INFORMATION HANDOUT

For Contract No. 11-288814

At 11-SD-11,125,905-variable

Identified by

Project ID 1113000167

PERMITS

United States Fish and Wildlife Service Biological Opinion, dated July 12, 2004

MATERIALS INFORMATION

1. Preliminary Foundation Report for Otay Mesa Road Undercrossing, Caltrans Bridge Nos 571202R/L, State Route 125, Kilometer Post 1.09, San Diego County, California, dated September 27, 2007
2. Hazardous Materials Review, dated August 28, 2013
3. Laboratory Test Result Report, dated November 22, 2013
4. Letter from Otay Water District, dated July 23, 2014
5. Foundation Report for Otay Mesa Road Undercrossing, dated December 19, 2013
6. Materials Information Brochure, dated December 20, 2013
7. Geotechnical Deisgn Report for State Route 905/State Route 125 Northbound Connectors Project, dated February 04, 2014
8. Underground Classification, No. C122-073-14T, dated April 8, 2014
9. Geotechnical Design Report for State Route 11/125/905 NB Connectors Project Addendum, dated July 18, 2014
10. Optional Imported Borrow Site Exhibit

ELECTRONIC FILES

1. The horizontal geometric alignment files in a CAiCE format
2. The vertical geometric alignment files in a CAiCE format
3. Cross Sections in a 2D DGN and PDF Format

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009

In Reply Refer To:
FWS-SDG-2296.5

Mr. Gene K. Fong
Division Administrator
U.S. Department of Transportation
Federal Highway Administration
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

JUL 1 2 2004

Re: Biological Opinion for the State Route 905 Extension Project, San Diego County, California (1-6-04-F-2296.5, File #: 11-SD-905 KP 9.2 - 19.3, EA 093160)

Dear Mr. Fong:

This document transmits the Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the proposed State Route 905 (SR-905) Extension Project (Project) between Interstate 805 (I-805) and the Otay Mesa Port of Entry (POE) in San Diego County, California, and its effects on the federally threatened coastal California gnatcatcher (*Polioptila californica californica*; gnatcatcher) and designated critical habitat for the gnatcatcher, and endangered San Diego fairy shrimp (*Branchinecta sandiegonenis*), Riverside fairy shrimp (*Streptocephalus woottoni*), Quino checkerspot butterfly (*Euphydryas editha quino*; Quino), and San Diego button celery (*Eryngium aristulatum* var. *parishii*; button celery) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). In addition, your letter requests concurrence that the proposed Project may affect, but is not likely to adversely affect, the federally threatened Otay tarplant (*Deinandra conjugens*; tarplant) and spreading navarretia (*Navarretia fossalis*), and endangered California Orcutt grass (*Orcuttia californica*; Orcutt grass) and Otay Mesa mint (*Pogogyne nudiuscula*). Your May 21, 2004, request for formal consultation was received at our office on May 24, 2004.

Within the action area is designated or proposed critical habitat for Quino, tarplant, and Riverside and San Diego fairy shrimp. No primary constituent elements within proposed or designated critical habitat for these species will be impacted by the proposed Project, therefore, critical habitat for Quino, tarplant, and Riverside and San Diego fairy shrimp will not be discussed further. Provided the description of the proposed action and conservation measures described below are implemented, we concur that the proposed Project may affect, but is not likely to adversely affect Otay tarplant, spreading navarretia, California Orcutt grass, and Otay Mesa mint. Therefore, these species will not be addressed in this Opinion. Should Project plans change or if these plant species are detected on-site, this determination may be reconsidered and formal consultation may be required.

This Opinion is based on information provided in the *Biological Assessment* (BA) *State Route 905 Extension*, dated May, 2004 (Caltrans); discussions during site visits to the proposed Project site and Wall Hudson property conducted on February 6, 2003, and May 20, 2004; and the final project description with conservation measures developed in cooperation with Federal Highway Administration (FHWA) and Caltrans.

CONSULTATION HISTORY

Planning for the SR-905 Extension has been ongoing since 1995. In a letter dated April 7, 1995, the Service responded to the February 28, 1995, Notice of Intent to prepare a joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the proposed Project. The FHWA letter, dated May 5, 1995, requested that the Service to be a cooperating Agency for the SR-905 EIR/EIS. Included with this letter was a Fact Sheet for the proposed Project, dated April 1995. On April 12, 1995, the Service provided Caltrans with a species list. The FHWA sent a May 10, 1995, letter to the City of San Diego (City), with a carbon copy to Nancy Gilbert of the Service, iterating the need to analyze wildlife crossings to be consistent with the City's Multiple Species Conservation Program (MSCP). In our May 25, 1995, letter, we agreed to participate as a cooperating agency.

