weathered rock or soil.

Discussion of Vs30

Vs30 for B-1 from 6.6 to 105 ft (2.0 – 32.0 m) was calculated at 1300 ft/sec (396 m/sec), classifying it as a NEHRP site class C.

Quality Assurance

These boring geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of velocity data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Suspension Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3-foot interval of depth. This high resolution results in the scatter of values shown in the graphs. In uncased borings, individual measurements are very reliable, with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks contribute to the reliability of the data.

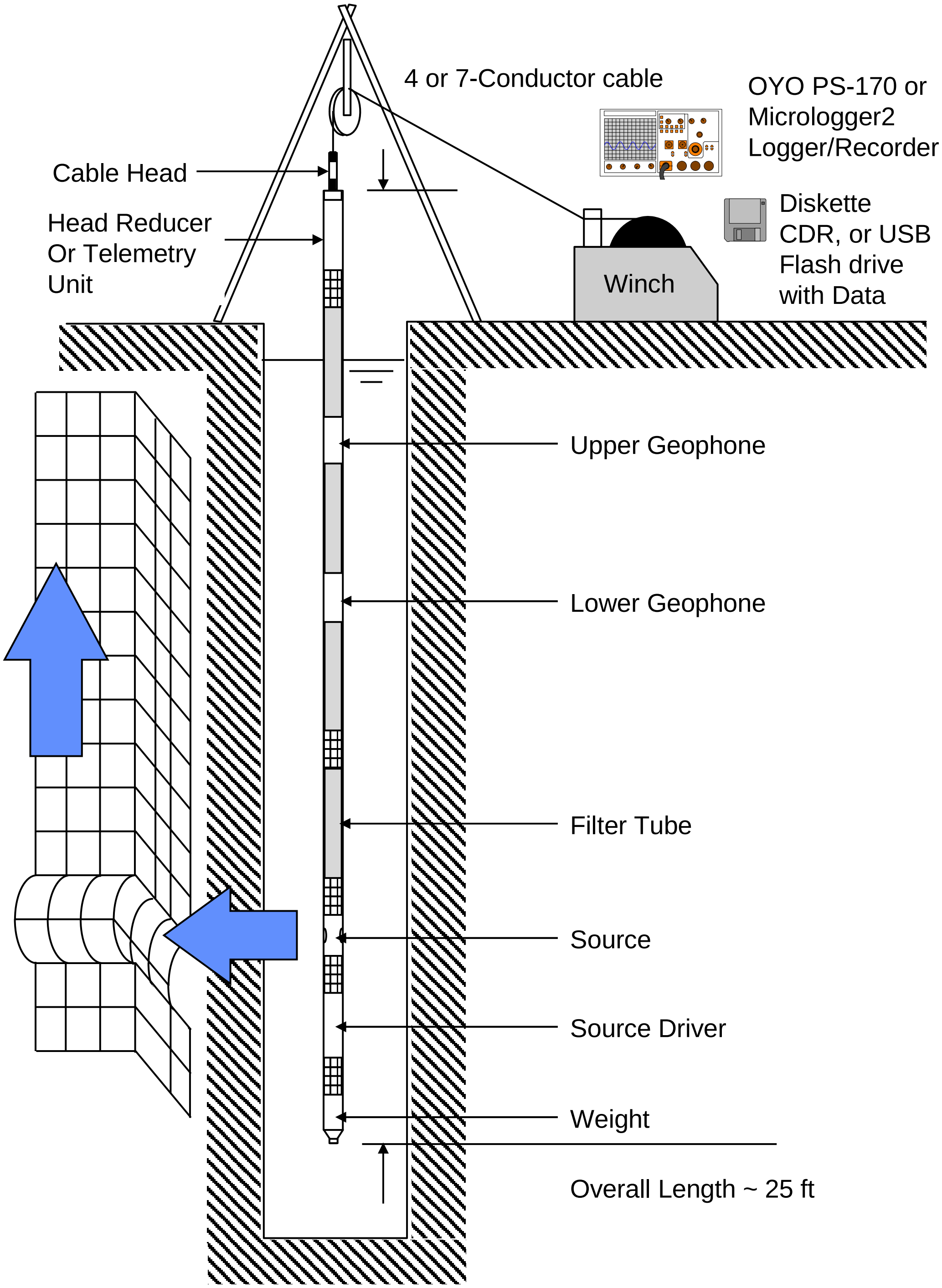


Figure 1: Concept illustration of P-S logging system

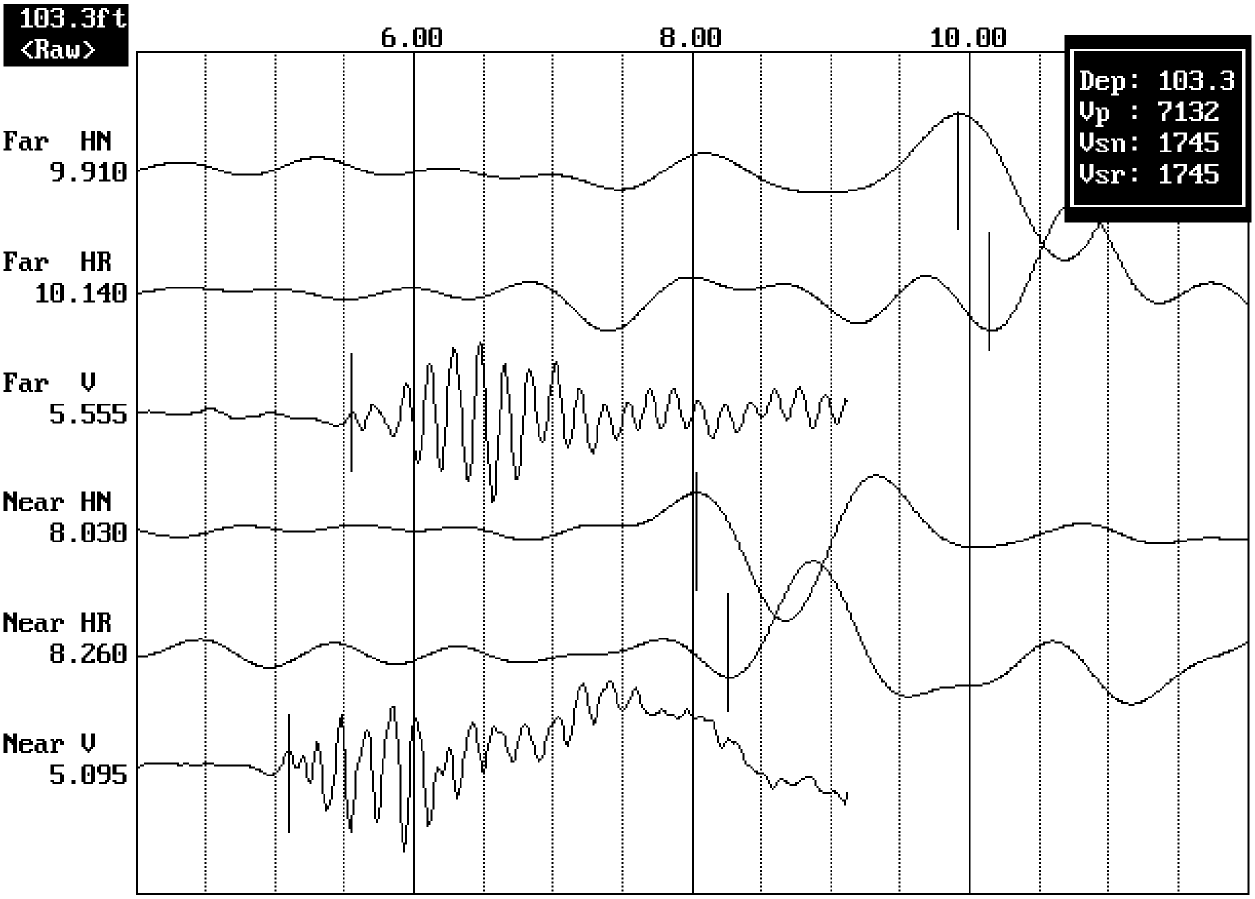


Figure 2: Example of filtered (1400 Hz lowpass) record

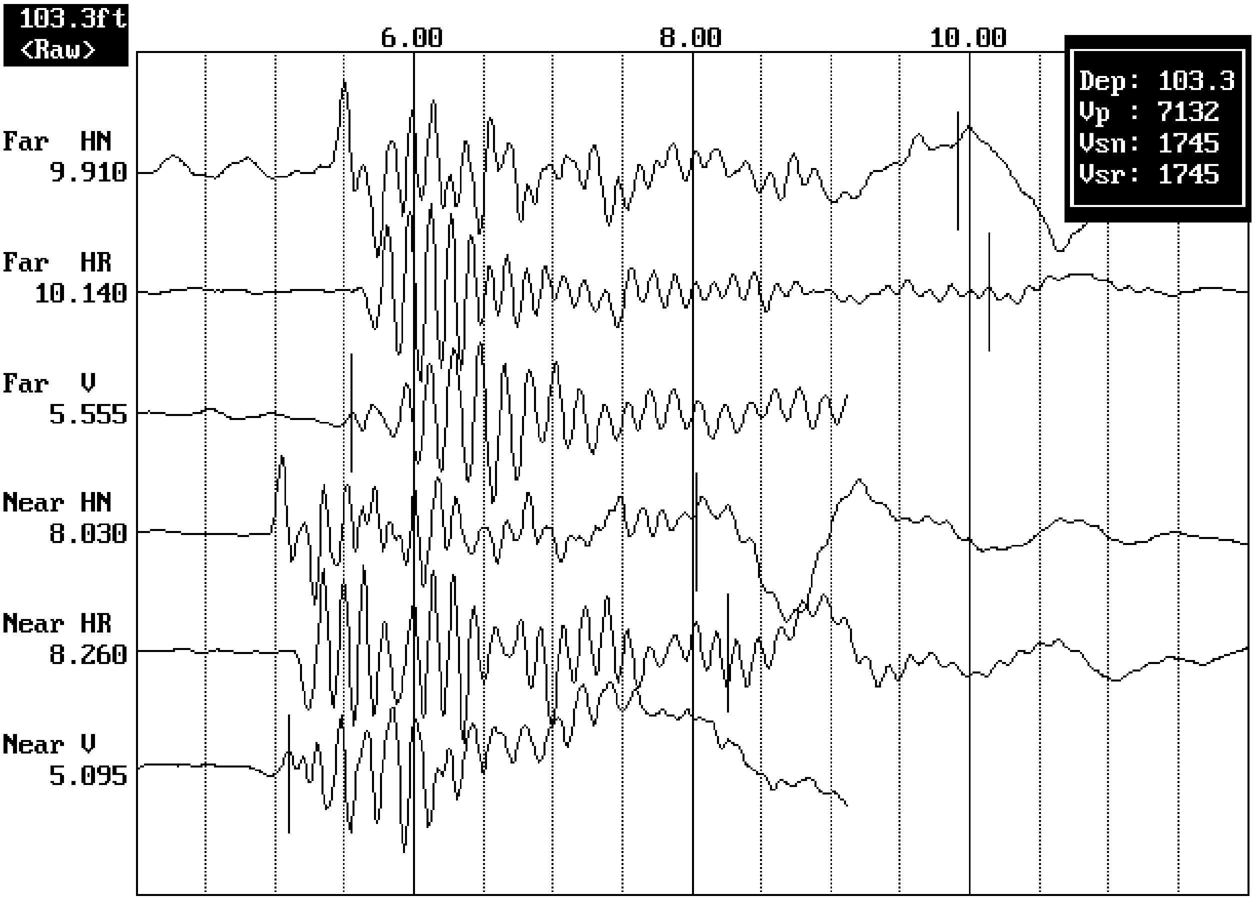


Figure 3: Example of unfiltered record

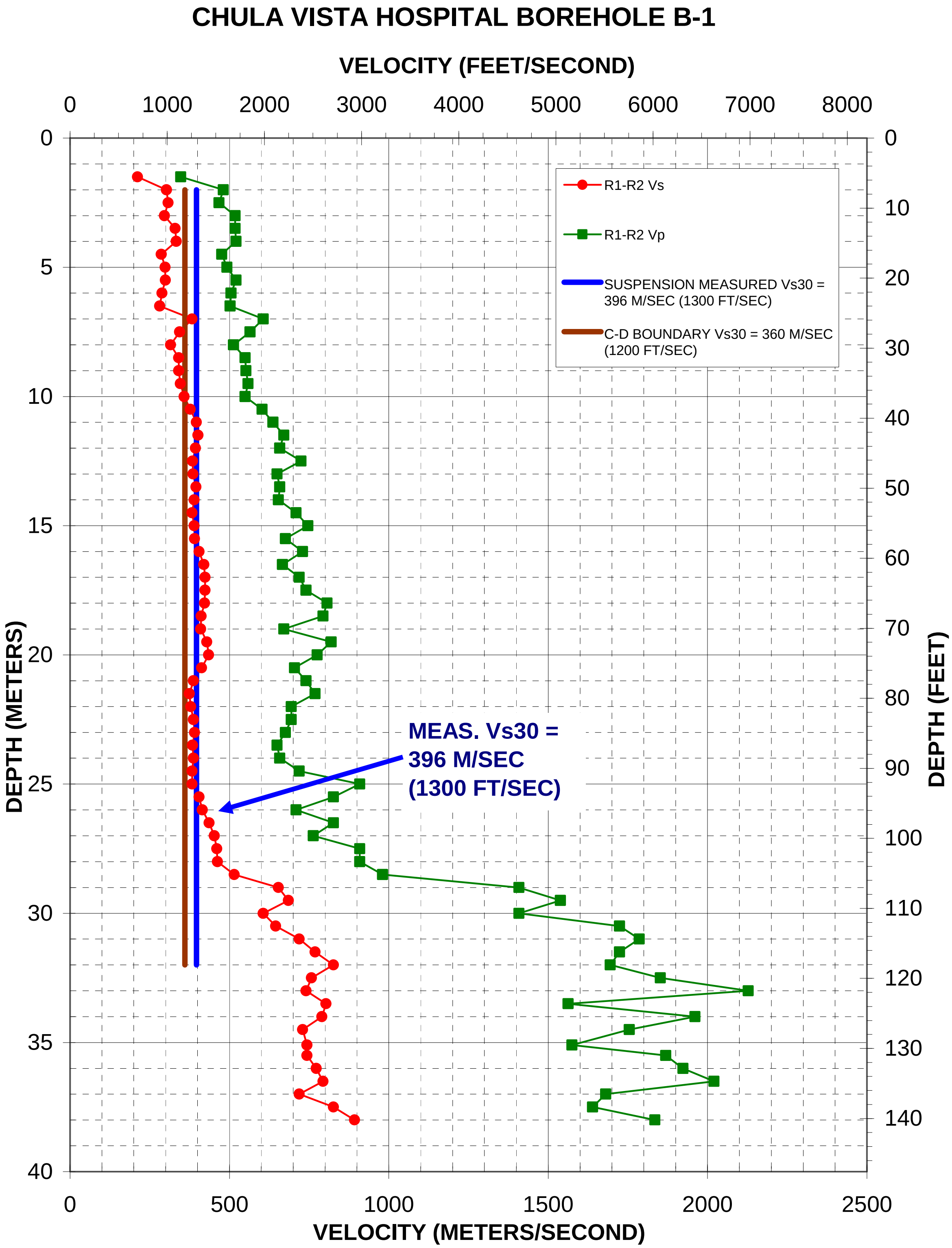


Figure 4: Boring B-1, Suspension R1-R2 P- and S_H-wave velocities with Vs30 values