On May 11, 1995, the Service met with the City, Caltrans, U.S. Army Corps of Engineers (ACOE), California Department of Fish and Game (CDFG), Helix Environmental, Inc. (Helix), and Sweetwater Environmental Biologists, Inc (SEB) to discuss wildlife crossings and the City's preserve design. On June 7, 1995, Caltrans issued a letter discussing the results of the May 11, 1995, meeting. On June 10, 1995, the City sent a letter to Caltrans, with a carbon copy to the Service, discussing the Otay Mesa Wildlife Connection. On June 15, 1995, the Service met with Caltrans, the City, ACOE, U.S. Environmental Protection Agency (EPA), Helix, and SEB to discuss three Project alternatives (north, central and south) and the status of other development in the area. On June 20, 1995, the Service met with Caltrans, SEB and Helix to discuss the status and results of fairy shrimp and Quino surveys. On September 19, 1995, the Service met with the City, Caltrans, SEB, CDFG, ACOE, and Helix to continue discussions on the wildlife crossings and alternatives development. On March 4, 1997, Caltrans sent a letter to the Service regarding the establishment of the Cal Terraces Vernal Pool Preserve which lies within the alignment of the northern alternative. This letter also discussed the alignment of the southern alternative and the impacts the MSCP preserve around Spring Canyon. The alignment of the central alternative was suggested as the best vernal pool avoidance alternative based on technical studies (RECON 1994, Helix 1995). The figure attached to the letter presented three alignments for the central alternative and the impacts to vernal pools from each alignment.

On March 19, 1997, the Service met with Caltrans, FHWA, EPA, Helix, ACOE, SEB, and the City to further discuss alignments for the central alternative with regards to endangered species issues. In our May 14, 1997, letter, the Service concurred with moving forward with the three alternatives developed through early coordination. The Service's May 14, 1997, letter to the City concurred with the three alignments presented in the figures and data for the proposed central alternative provided by Helix. On February 10, 1998, the Service received the draft biological impact maps generated by Helix. The April 27, 1998, Caltrans letter to the Service initiated the National Environmental Policy Act and Clean Water Act Section 404 Integration Process (NEPA/404 Integration Process) and requested our concurrence with the basic Purpose and Need and criteria for alternative selection. Attached to this letter was a history of the collaborative effort to date. On July 15, 1998, we responded that we will continue to participate in the NEPA/404 Integration Process. In this letter, we concurred with the basic Purpose and Needs and we referenced the issues addressed in our May 14, 1997, letter regarding our position on the alternatives as it relates to the three alignment variations. However, we did not address the proposed alignment project designs. Instead, we stated that more information was needed to analyze the preferred alternative and alignments.

On May 18, 1999, the Service provided Caltrans with an updated species list. On November 16, 2000, the Service met with the ACOE, CDFG, Caltrans, the County of San Diego, EPA, FHWA, and City to discuss final issues before completing the draft EIR/EIS and circulating for public review. In a January 2, 2001, Memorandum to the Resource Agencies, Caltrans provided responses to Resource Agency comments discussed during the November 16, 2000, meeting. In their February 27, 2001, letter, Caltrans requested to withdraw from the NEPA/404 Integration Process since potential wetland impacts from the preferred alternative were below 0.5 acres and these impacts would potentially qualify for a Nationwide Permit from the ACOE. In our May 15, 2001, electronic mail message to Caltrans, we deferred to the ACOE and EPA for withdrawal from the NEPA/404 Integration Process. We also recommended that a variety of alignments be examined within the preferred alternative, a bridge be constructed over Spring Canyon, the need for the proposed interchange at Heritage Road be fully addressed, and the Project area be surveyed for Quino.

On September 26, 2001, the Service met with the City, Caltrans, FHWA, EPA, CDFG, and McMillan Biological consulting to review the Wall-Hudson property as a parcel to offset impacts from the proposed Project. On October 2, 2001, we submitted a letter to FHWA addressing our comments and concerns on the draft EIR/EIS for the proposed Project. During telephone discussions in August 2002, the Service iterated the need to revegetate the corridor with native species and to strictly avoid the use of non-native plant species, and particularly invasive exotic plant species, in areas adjacent to the MHPA. In response to a Caltrans January 30, 2003, request, the Service supplied an updated species list on March 6, 2003. On February 6, 2003, the Service met with Caltrans for a site review of both the proposed Project alignment and the Wall-Hudson property.

On October 1, 2003, the FHWA sent a letter to the Service stating that the wetland impacts exceeded the 5-acre threshold for implementing the NEPA/404 Integration Process. This was due to incorrectly defining jurisdictional wetlands as per the ACOE regulatory definitions. The

October 1, 2003, letter requested that the Project not be required to reenter the NEPA/404 Integration Process. The Service coordinated with the ACOE and EPA and we requested information from Caltrans on this issue. This information was never provided and we continued to defer to the ACOE and EPA on the status of the NEPA/404 Integration Process. On May 20, 2004, the Service met with Caltrans staff to conduct a field review of the conservation strategy for the proposed Project. In your May 21, 2004, letter, you requested initiation of formal consultation. On June 1, 2004, we concurred that the proposed State Route 905 (SR 905) Project does not need to be further reviewed through the NEPA/404 Integration Process.