Table 3: Boring B-1, Suspension R1-R2 depths and P- and S_H-wave velocities

RECEIVER 1 - RECEIVER 2 VELOCITY DATA					
	METRIC			ENGLISH	
DEPTH	Vs	Vp	DEPTH	Vs	Vp
(M)	(M/SEC)	(M/SEC)	(FT)	(FT/SEC)	(FT/SEC)
1.5	212	347	4.92	694	1139
2.0	303	481	6.56	994	1577
2.5	308	467	8.20	1009	1533
3.0	296	518	9.84	972	1700
3.5	330	518	11.48	1083	1700
4.0	333	521	13.12	1094	1709
4.5	287	476	14.76	940	1562
5.0	299	493	16.40	979	1616
5.5	299	521	18.04	982	1709
6.0	288	505	19.69	945	1657
6.5	282	503	21.33	924	1649
7.0	383	606	22.97	1257	1988
7.5	344	565	24.61	1127	1854
8.0	315	513	26.25	1035	1682
8.5	341	549	27.89	1120	1803
9.0	341	552	29.53	1120	1813
9.5	346	559	31.17	1135	1833
10.0	358	549	32.81	1176	1803
10.5	377	602	34.45	1238	1976
11.0	397	637	36.09	1302	2090
11.5	402	671	37.73	1318	2202
12.0	394	658	39.37	1292	2158
12.5	385	725	41.01	1262	2377
13.0	386	649	42.65	1267	2130
13.5	395	658	44.29	1297	2158
14.0	389	654	45.93	1277	2144
14.5	383	709	47.57	1257	2327
15.0	389	746	49.21	1277	2448
15.5	391	676	50.85	1282	2217
16.0	405	730	52.49	1328	2395
16.5	420	667	54.13	1379	2187
17.0	424	719	55.77	1390	2360
17.5	424	741	57.41	1390	2430
18.0	422	806	59.06	1384	2646
18.5	412	794	60.70	1350	2604
19.0	410	671	62.34	1345	2202

RECEIVER 1 - RECEIVER 2 VELOCITY DATA

	METRIC			ENGLISH	
DEPTH	Vs	Vp	DEPTH	Vs	Vp
(M)	(M/SEC)	(M/SEC)	(FT)	(FT/SEC)	(FT/SEC)
19.5	429	820	63.98	1408	2689
20.0	435	775	65.62	1426	2543
20.5	413	704	67.26	1356	2310
21.0	388	741	68.90	1272	2430
21.5	375	769	70.54	1229	2524
22.0	379	694	72.18	1243	2278
22.5	388	694	73.82	1272	2278
23.0	391	676	75.46	1282	2217
23.5	385	649	77.10	1262	2130
24.0	388	658	78.74	1272	2158
24.5	383	719	80.38	1257	2360
25.0	383	909	82.02	1257	2983
25.5	405	826	83.66	1328	2711
26.0	415	709	85.30	1361	2327
26.5	437	826	86.94	1433	2711
27.0	452	763	88.58	1485	2504
27.5	461	909	90.22	1512	2983
28.0	463	909	91.86	1519	2983
28.5	515	980	93.50	1691	3217
29.0	654	1408	95.14	2144	4621
29.5	685	1538	96.78	2247	5047
30.0	606	1408	98.43	1988	4621
30.5	645	1724	100.07	2117	5657
31.0	719	1786	101.71	2360	5859
31.5	769	1724	103.35	2524	5657
32.0	826	1695	104.99	2711	5561
32.5	758	1852	106.63	2485	6076
33.0	741	2128	108.27	2430	6981
33.5	803	1563	109.91	2635	5126
34.0	791	1961	111.55	2594	6433
34.5	730	1754	113.19	2395	5756
35.1	743	1575	115.16	2439	5167
35.5	743	1869	116.47	2439	6132
36.0	772	1923	118.11	2533	6309
36.5	794	2020	119.75	2604	6628
37.0	719	1681	121.39	2360	5514
37.5	826	1639	123.03	2711	5378
38.0	893	1835	124.67	2929	6020

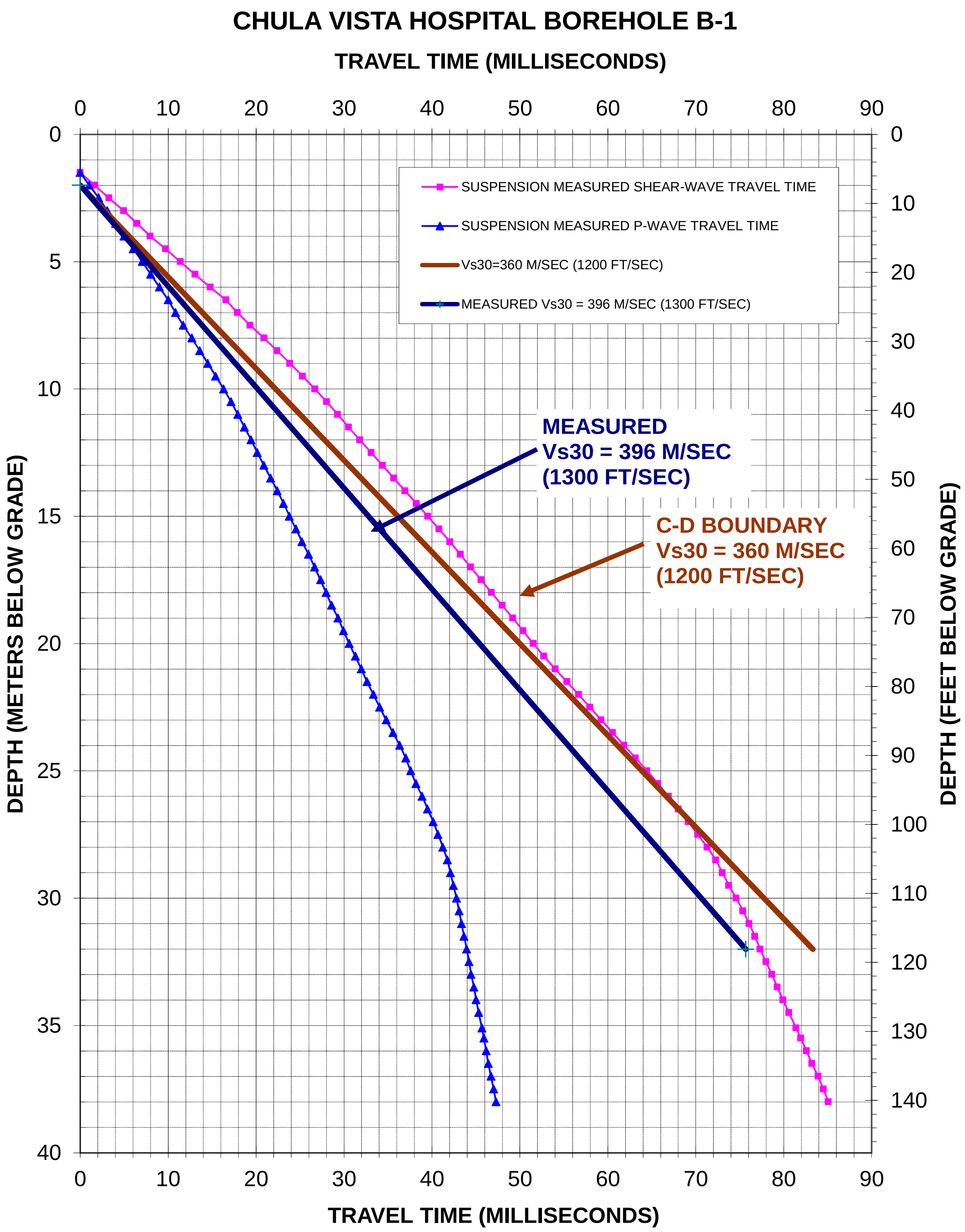


Figure 5: Boring B-1, Suspension P- and S_H-wave travel times with Vs30 values

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

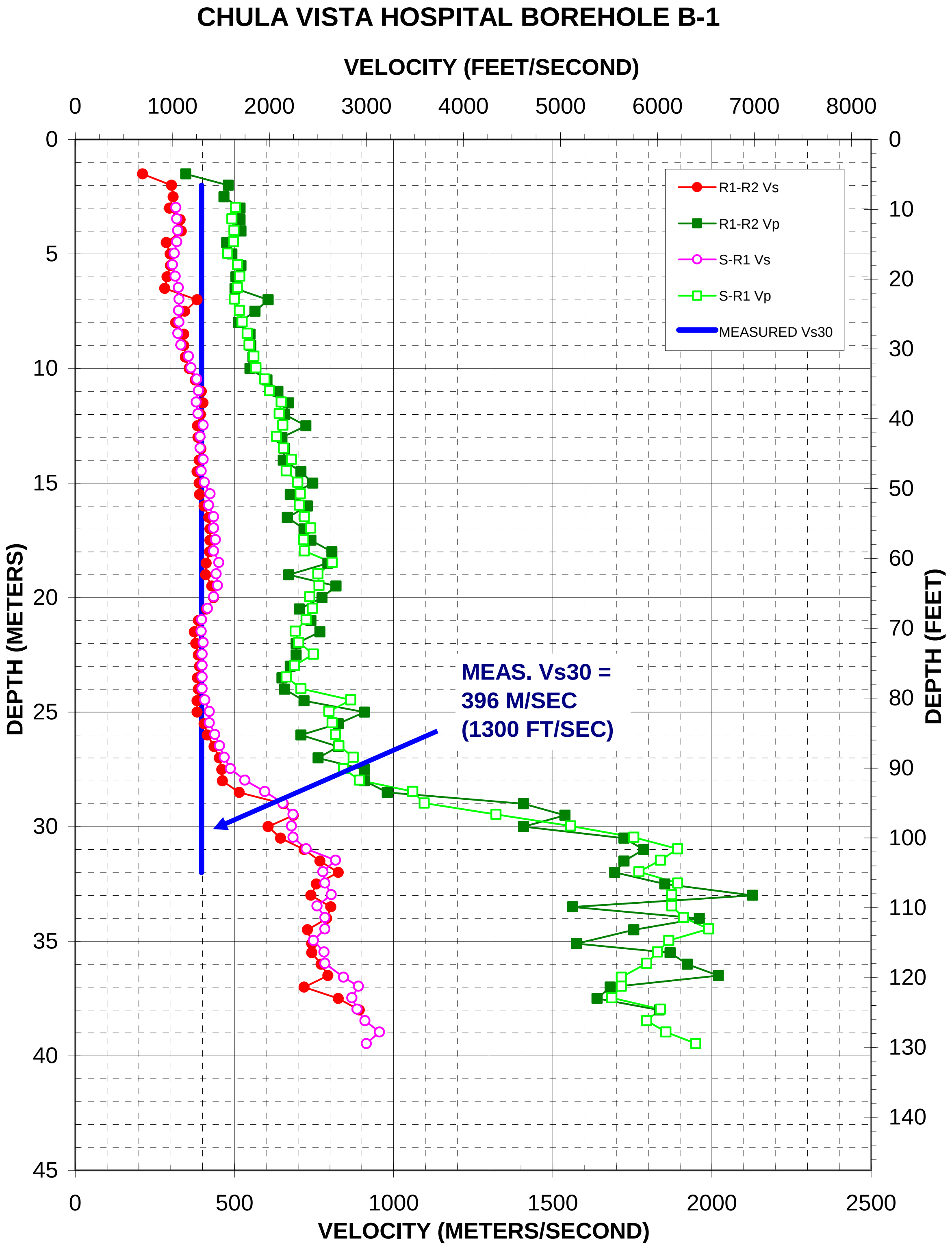


Figure A-1. Boring B-1, R1 - R2 high resolution analysis
and S - R1 quality assurance analysis P- and S_H-wave data

Table A-1. Boring B-1, S - R1 quality assurance analysis P- and S_H-wave data

SOURCE - RECEIVER 1 VELOCITY DATA					
	METRIC			ENGLISH	
DEPTH	Vs	Vp	DEPTH	Vs	Vp
(M)	(M/SEC)	(M/SEC)	(FT)	(FT/SEC)	(FT/SEC)
3.0	316	504	9.73	1038	1653
3.5	319	492	11.37	1047	1615
4.0	322	499	13.01	1055	1636
4.5	319	497	14.65	1047	1632
5.0	311	479	16.29	1021	1571
5.5	305	511	17.93	1002	1675
6.0	314	517	19.57	1031	1698
6.5	324	509	21.21	1062	1671
7.0	326	500	22.85	1070	1640
7.5	325	516	24.49	1066	1693
8.0	326	524	26.13	1070	1721
8.5	323	541	27.77	1059	1774
9.0	332	547	29.41	1088	1794
9.5	356	561	31.05	1168	1841
10.0	364	568	32.69	1195	1862
10.5	381	596	34.33	1251	1954
11.0	388	611	35.97	1271	2004
11.5	380	648	37.61	1246	2125
12.0	386	641	39.26	1266	2104
12.5	402	652	40.90	1319	2139
13.0	392	633	42.54	1287	2076
13.5	392	654	44.18	1287	2146
14.0	402	680	45.82	1319	2230
14.5	395	663	47.46	1298	2176
15.0	405	699	49.10	1330	2294
15.5	423	707	50.74	1389	2319
16.0	420	704	52.38	1377	2311
16.5	435	720	54.02	1426	2363
17.0	435	739	55.66	1426	2426
17.5	441	717	57.30	1446	2354
18.0	435	720	58.94	1426	2363
18.5	451	808	60.58	1479	2649
19.0	443	763	62.22	1452	2503
19.5	447	766	63.86	1466	2513
20.0	435	737	65.50	1426	2417
20.5	416	745	67.14	1365	2445
21.0	397	726	68.78	1303	2380

SOURCE - RECEIVER 1 VELOCITY DATA

	METRIC			ENGLISH	
DEPTH	Vs	Vp	DEPTH	Vs	Vp
(M)	(M/SEC)	(M/SEC)	(FT)	(FT/SEC)	(FT/SEC)
21.5	395	692	70.42	1298	2270
22.0	402	702	72.06	1319	2303
22.5	399	748	73.70	1308	2454
23.0	399	689	75.34	1308	2261
23.5	399	663	76.98	1308	2176
24.0	399	710	78.63	1308	2328
24.5	407	865	80.27	1336	2839
25.0	421	798	81.91	1383	2617
25.5	421	808	83.55	1383	2649
26.0	439	818	85.19	1439	2683
26.5	453	828	86.83	1486	2718
27.0	468	873	88.47	1537	2865
27.5	487	843	90.11	1599	2765
28.0	533	894	91.75	1749	2931
28.5	596	1060	93.39	1954	3479
29.0	652	1097	95.03	2139	3598
29.5	684	1322	96.67	2245	4337
30.0	680	1556	98.31	2230	5106
30.5	684	1755	99.95	2245	5756
31.0	726	1892	101.59	2380	6208
31.5	818	1838	103.23	2683	6030
32.0	778	1771	104.87	2553	5809
32.5	785	1892	106.51	2574	6208
33.0	804	1874	108.15	2638	6148
33.5	760	1874	109.79	2493	6148
34.0	785	1911	111.43	2574	6269
34.5	785	1990	113.07	2574	6528
35.0	748	1865	114.71	2454	6118
35.5	781	1829	116.35	2564	6002
36.0	785	1795	118.00	2574	5890
36.6	843	1716	119.96	2765	5628
37.0	889	1716	121.28	2918	5628
37.5	869	1686	122.92	2852	5530
38.0	885	1838	124.56	2905	6030
38.5	910	1795	126.20	2987	5890
39.0	955	1856	127.84	3135	6088
39.5	915	1949	129.48	3001	6396

APPENDIX B

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION RECORDS

MICRO PRECISION CALIBRATION, INC
12686 HOOVER ST
GARDEN GROVE CA 92841
714-901-5659

Calibration CERT #
935.11

Certificate of Calibration

Date: Aug 27, 2014 **Cert No. 222008122227166**

Customer:

GEOVISION

1124 OLYMPIC DRIVE
CORONA CA 92881

Work Order #: LA-90014973

MPC Control #: AM6768
Asset ID: 160024
Gage Type: LOGGER
Manufacturer: OYO
Model Number: 3403
Size: N/A
Temp/RH: 71°F / 52 %

Serial Number: 160024
Department: N/A
Performed By: STEVE BORING
Received Condition: IN TOLERANCE
Returned Condition: IN TOLERANCE
Cal. Date: August 26, 2014
Cal. Interval: 12 MONTHS
Cal. Due Date: August 26, 2015

Calibration Notes:

See attached data sheet for calculations.
Calibrated IAW customer supplied data form Rev 2.1
Frequency measurement uncertainty = 0.0005 Hz
Unit calibrated with Laptop Panasonic s/n: 5KKSA84231
Calibrated to 4:1 accuracy ratio.