BIOLOGICAL OPINION

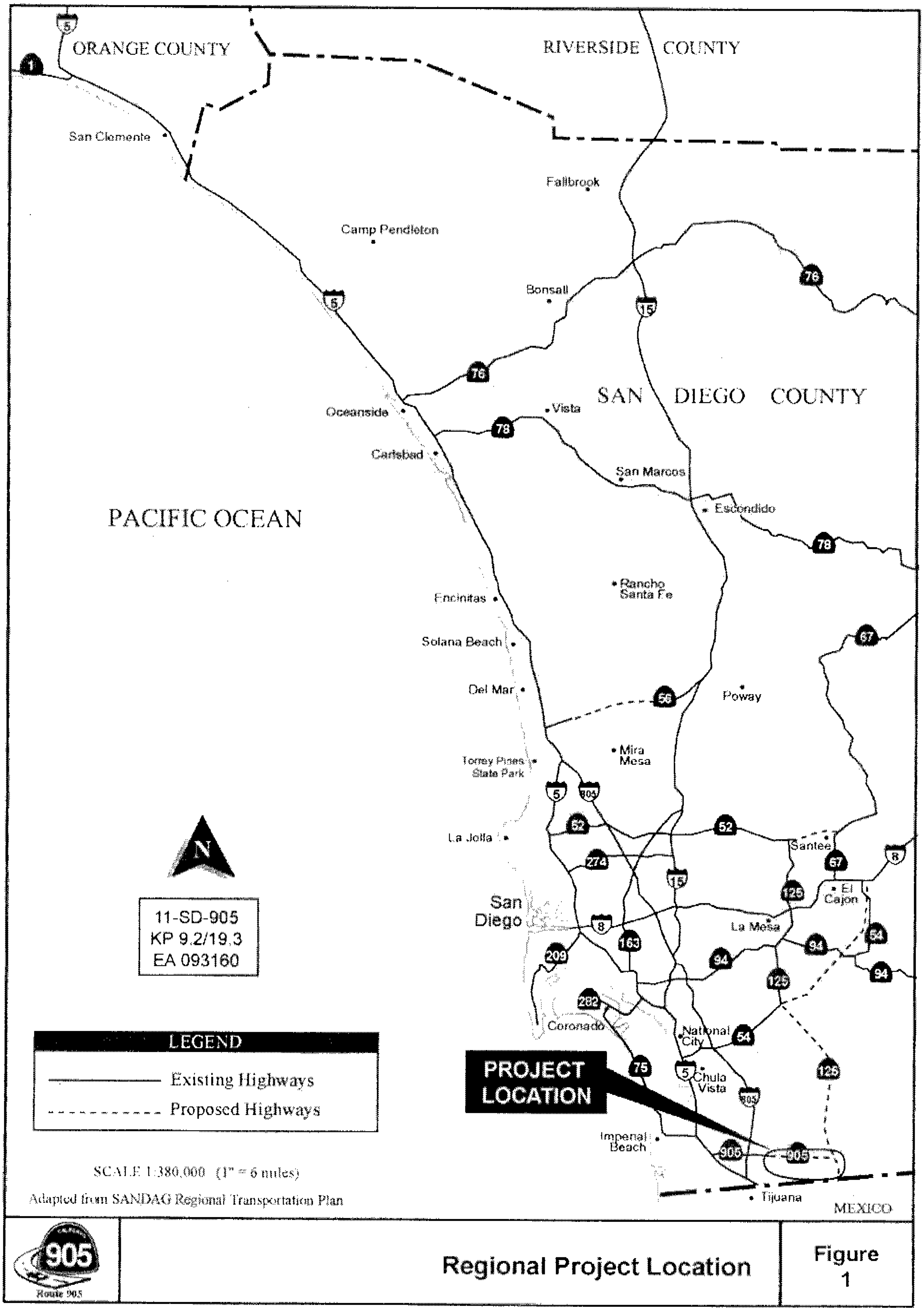
DESCRIPTION OF THE PROPOSED ACTION

Caltrans and FHWA propose to construct the extension of SR-905 from approximately I-805 to the Otay Mesa Point-of-Entry (POE) in southern San Diego County, California (Figure 1). The past widening of Otay Mesa Road has increased roadway functioning; however, the corridor is projected to reach capacity by the year 2005. The primary purpose of the Project is to: reduce traffic congestion; provide for effective transportation of people, goods, and services; and improve the mobility of local, regional, interregional, and international traffic between I-805 and the Otay Mesa POE. Overall, the extension of SR-905 will offset congestion on Otay Mesa Road and allow direct access to I-805 and I-5. Inadequate transportation services currently exist in the Otay Mesa region of San Diego County and conditions will continue to deteriorate without proper improvements. In addition, the proposed Project will bypass all developments and Brown Field Airport along Otay Mesa Road, allowing for improved functioning of SR-905, and likely reducing the accident rate in Otay Mesa.

The proposed Project will construct a new six lane (three lanes in each direction) freeway, as well as sufficient right-of-way (ROW) to accommodate two, future HOV lanes in the median (Figure 2). The total roadway length will be approximately 6.2 miles, with a ROW area requirement of approximately 314 acres. The west end of the existing Otay Mesa Road will be terminated in a cul-de-sac approximately 1,150 feet west of the proposed intersection with Caliente Avenue. The Project boundaries will be fenced along the north and south ROW lines of the alignment. Local interchanges will be provided at Caliente Avenue, Heritage Road, Britannia Boulevard, and La Media Road, with additional improvements in the vicinity of Siempre Viva Road. A freeway-to-freeway interchange will be constructed at State Route 125 (SR-125). The current schedule indicates that project-related work will commence in the fiscal year 2004/2005 and require approximately five years for the completion of all roadway features.

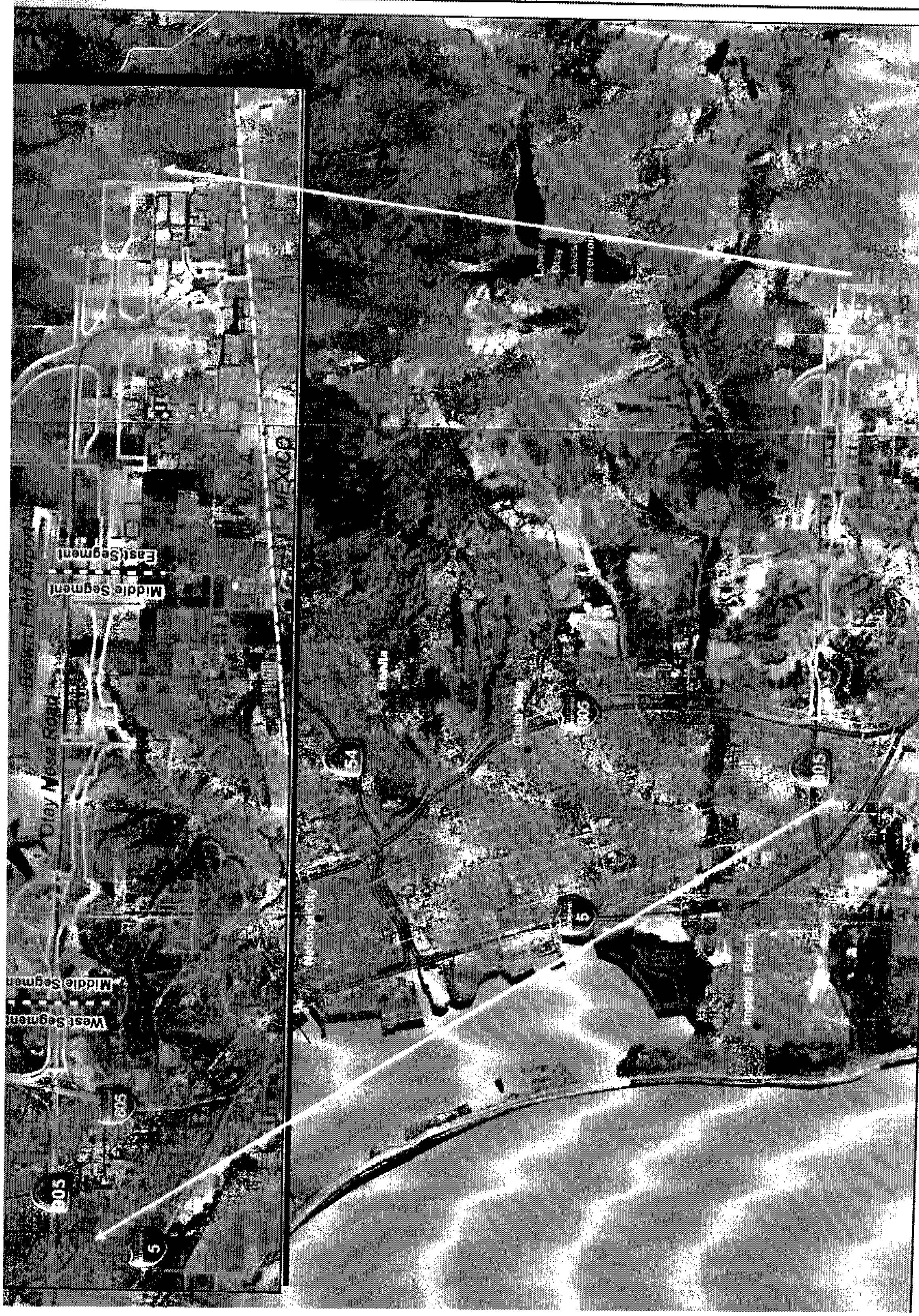
The major roadway design elements of the proposed Project are as follows:

- A 2,400-foot long auxiliary lane that will be constructed along northbound I-805 between Palm Avenue and the westbound SR-905 to northbound I-805 connector to accommodate merging traffic from westbound SR-905.