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
BD7715	UNIVERSAL COUNTER	53131A	3416A05377	HEWLETT PACKARD	Aug 1, 2015	222008122225973
CC8416	MULTIFUNCTION CALIBRATOR	5700A	5860909	FLUKE	Dec 3, 2014	220081202213692

Procedures Used in this Event

Procedure Name	Description
GEOVISION SEISMIC	Suspension PS Seismic Logger/Recorder Calibration Procedure

Calibrating Technician: STEVE BORING

QC Approval: Jim Williams

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

GEOVision
geophysical services

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Oyo	Model no.:	3403
Serial no.:	160024	Calibration date:	8/26/2014
By:	Charles Carter	Due date:	8/26/2015
Counter mfg.:	Hewlett-Packard	Model no.:	53131A
Serial no.:	3146A05377	Calibration date:	8/1/2014
By:	Microprecision	Due date:	8/1/2015
Signal generator mfg.:	Fluke	Model no.:	5700A
Serial no.:	5860909	Calibration date:	12/3/2014
By:	Microprecision	Due date:	12/3/2015
Laptop controller mfg.:	Panasonic	Model no.:	Toughbook CF-29
Serial no.:	5KKSA84231	Calibration date:	N/A

SYSTEM SETTINGS:

Gain:	2
Filter	10KHz
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	8/26/2014 10:55

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found + 0.12% As left + 0.12%

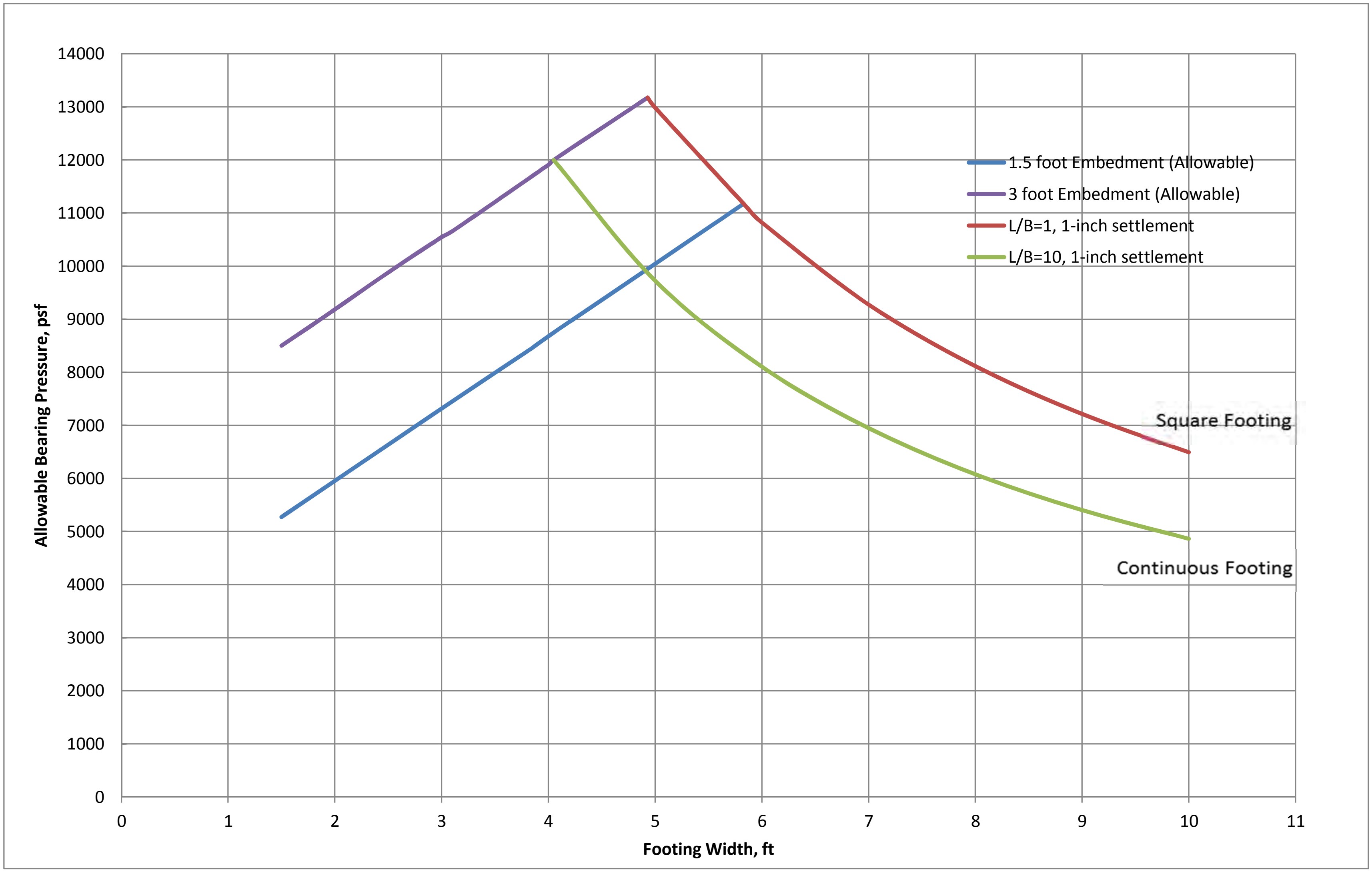
Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	019	180.0	50.00	180.0	50.00	180.2	49.94
100.0	100.0	100	020	90.00	100.0	90.10	99.9	90.10	99.9
200.0	200.0	50	021	45.05	199.8	45.00	200.0	45.00	200.0
500.0	500.0	20	022	18.00	500.0	18.02	499.4	18.00	500.0
1000	999.97	10	023	9.000	1000	9.000	1000.0	8.990	1001.1
2000	1999.92	5	024	4.500	2000	4.495	2002	4.495	2002

Calibrated by:	Steve Boring Name	8/26/2014 Date	Signature
Witnessed by:	Charles Carter Name	8/26/2014 Date	Charles Carter Signature

Suspension PS Seismic Recorder/Logger Calibration Data Form Rev 2.1 February 7, 2012

Appendix F

Shallow Foundation Capacity Curves



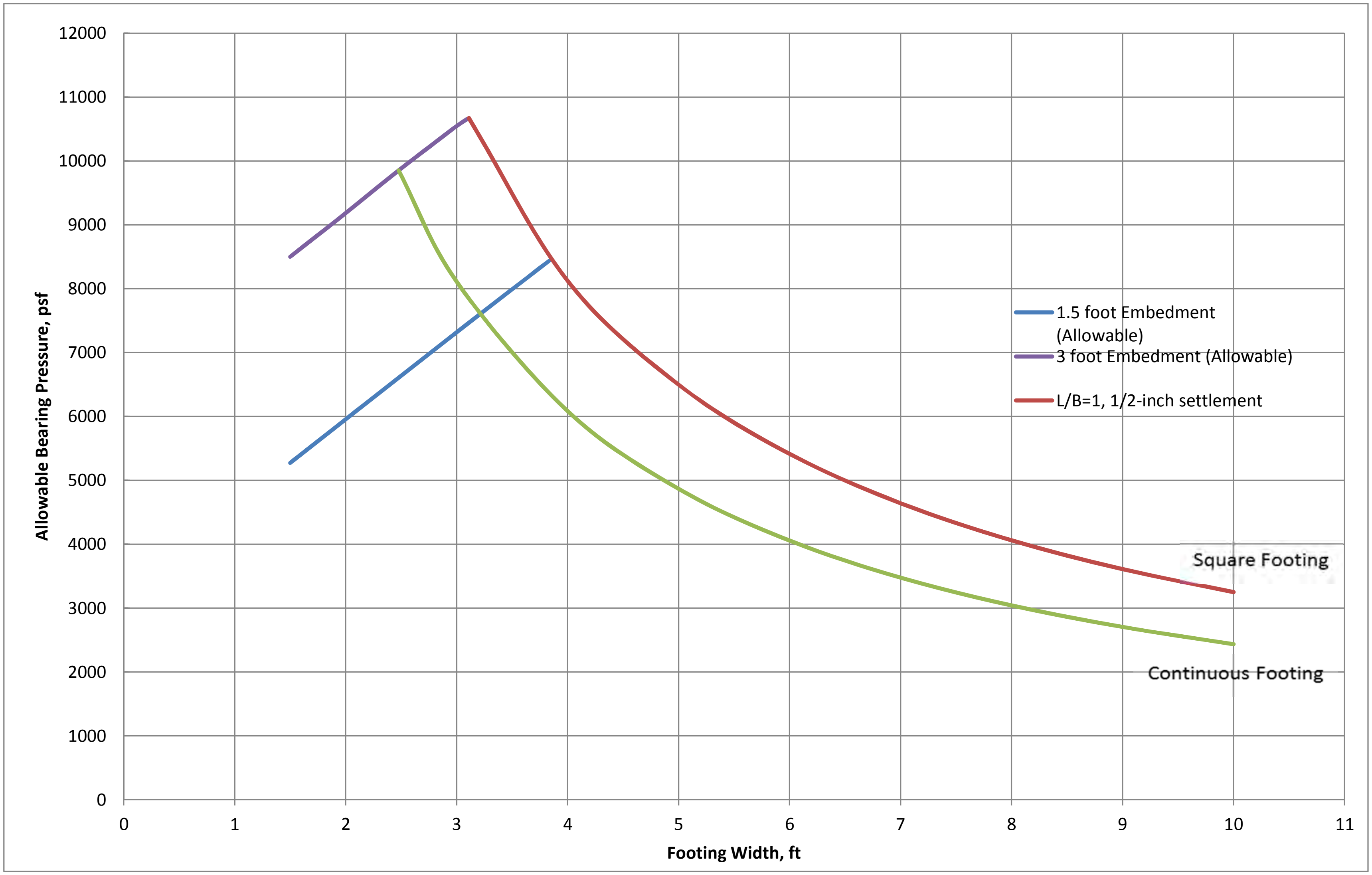
BUILDING FOUNDATIONS
ALLOWABLE BEARING CAPACITY (FORMATION)
1-inch Tolerable Settlement
SHARP CHULA VISTA MEDICAL CENTER

Exhibit: F1

Leighton

Date: December 2015

Project No.: 603541-003



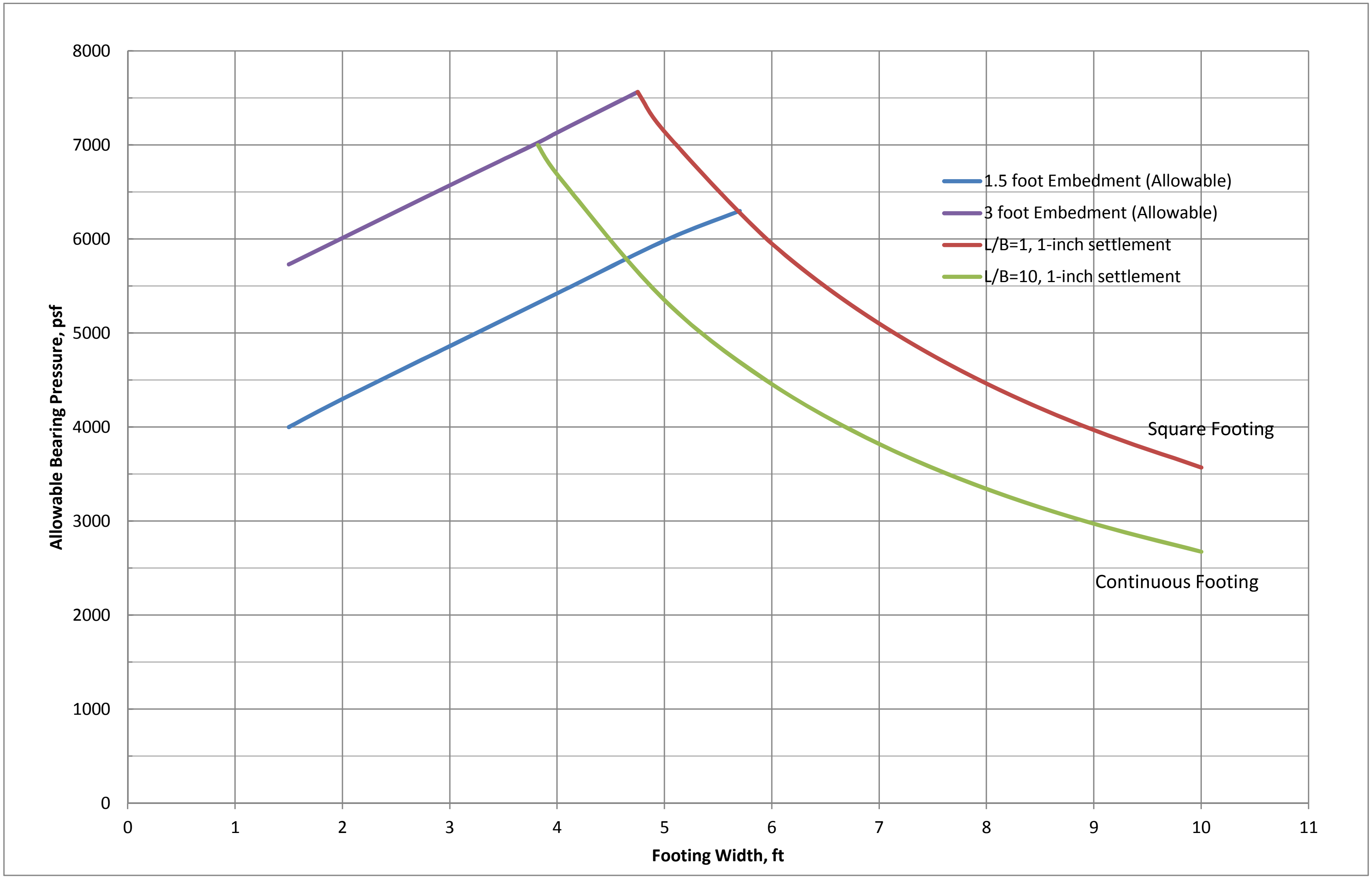
BUILDING FOUNDATIONS
ALLOWABLE BEARING CAPACITY (FORMATION)
1/2-inch Tolerable Settlement
SHARP CHULA VISTA MEDICAL CENTER