Regional Project Location

Figure 1



Project Vicinity Map

Figure 2

- A total of four lanes in each direction along SR-905, immediately east of I-805 to provide connections to and from I-805. The southbound I-805 to eastbound SR-905 connector will remain as two lanes. SR-905 will transition to three lanes in each direction at the Caliente Avenue Interchange.

- Modification of the westbound SR-905 to northbound I-805 direct connector to allow for a two-lane exit and a two-lane entrance.

- A 1.2-mile long westbound truck climbing lane that will be constructed from the northbound I-805 to eastbound SR-905 connector ramp to just east of Caliente Avenue.
- Diamond-type interchanges that cross over the SR-905 facility will be constructed at Caliente Avenue and Britannia Boulevard.

- The future Heritage Road interchange will incorporate loop ramps on the eastbound exit and westbound entrance. All access will be from the east of Heritage Road to minimize impacts to Spring Canyon.

- A Park-and-Ride lot, with provisions for public bus service, will be constructed in the northwest quadrant of the Caliente Avenue interchange and provide approximately 210 parking spaces within a 2.2-acre lot.

- South of Otay Mesa Road, SR-905 will interrupt Cactus Road. North of the freeway, Cactus Road will terminate in a cul-de-sac. On the south side of SR-905, a two-lane frontage road will maintain existing circulation by connecting Gateway Park Drive to Cactus Road.

- All utilities will be relocated within the proposed Project's disturbance footprint in coordination with the responsible utility companies. There will be no utility relocations near sensitive biological resources (i.e., the I-805/SR-905 interchange, Spring Canyon, and La Media Road).

- All staging areas and access routes will be placed entirely within the proposed Project footprint.

- Two parallel bridge structures will traverse Spring Canyon, which serves as the primary MSCP wildlife corridor in the Otay Mesa area. Each bridge will be centrally supported by columns to minimize impacts to waters of the U.S. within the canyon. The westbound bridge will be 253 feet long, 62 feet wide, and 5 feet deep. The eastbound bridge will be approximately 180 feet long, 62 feet wide, and 8 feet deep. The minimum clearance from the canyon bottom to the base of each bridge will be 27 feet.

- A minimum 6-foot high fence will follow the length of the alignment on both sides to preclude human access into the adjacent habitat and prevent wildlife from traversing the freeway. The fence will be buried to a depth of approximately 1-foot (only near the wildlife crossing) to prevent animals from digging under the barrier.

- The Otay Corporate Center South (OCCS) vernal pool preserve will be connected to Spring Canyon (on the south side) by an approximately 300-foot long and 5-foot high culvert extending under the freeway. In addition, a fenced/protected wildlife corridor (consisting of a detention basin and native vegetation) will be maintained between the OCCS and Spring Canyon (to the west side), that will be approximately 164 feet wide and 984 feet long.

- Construction will include approximately 23,190 linear feet of fill slope, with the largest slope being approximately 5,900 feet long and 98 feet high near the SR-905/SR-125 Interchange. An estimated 16,300 linear feet of cut slope will be required, with maximum heights of approximately 65 feet.

- A two-quadrant clover leaf interchange will be built at La Media Road.

- Otay Mesa Road will be widened to six lanes plus the width required for double left turn lanes within the ROW for the SR-125 Interchange with Otay Mesa Road. In addition, the Otay Mesa Road undercrossings will be constructed to accommodate future installation of the light rail transit extension. East of the interchange, Otay Mesa Road will be widened to four lanes between the SR-125 ROW and Sanyo Avenue. The unfinished portion of Sanyo Avenue will be widened from two to four lanes, for approximately 1,900 feet, between Otay Mesa Road and Airway Road.

- A four-lane access ramp will extend approximately 1.2 miles east from the SR-905/SR-125 Interchange to Enrico Fermi Drive. To minimize impacts to existing, adjacent industries, retaining walls up to 21 feet high will be constructed adjacent to the road, extending from Sanyo Road east for approximately 1,300 feet. Grading for the proposed local access ramp will include an adjacent material site just west of the intersection with proposed Enrico Fermi Drive. Each side of the roadway will be inclined at a 1:6 (V:H) slope and contour graded to blend with the existing terrain. The operation will generate sufficient fill material to balance the earthwork for the alignment. A temporary construction easement will allow excavation of the area outside the ROW. Additionally, a connection is proposed for westbound traffic on the local access ramp to northbound SR-125.

- SR-125 has been scheduled for completion prior to the conclusion of SR-905. The plans for SR-125 anticipate an at-grade connection at Otay Mesa Road. The proposed SR-905 will include a multi-level SR-905/SR-125 Interchange, with connectors for southbound SR-125 to westbound SR-905, eastbound SR-905 to northbound SR-125, southbound SR-125 to eastbound SR-905, and westbound SR-905 to northbound SR-125. A number of bridge structures will be required for the various ramp and roadway crossings. The SR-905 to SR-125 Interchange will necessitate removal of some facilities, including the interim SR-905 between Airway Road and Otay Mesa Road.

- Relocation of overhead electric power lines will be required along the east side of Harvest Road.

- Harvest Road will be permanently closed between Otay Mesa Road and Airway Road, with local access from Otay Mesa Road for properties abutting Harvest Road north of the SR-905/SR-125 Interchange.

- Permanent low sodium lights will be installed at all interchanges. High pressure lighting will be used to illuminate overhead directional signs. The direction of the high pressure lighting will be focused up on the signs and away from all sensitive biological resources. No permanent lights will be installed adjacent to sensitive biological resources, except one low sodium light required by Caltrans safety standards approximately 65 feet north of the San Diego button-celery preserve along La Media Road.

Soil sampling and geotechnical borings will be required at various locations within the Project footprint. A mud-rotary drilling technique will be used to bore holes approximately 4 inches in diameter to a maximum depth of 150-200 feet. In addition, test pits will be excavated near/adjacent to the borings to acquire other soil information. An area approximately 10 feet by 10 feet will be sliced with a backhoe, the samples collected, and the site backfilled with the remaining soils. Work at each location could require a maximum of 2 months and will not be expected to involve any nighttime drilling/excavating. Equipment used in the these operations will be stored or staged at a local Caltrans maintenance yard.

All impacts occurring within the proposed Project footprint have been assessed as permanent impacts, with the exception of the two bridge crossings at Spring Canyon. At the proposed Spring Canyon bridges, permanent impacts will be generated from pier construction and the effects of shading, and will be compensated with habitat creation/restoration. At Spring Canyon, temporary impacts will be generated from clearing within the project footprint, and all temporary impacts will be revegetated upon Project completion.

Through negotiations with the Service and other Resource Agencies, the proposed Project footprint was moved to the north of the J14 vernal pool complex on the mesa above Spring Canyon. Additional design features to avoid the J14 vernal pool complex include: placing the road surface below the existing topography as it approaches the Spring Canyon bridge; revegetating the cutslope and temporary disturbance areas with native plant species; recontouring the top of the cutslope to maintain surface water drainage patterns; and implementing best management practices (BMPs) to prevent soil from eroding and depositing in vernal pools within the J14 vernal pool complex.

The proposed Project will permanently impact 9.45 acres of maritime succulent scrub (MSS), 29.02 acres of Diegan coastal sage scrub (CSS), 134.1 acres of non-native grassland, 0.14 acre of vernal/road pool, 12.15 acres of wetlands and waters of the U.S./State of California, 0.31 acres of non-jurisdictional wetlands, 32.7 acres of agriculture, 9.3 acres of non-native vegetated communities, 309 acres of disturbed land, and 223.9 acres of developed land (Table 1). The proposed Project will permanently impact 31.67 acres of Multiple Habitat Planning Area (MHPA) of the MSCP. Proposed temporary impacts to 2.55 acres at the Spring Canyon bridges include 0.93 acre of MSS, 0.81 acre of CSS, 0.02 acre of southern willow scrub, 0.02 acre of

Table 1. Permanent impacts by habitat type for the proposed SR-905 Extension Project.

Habitat Type	Permanent Impacts (acres)*	Permanent Impacts w/in MHPA (acres)*	Mitigation Ratio	Total Compensation (acres)	Mitigation Location
Maritime Succulent Scrub	Direct: 3.2 Temporal/ Indirect: 6.25	Direct: 2.7 Temporal/ Indirect: 5.88	Direct: 2:1 Temporal/ Indirect: 1:1	Direct: 6.4 Temporal/ Indirect: 6.25	Wall-Hudson 12.65 acres
Coastal Sage Scrub	Direct: 12.3 Temporal/ Indirect: 16.72	Direct: 2.9 Temporal/ Indirect: 14.76	1:1	Direct: 12.3 Temporal/ Indirect: 16.72	Wall-Hudson 29.02acres
Non-native grassland	134.1	5.3	0.5:1	67.1	Wall-Hudson 22.4 acres, Bonita Meadows 44.7 acres
Vernal Pool (VP) and Road Pool (RP) w/fairy shrimp, Watershed (WS)	VP: 0.11 RP: 0.03	VP: 0.05	VP: 3:1 RP: 2:1 WS: 10:1	VP: 0.33 RP: 0.06 WS: 3.90	Wall-Hudson 0.39 acre of VP surface area with 3.9 acres of contributing watershed for a total of 4.29 acres
Quino checkerspot butterfly habitat**				VP: 0.51 WS: 4.15	Wall-Hudson 0.51 acre of VP surface area with 4.15 acres of contributing watershed for a total of 4.66 acres
Freshwater Marsh	0.40		2:1	0.80	La Media Road and Bonita Meadows 0.80 acre
Southern Willow Scrub	3.10	0.03	2:1	6.20	La Media Road and Bonita Meadows 6.20 acres
Mulefat Scrub	1.98	0.05	2:1	3.96	La Media Road and Bonita Meadows 3.96 acres
Disturbed Wetlands	3.02		1:1	3.02	La Media Road and Bonita Meadows 3.02 acres
Seasonal pond/ linear streambed	3.96		1:1	3.96	Bonita Meadows 3.96 acres