Exhibit: F2

Leighton

Date: December 2015

Project No.: 603541-003



ACCESSORY STRUCTURE FOUNDATIONS **ALLOWABLE BEARING CAPACITY (FILL)** **1-inch Tolerable Settlement** **SHARP CHULA VISTA MEDICAL CENTER**		**Exhibit: F3**	Leighton
		Date: December 2015	Project No.: 603541-003

Appendix G

General Earthwork and Grading Specifications

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical

Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill

All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified. Backfill shall be placed and densified to a minimum of 90 percent of relative compaction from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

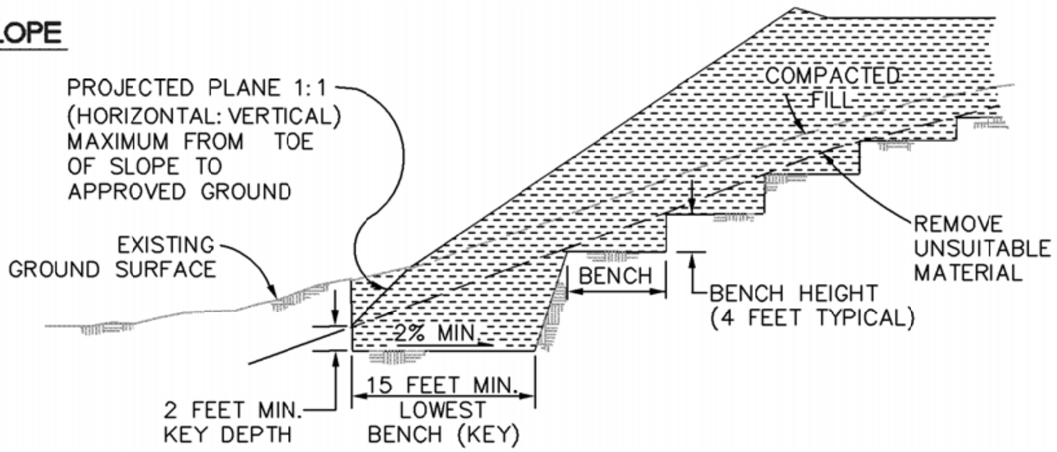
7.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

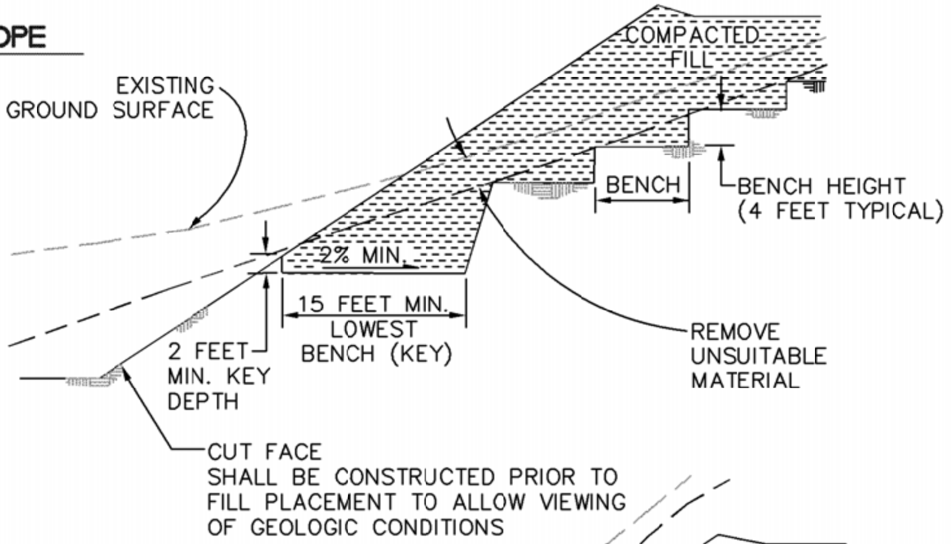
7.4 Observation and Testing

The densification of the bedding around the conduits shall be observed by the Geotechnical Consultant.

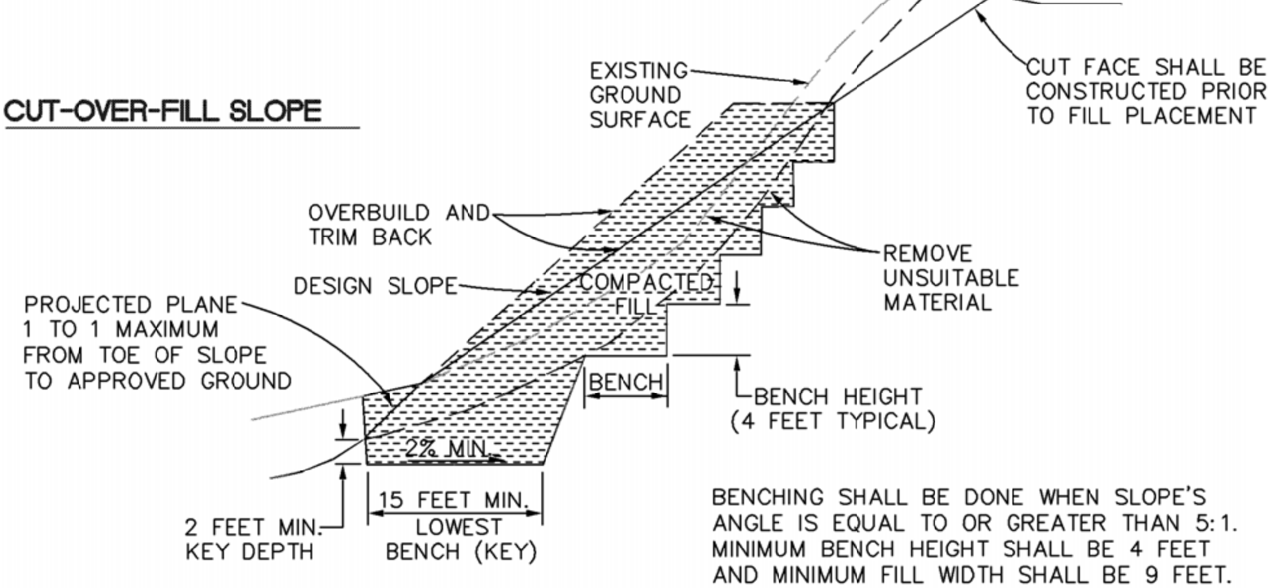
FILL SLOPE



FILL-OVER-CUT SLOPE



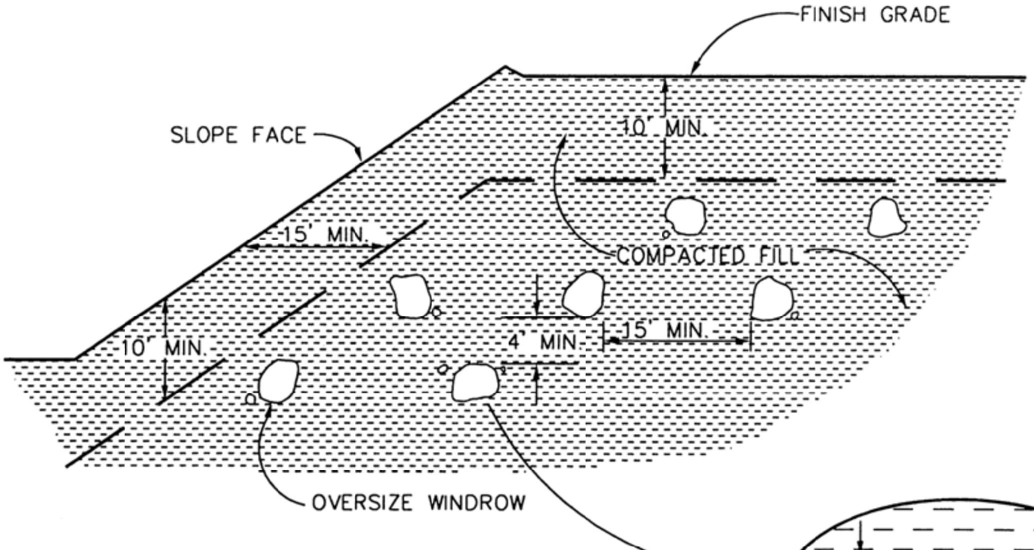
CUT-OVER-FILL SLOPE

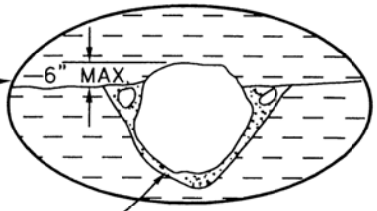


BENCHING SHALL BE DONE WHEN SLOPE'S ANGLE IS EQUAL TO OR GREATER THAN 5:1. MINIMUM BENCH HEIGHT SHALL BE 4 FEET AND MINIMUM FILL WIDTH SHALL BE 9 FEET.

KEYING AND BENCHING

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL A

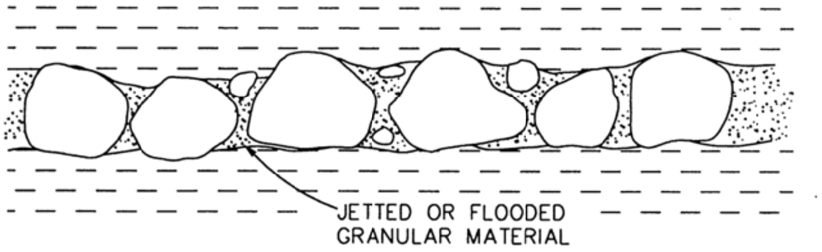




GRANULAR MATERIAL TO BE DENSIFIED IN PLACE BY FLOODING OR JETTING.

DETAIL

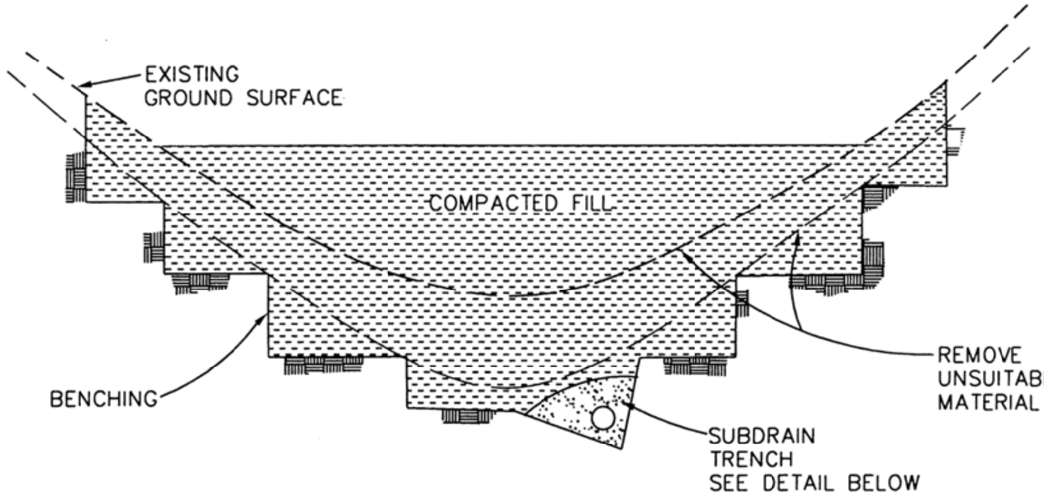
- OVERSIZE ROCK IS LARGER THAN 8 INCHES IN LARGEST DIMENSION.
- EXCAVATE A TRENCH IN THE COMPACTED FILL DEEP ENOUGH TO BURY ALL THE ROCK.
- BACKFILL WITH GRANULAR SOIL JETTED OR FLOODED IN PLACE TO FILL ALL THE VOIDS.
- DO NOT BURY ROCK WITHIN 10 FEET OF FINISH GRADE.
- WINDROW OF BURIED ROCK SHALL BE PARALLEL TO THE FINISHED SLOPE.