* Unless otherwise noted, all impacts are direct.

** Unquantified impacts to Quino will be offset by restoring Quino habitat at Wall-Hudson.

seasonal pond/linear streambed, 0.52 acre of non-native grassland, and 0.25 acre of disturbed habitat.

Restoration activities (grading, planting, weeding) will occur at the Wall-Hudson property (Wall-Hudson), Bonita Meadows Open Space Preserve (Bonita Meadows), and the on-site La Media drainage (Figure 3). On Wall-Hudson, approximately 9.06 acres of mesa top, consisting of north and south fingers extending into Dennery Canyon currently support degraded vernal pools, non-native grasslands, and MSS. Grading to restore vernal pools will occur within and around the degraded vernal pools on the mesa top. In addition, seed of native threatened, endangered, and sensitive vernal pool/upland plant species will be collected from adjacent off-site areas, and dispersed throughout the enhanced pools and associated watersheds. Restoration grading at Bonita Meadows will occur in select areas along the un-named creek flowing through the property. Restoration at the La Media drainage will entail constructing a new drainage facility and planting/seeding with native species.

Action Area

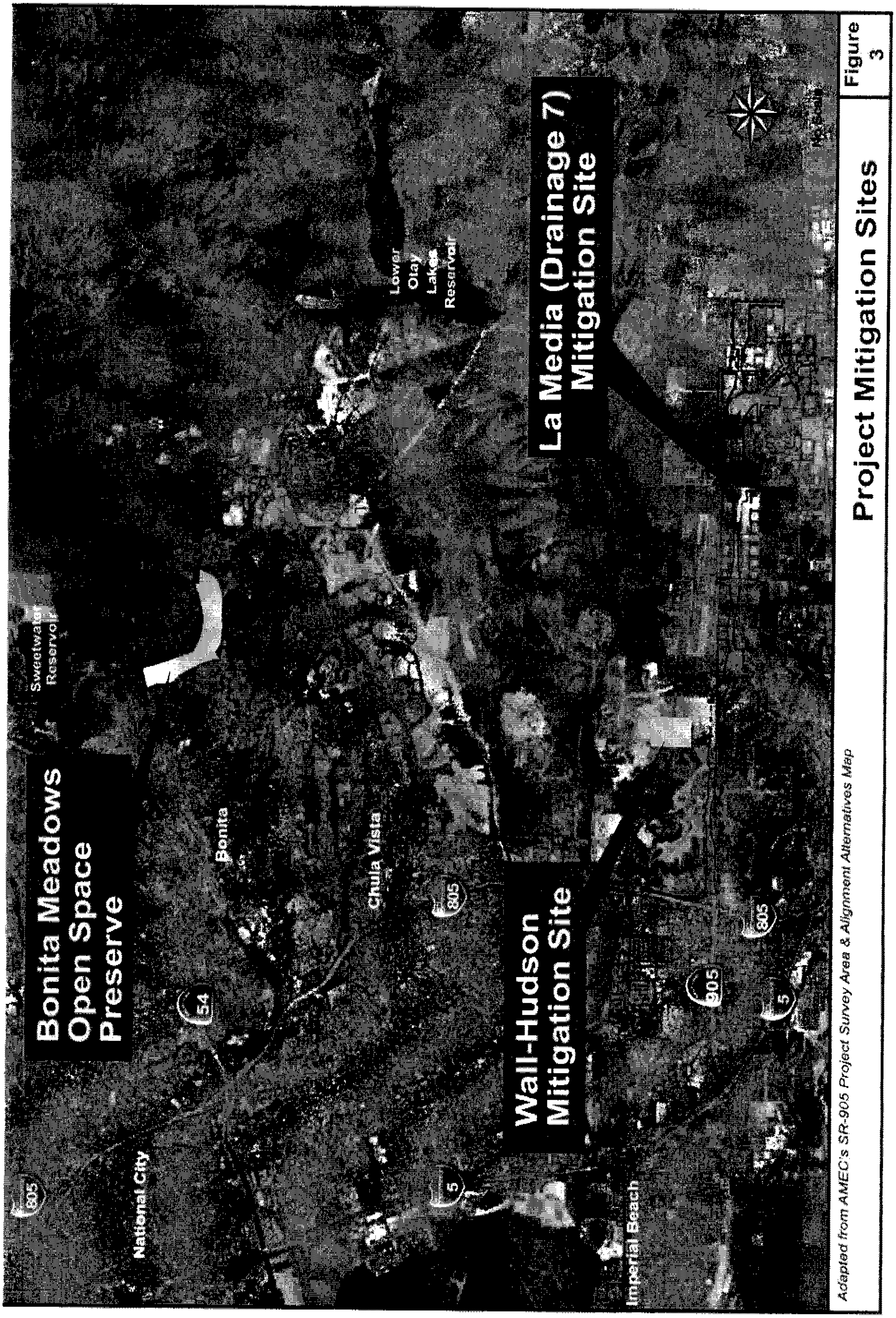
The Service describes the action area to include the general area surrounding Otay Mesa, and the Bonita Meadows Open Space Preserve immediately north of the City of Chula Vista Sub-area planning area within unincorporated San Diego County.