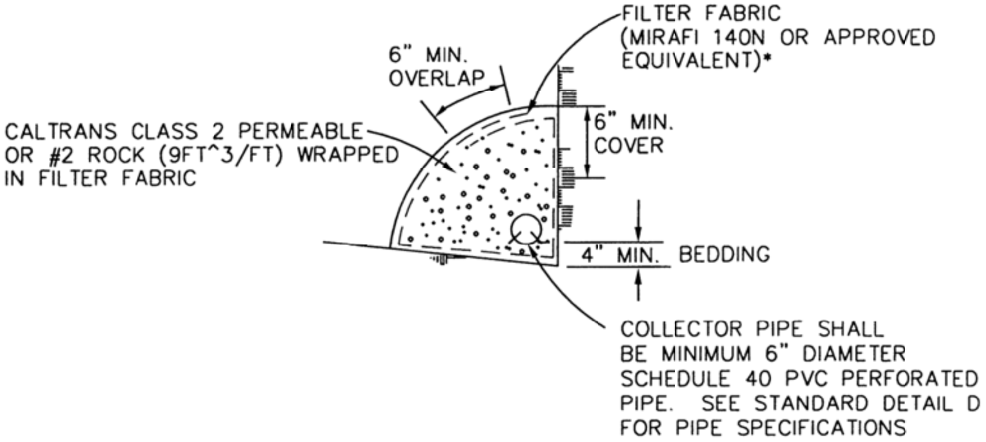

JETTED OR FLOODED GRANULAR MATERIAL

TYPICAL PROFILE ALONG WINDROW

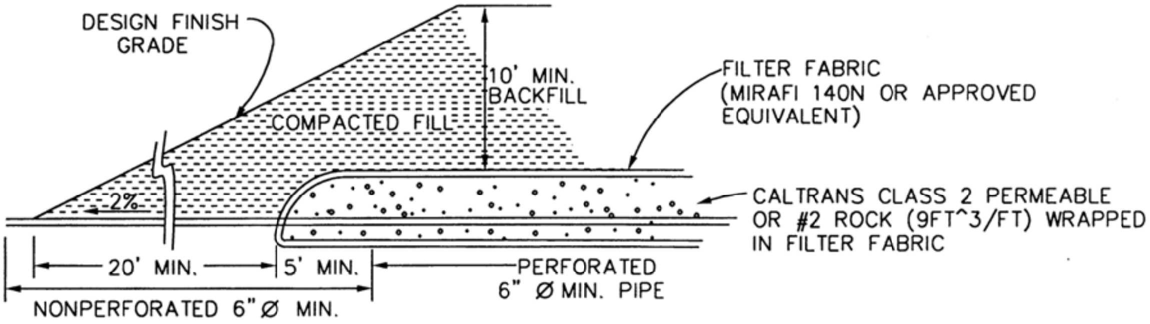
OVERSIZE ROCK DISPOSAL

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL B





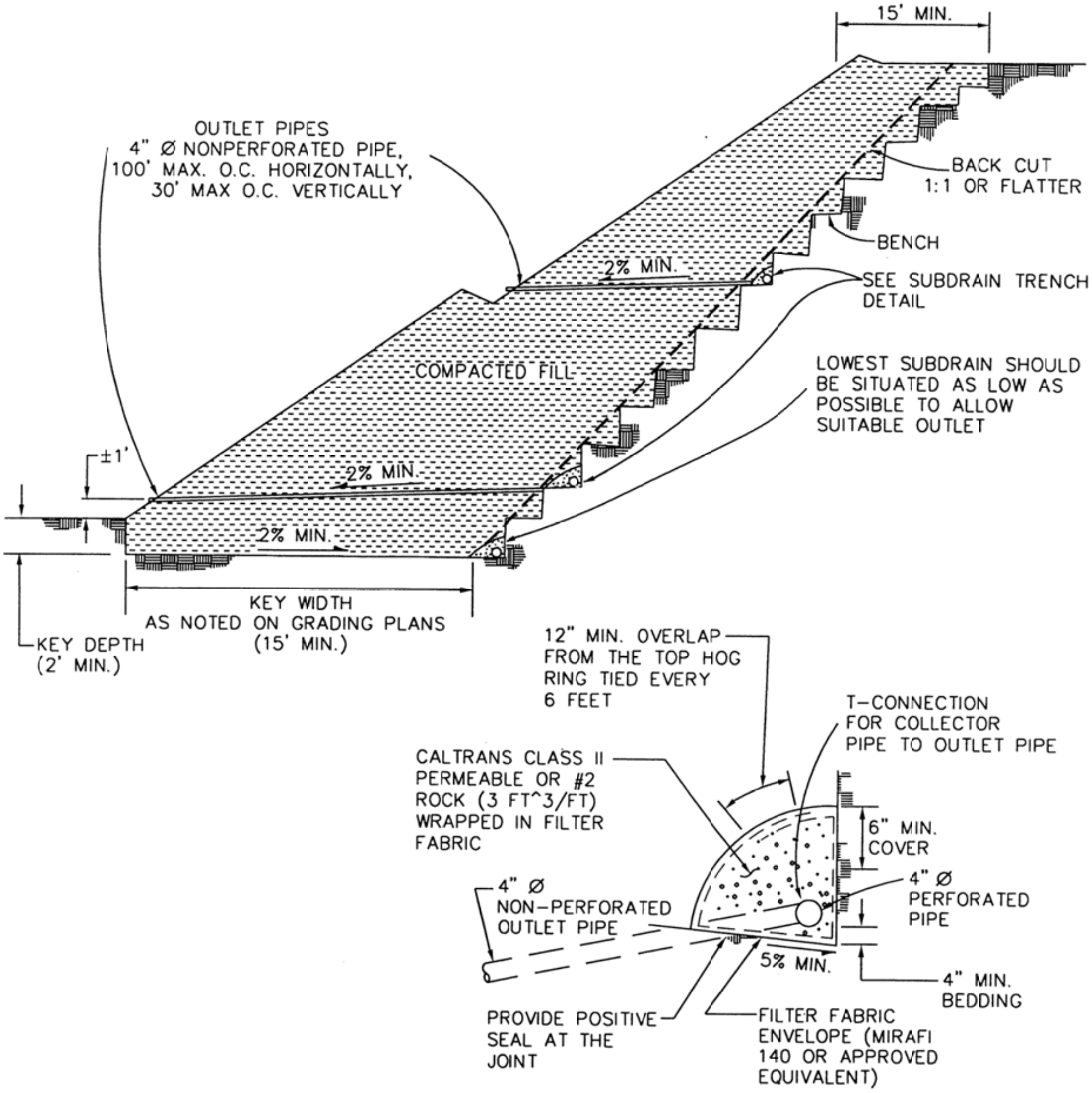
SUBDRAIN DETAIL



DETAIL OF CANYON SUBDRAIN OUTLET

CANYON SUBDRAINS

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL C



SUBDRAIN TRENCH DETAIL

SUBDRAIN INSTALLATION – subdrain collector pipe shall be installed with perforation down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drill holes are used. All subdrain pipes shall have a gradient of at least 2% towards the outlet.

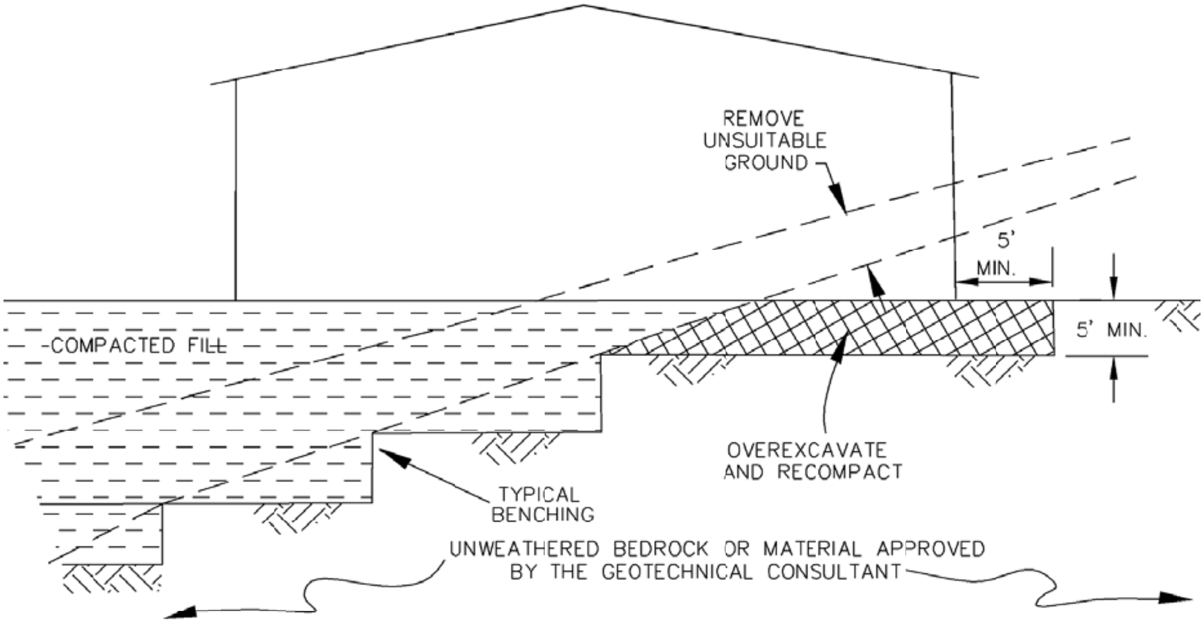
SUBDRAIN PIPE – Subdrain pipe shall be ASTM D2751, SDR 23.5 or ASTM D1527, Schedule 40, or ASTM D3034, SDR 23.5, Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe.

All outlet pipe shall be placed in a trench no wider than twice the subdrain pipe.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS

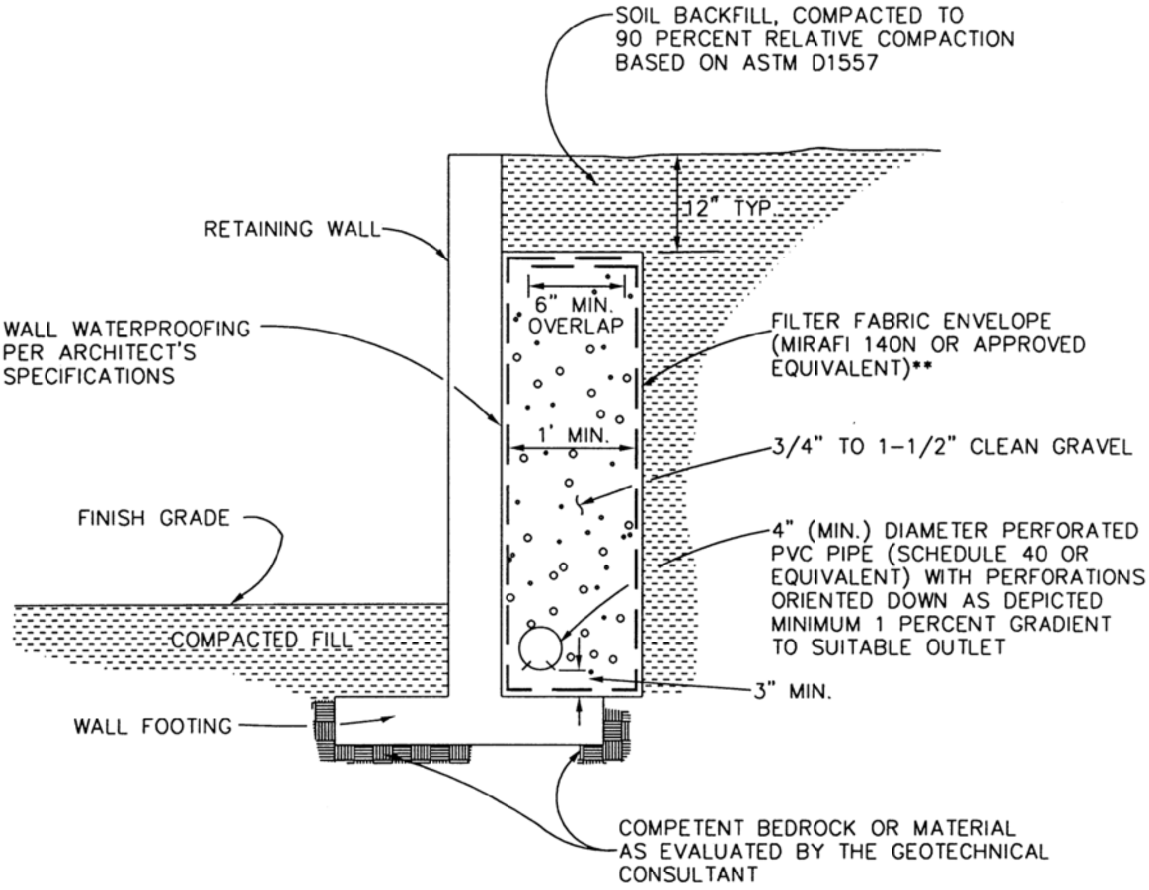
GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL D

CUT-FILL TRANSITION LOT OVEREXCAVATION



TRANSITION LOT FILLS

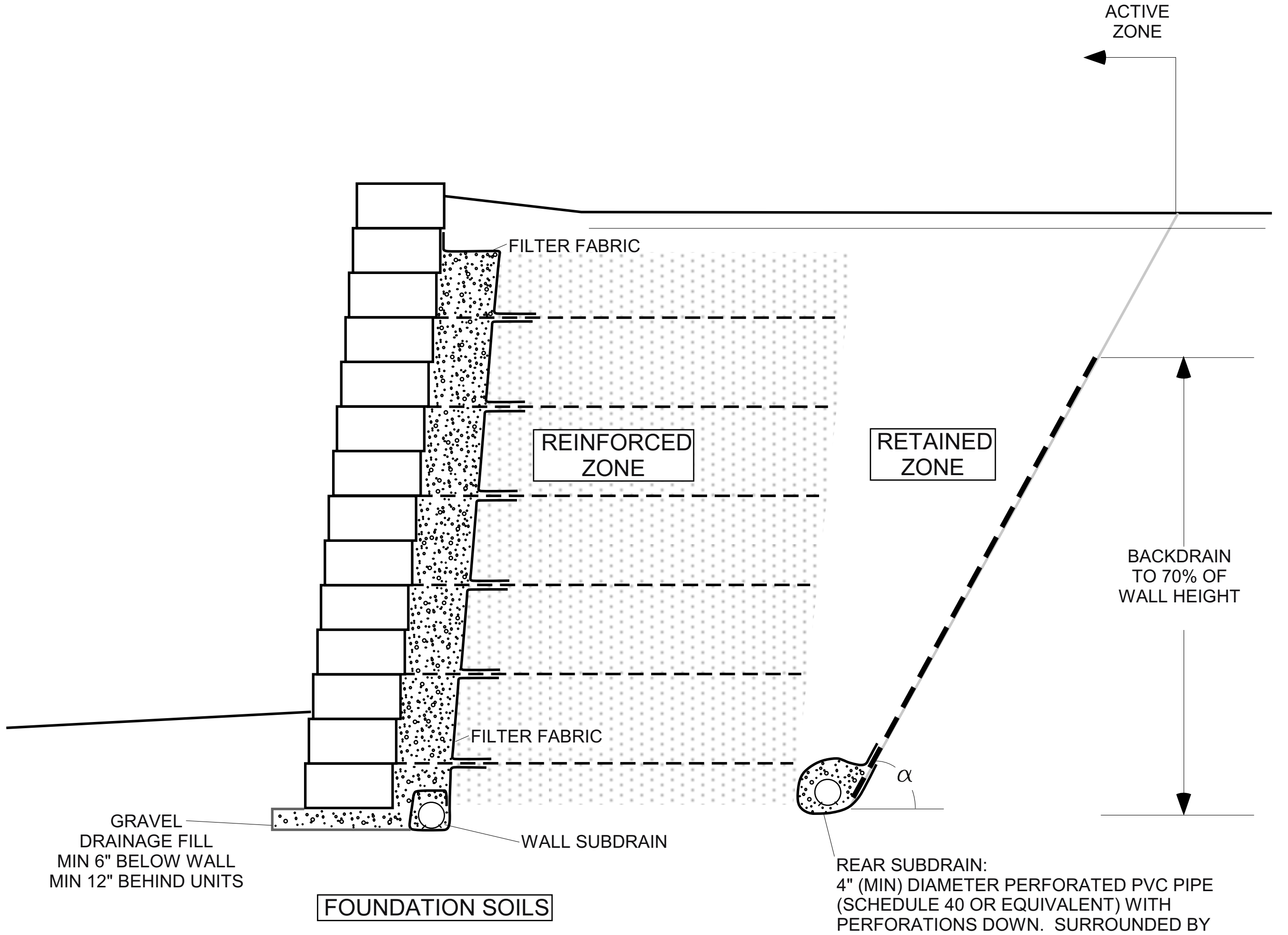
GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL E



NOTE: UPON REVIEW BY THE GEOTECHNICAL CONSULTANT, COMPOSITE DRAINAGE PRODUCTS SUCH AS MIRADRAIN OR J-DRAIN MAY BE USED AS AN ALTERNATIVE TO GRAVEL OR CLASS 2 PERMEABLE MATERIAL. INSTALLATION SHOULD BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

RETAINING WALL DRAINAGE

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL F



REAR SUBDRAIN:
4" (MIN) DIAMETER PERFORATED PVC PIPE (SCHEDULE 40 OR EQUIVALENT) WITH PERFORATIONS DOWN. SURROUNDED BY 1 CU. FT/FT OF 3/4" GRAVEL WRAPPED IN FILTER FABRIC (MIRAFI 140N OR EQUIVALENT)

OUTLET SUBDRAINS EVERY 100 FEET, OR CLOSER, BY TIGHTLINE TO SUITABLE PROTECTED OUTLET

NOTES:

1) MATERIAL GRADATION AND PLASTICITY

REINFORCED ZONE:

SIEVE SIZE	% PASSING
1 INCH	100
NO. 4	20-100
NO. 40	0-60
NO. 200	0-35

FOR WALL HEIGHT < 10 FEET, PLASTICITY INDEX < 20
FOR WALL HEIGHT 10 TO 20 FEET, PLASTICITY INDEX < 10
FOR TIERED WALLS, USE COMBINED WALL HEIGHTS
WALL DESIGNER TO REQUEST SITE-SPECIFIC CRITERIA FOR WALL HEIGHT > 20 FEET

GRAVEL DRAINAGE FILL:

SIEVE SIZE	% PASSING
1 INCH	100
3/4 INCH	75-100
NO. 4	0-60
NO. 40	0-50
NO. 200	0-5

2) CONTRACTOR TO USE SOILS WITHIN THE RETAINED AND REINFORCED ZONES THAT MEET THE STRENGTH REQUIREMENTS OF WALL DESIGN.

3) GEOGRID REINFORCEMENT TO BE DESIGNED BY WALL DESIGNER CONSIDERING INTERNAL, EXTERNAL, AND COMPOUND STABILITY.

3) GEOGRID TO BE PRETENSIONED DURING INSTALLATION.

4) IMPROVEMENTS WITHIN THE ACTIVE ZONE ARE SUSCEPTIBLE TO POST-CONSTRUCTION SETTLEMENT. ANGLE $\alpha = 45+\phi/2$, WHERE ϕ IS THE FRICTION ANGLE OF THE MATERIAL IN THE RETAINED ZONE.

5) BACKDRAIN SHOULD CONSIST OF J-DRAIN 302 (OR EQUIVALENT) OR 6-INCH THICK DRAINAGE FILL WRAPPED IN FILTER FABRIC. PERCENT COVERAGE OF BACKDRAIN TO BE PER GEOTECHNICAL REVIEW.

SEGMENTAL RETAINING WALLS

GENERAL EARTHWORK AND
GRADING SPECIFICATIONS
STANDARD DETAIL G

Appendix H

Fault Trench Logs Dated January 31, 2013

LEGEND

Af	Undifferentiated Fill
A	Topsoil Pedogenic Soil Horizon (Holocene age); Light brown to dark brown silty sand, porous, abundant rootlets and bioturbation.
A_2	Colluvium (Holocene age); Reddish brown to orange-brown silty sandstone, damp to moist, dense, blocky, moderately weathered.
Bt	Pedogenic Soil Horizon (pre-Holocene age); Dark brown to brown clayey sand and sandy clay, moist, firm to stiff. Weak- to well-developed pedogenic surfaces developed with clay films.
$Qvop_{1\text{-}2}$	Very Old Paralic Deposits (Middle to Early Pleistocene age); Light brown, light reddish brown to dark reddish brown silty sandstone with scattered interbedded cobble-gravel conglomerate and coarse-grained sandstone, damp to moist, very dense.
$Tsd_{1\text{-}9}$	San Diego Formation (Early Pleistocene to Pliocene age); Light brown to white to olive brown, silty sandstone with interbedded cobble-gravel conglomerate, damp to moist, dense, generally friable with less friable zones, scattered zones of abundant carbonate blebs, stringers, and infilled fractures, fine-grained with localized zones of medium-grained sand.

SYMBOLS

K	Krotovina
/ / \	Argillic pedogenic soil development
⌐ < ⌐	Blocky pedogenic surfaces
o o o	Gravel-cobble
⁘	Sandy
——	Lithologic contact
— — —	Gradational lithologic contact
①	Number corresponds to marked bed

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Scale: NTS	Date: 01/2013
Drafted By: MAM	Checked By:

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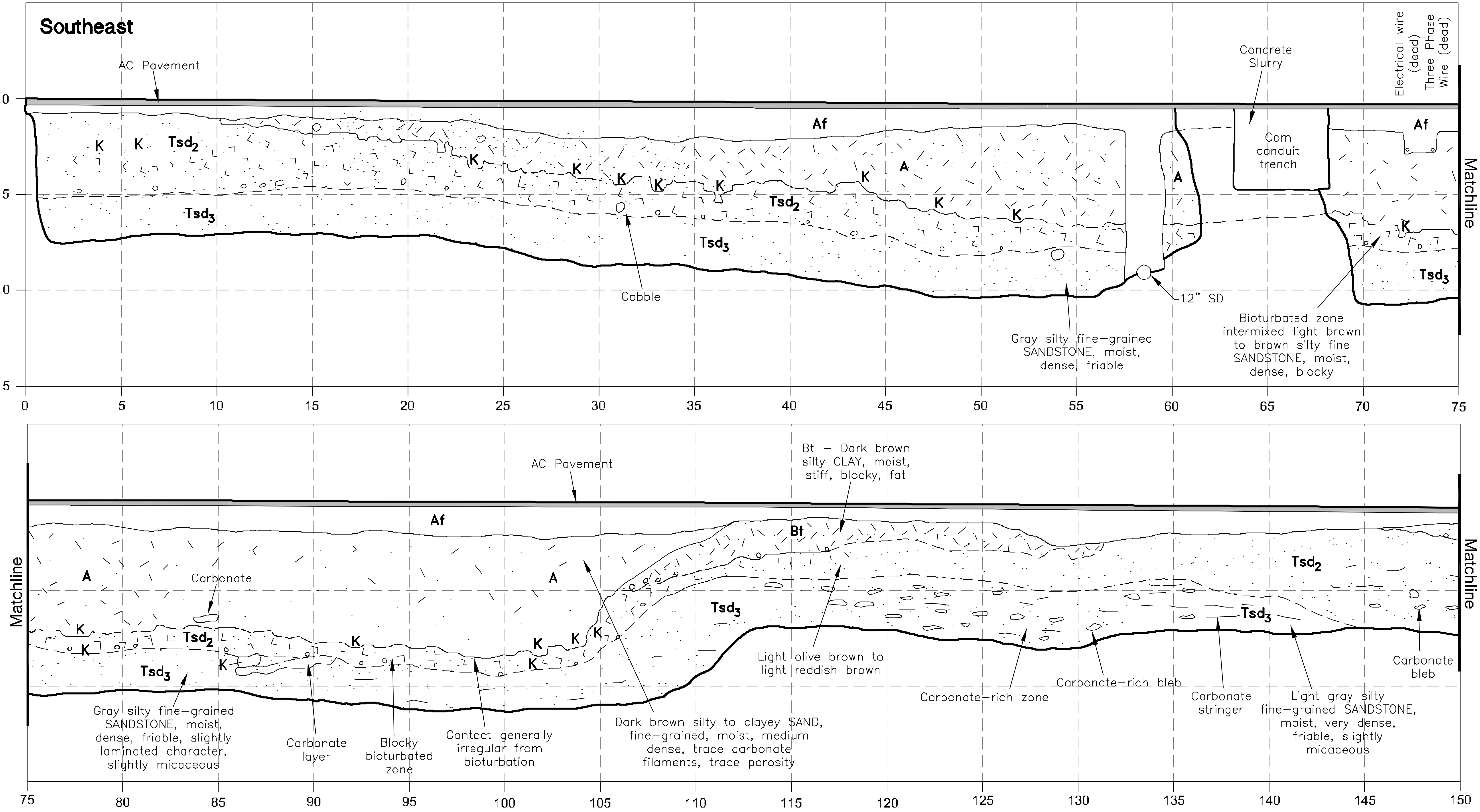
TRENCH LOG LEGEND

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 6

Leighton



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Eng/Geol: SAC/RCS

Scale: 1"=5'

Date: 01/2013

Drafted By: MAM

Checked By: RCS

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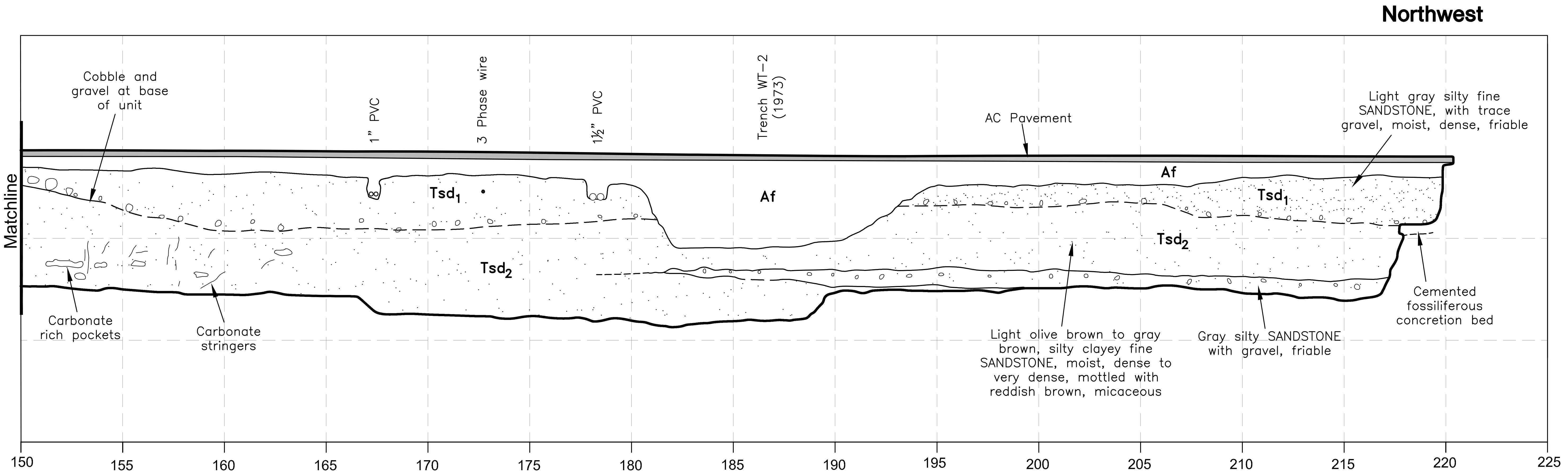
TRENCH T-1

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 7A

Leighton



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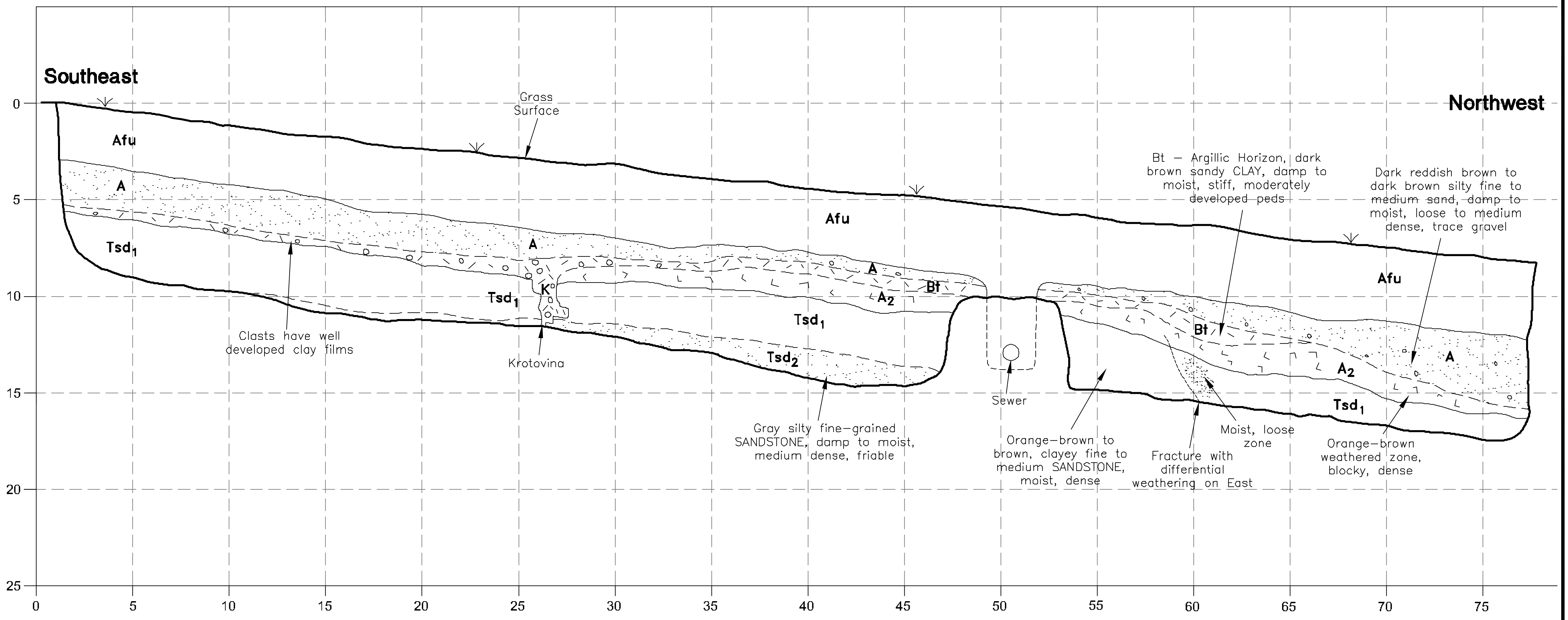
TRENCH T-1

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 7B

Leighton



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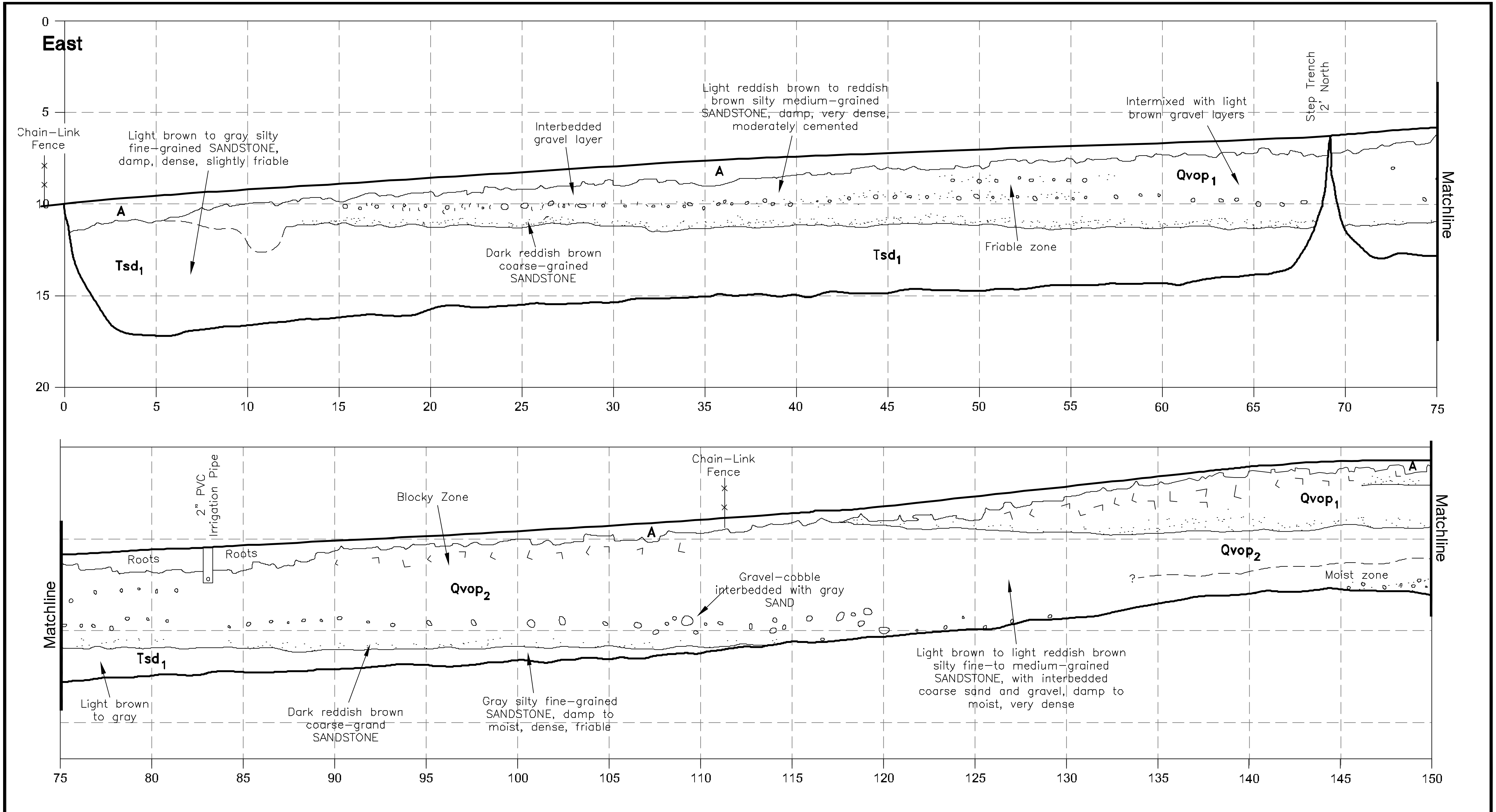
TRENCH T-2

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 8

Leighton



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Eng/Geol: SAC/RCS

Scale: 1"=5'

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Checked By: RCS

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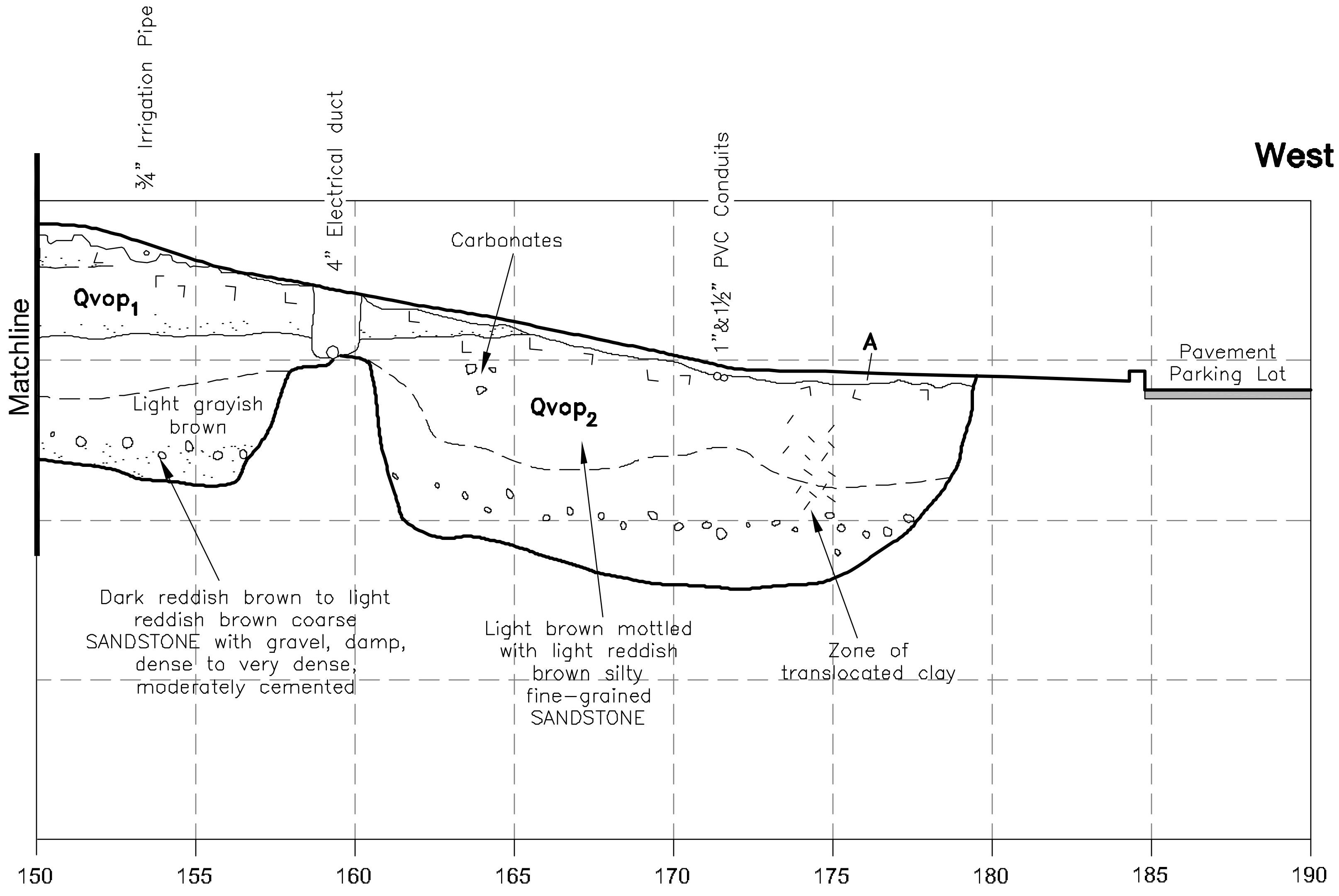
TRENCH T-3

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 9A

Leighton



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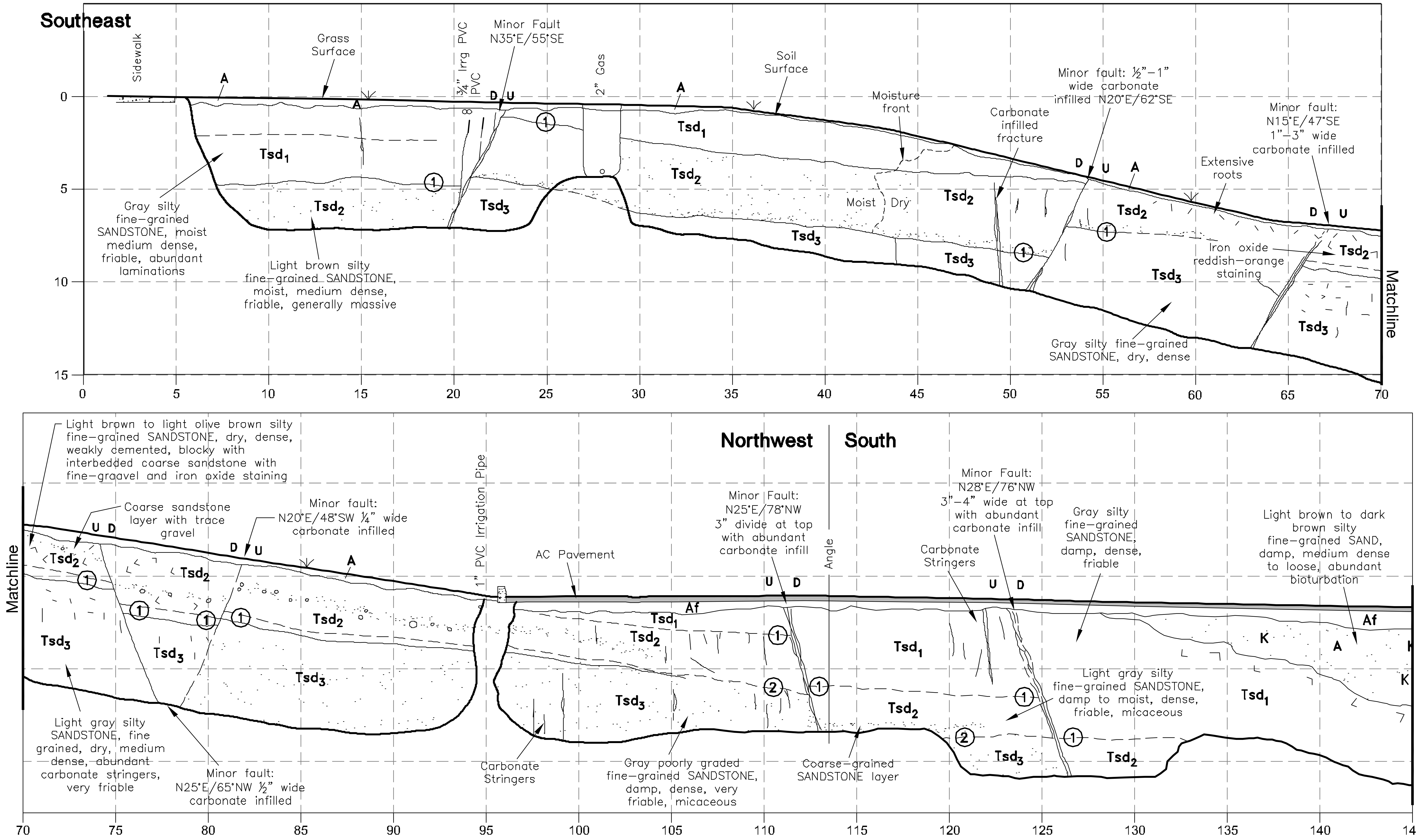
TRENCH T-3

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 9B

Leighton



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Scale: 1"=5'	Date: 01/2013

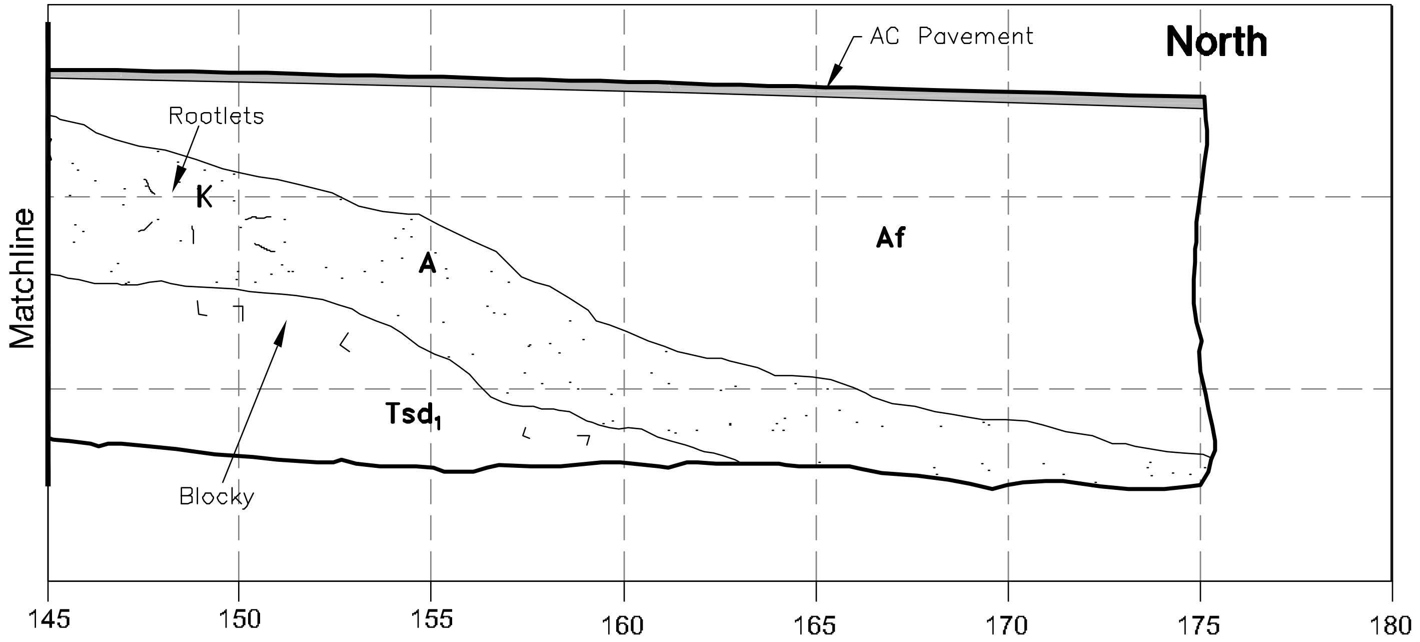
Drafted By: MAM | Checked By: RCS | P:\DRAFTING\603541\001\OT_2012-10-01\TRENCHES.DWG (02-01-13 11:57:37AM); Plotted by: mmurphy

TRENCH T-4

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 10A

Leighton



Proj: 603541-001	Eng/Geol: SAC/RCS
Scale: 1"=5'	Date: 01/2013

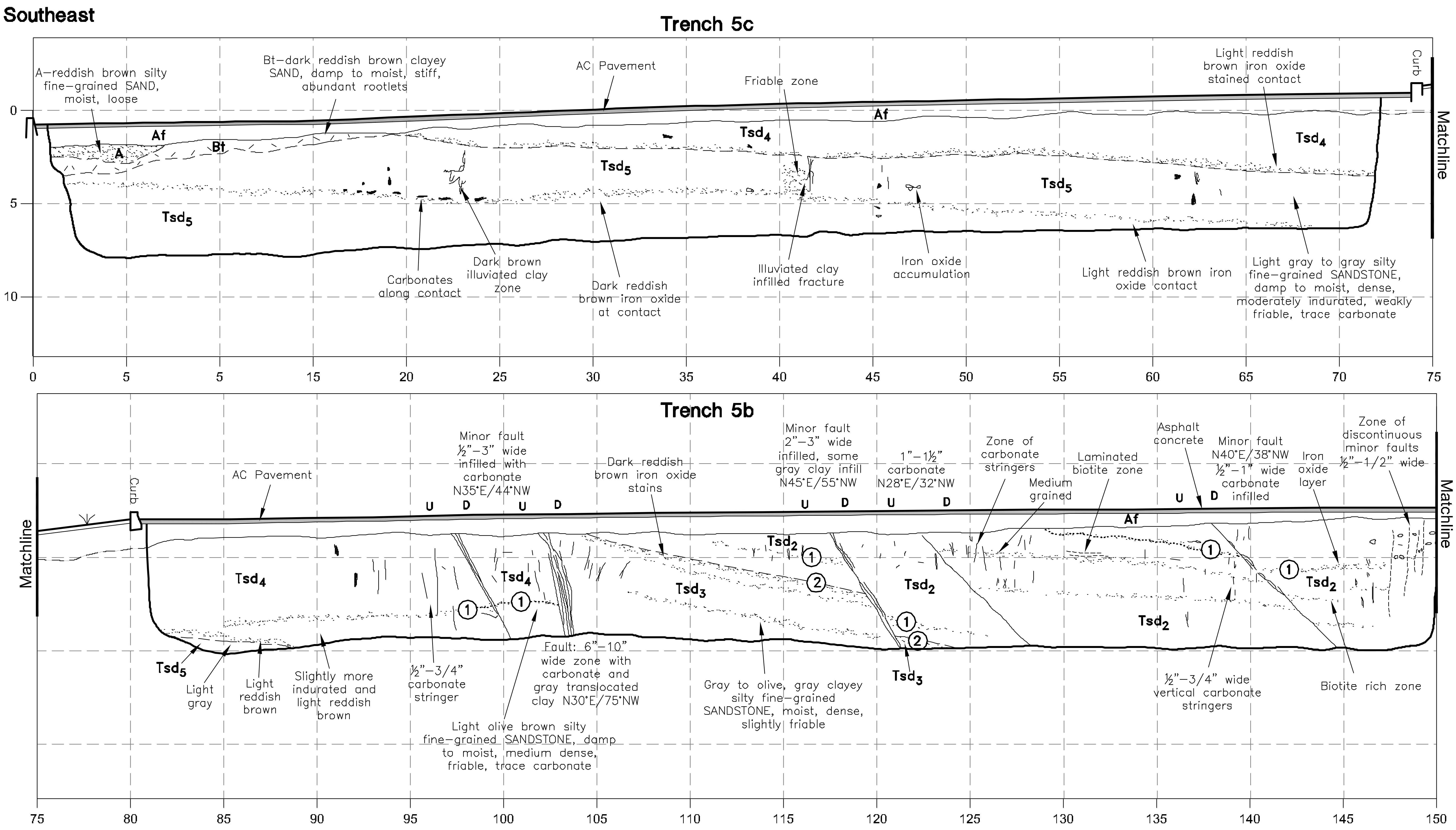
Drafted By: MAM | Checked By: RCS | P:\DRAFTING\603541\001\OF_2012-10-01\TRENCHES.DWG (02-01-13 11:53:40AM) Plotted by: mmurphy

TRENCH T-4

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 10B

Leighton



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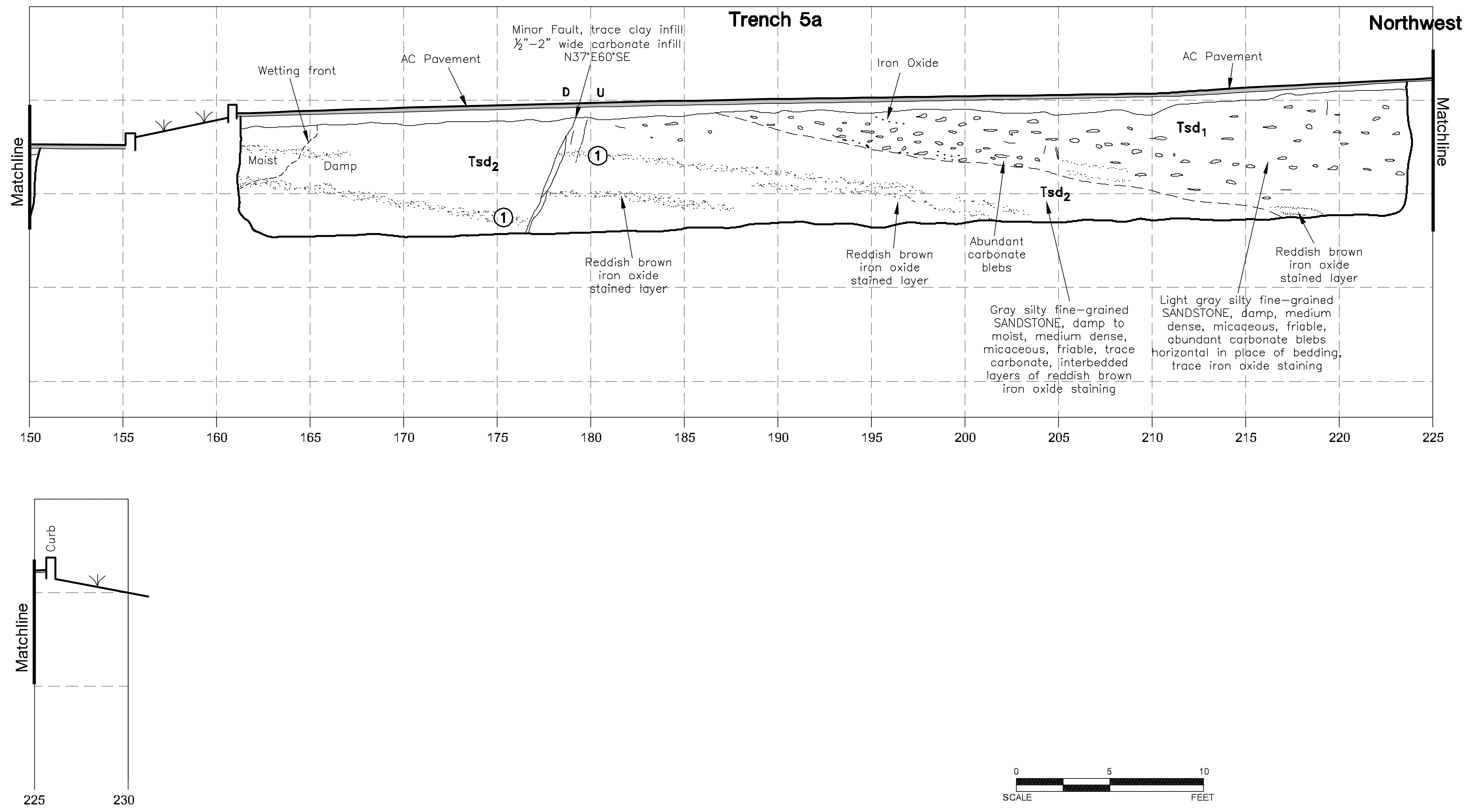
TRENCH T-5

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 11A

Leighton



Proj: 603541-001

Eng/Geol: SAC/RCS

Scale: 1"=5'

Date: 01/2013

Drafted By: MAM

Checked By: RCS

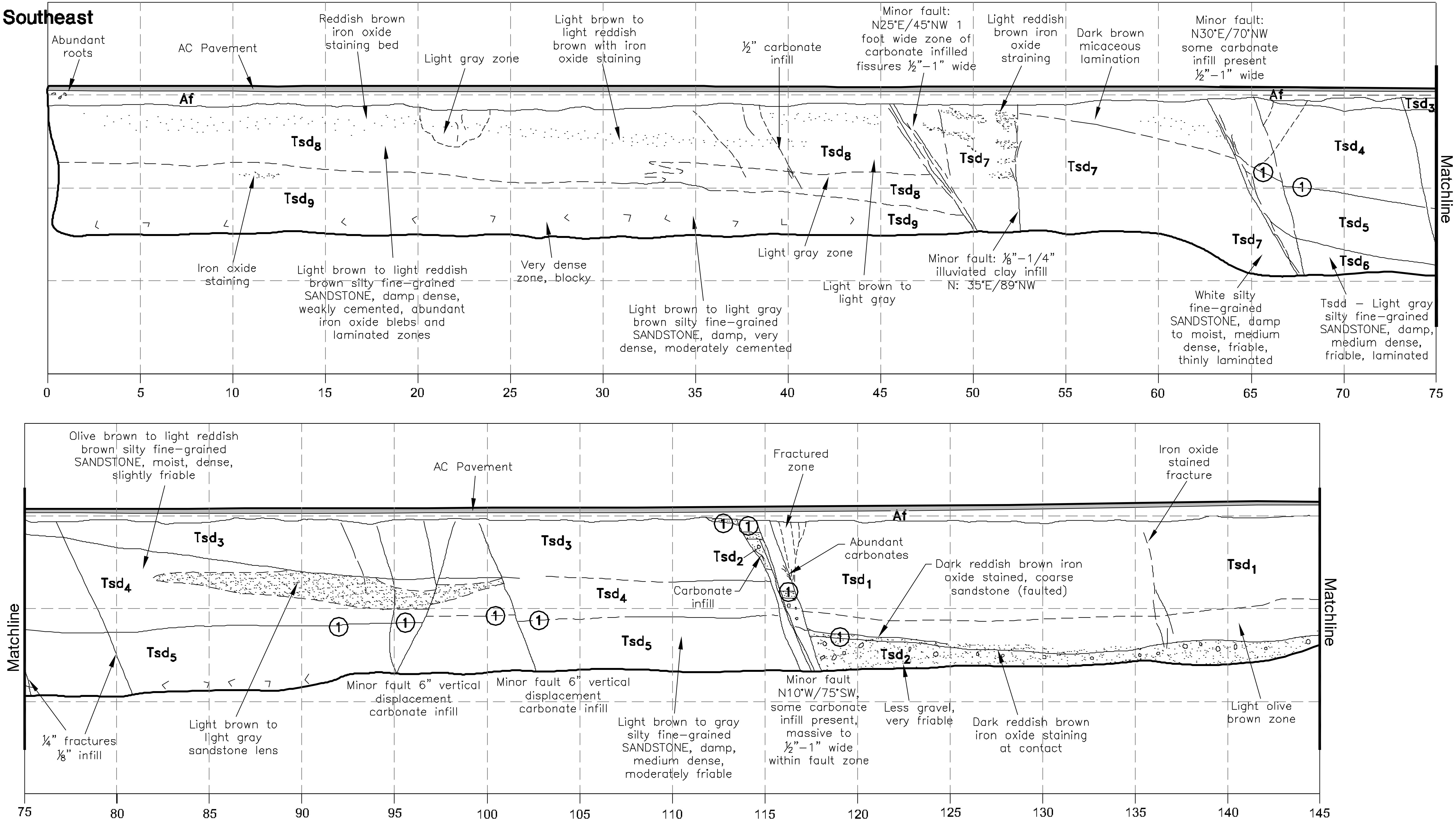
P:\DRAFTING\603541\001\OF_2012-10-01\TRENCHES.DWG (02-01-13 12:00:16PM) Plotted by: nmurphy

TRENCH T-5

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 11B

Leighton



Proj: 603541-001

Eng/Geol: SAC/RCS

Scale: 1"=5'

Date: 01/2013

Drafted By: MAM

Checked By: RCS

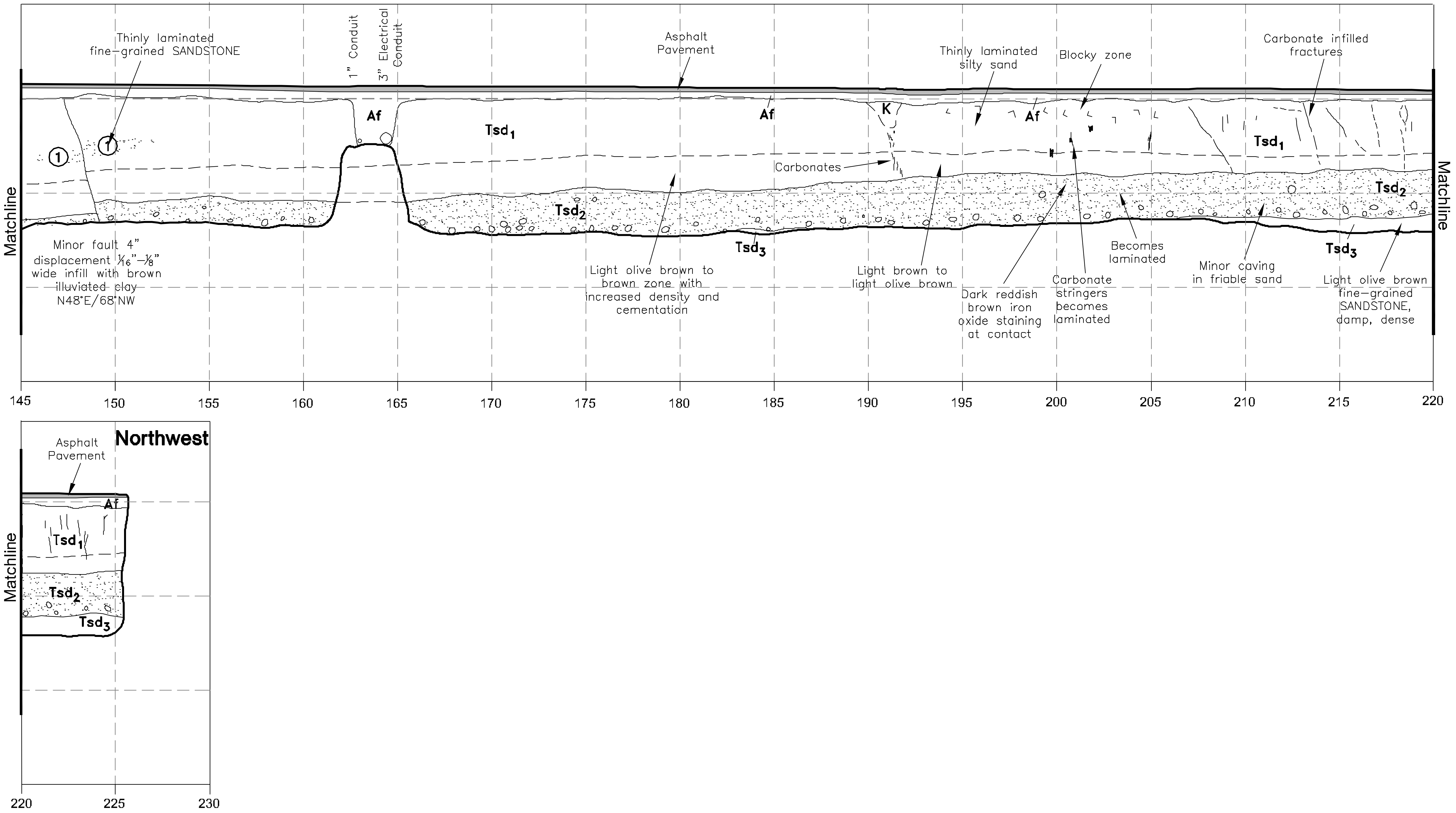
P:\DRAFTING\603541\001\GF_2012-10-01\TRENCHES.DWG (02-01-13 12:01:04PM); Plotted by: mmurphy

TRENCH T-6

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 12A

Leighton



Proj: 603541-001	Eng/Geol: SAC/RCS
Scale: 1"=5'	Date: 01/2013

Drafted By: MAM | Checked By: RCS | P:\DRAFTING\603541\001\OT_2012-10-01\TRENCHES.DWG (02-01-13 12:01:53PM); Plotted by: mmurray

TRENCH T-6

SHARP CHULA VISTA MEDICAL CENTER MASTER PLAN
CHULA VISTA, CALIFORNIA

FIGURE 12B

Leighton