Conservation Measures

The proposed action includes the following conservation measures which will be implemented to avoid or otherwise minimize potential adverse effects of the action on federally listed species:

1. To offset impacts from clearing 12.3 acres of CSS, 3.2 acres of MSS and 134.1 acres of non-native grassland, 12.3 acres of CSS (1:1 ratio), 6.4 acre of MSS (2:1 ratio), and 22.4 acres (0.5:1 ratio) of non-native grassland, respectively, will be preserved at Wall-Hudson. The remaining 44.7 acres of non-native grassland will also be preserved at Bonita Meadows. To offset impacts to 0.11 acre of vernal pool and 0.03 acre of road pool with fairy shrimp, 4.29 acres of habitat including 0.39 acre of vernal pool surface area and 3.9 acres of contributing watershed will be enhanced/restored at Wall-Hudson. Approximately 0.113 acre of existing vernal pool surface area will be enhanced and an additional 0.277 acre of vernal pool surface area will be restored.

2. To offset impacts to ACOE and CDFG regulated wetlands/waters, and non-jurisdictional wetlands, 0.80 acre of freshwater marsh, 6.2 acres of southern willow scrub, 3.96 acres of mulefat scrub, 3.02 acres of wetlands and 3.96 acres of seasonal pond/linear streambeds will be enhanced/restored at La Media Drainage and Bonita Meadows. A wetland enhancement/restoration plan will be approved by the Service and other Resource Agencies prior to the start of Project construction.


Bonita Meadows Open Space Preserve
Sweetwater Reservo
Lower Otay Lakes Reservoir
La Media (Drainage 7) Mitigation Site
Wall-Hudson Mitigation Site
National City
Bonita
Chula Vista
Imperial Beach
805
54
5
905
Adapted from AMEC's SR-905 Project Survey Area & Alignment Alternatives Map
Project Mitigation Sites
Figure 3

3. To offset impacts to Quino habitat, approximately 4.66 acres of vernal pool habitat, including 0.51 acres of vernal pool surface area and 4.15 acres of contributing watershed, on the Wall-Hudson property will be restored to provide habitat for Quino. These offsetting measures for Quino are separate and additional to the vernal pool restoration that will be used to offset impacts to listed vernal pool species. Also, appropriate Quino larval host plant species will be incorporated into the seed palette used in the upland restoration. All enhancement activities will be implemented following the Service approved Wall-Hudson restoration plan.

4. To offset indirect and temporal noise impacts to gnatcatchers occupying 6.25 acres of MSS and 16.72 acres of CSS within 500 feet of the Project footprint, 22.97 acres (1:1 ratio) of CSS/MSS will be preserved at Wall-Hudson.

5. A plan, outlining the details and implementation schedule of all enhancement/restoration of the MSS, CSS, grasslands, and vernal pools on Wall-Hudson and Bonita Meadows, will be prepared by Caltrans and approved by the Service and other Resource Agencies prior to the start of Project construction. All enhancement/restoration activities will commence the first summer/fall season prior to or concurrently with the start of Project construction. The following criteria will be included in the plan for enhancement/ restoration of fairy shrimp pools and their contributing watersheds:

   a. A hydrologic evaluation and map of the enhanced and restored vernal pools and contributing watersheds. The evaluation must demonstrate that the watersheds of newly restored pools will provide the appropriate amount of water for fairy shrimp without impacting the watersheds of existing vernal pools currently supporting San Diego fairy shrimp.

   b. The grading for the enhanced and restored pools will be conducted under the direction of a qualified biologist with a minimum three years of vernal pool restoration experience approved by the Service.

   c. Grading plans for the enhanced and restored pools with 0.5-foot topographic contours. The grading plans will specify the areas of existing habitat which are to remain unaffected by enhancement/restoration activities. Grading will be done using a bobcat or small tracked dozer with ripping tines and slopeboards, rubber-tired loaders and a sheeps-foot for mound construction. All grading within the upper margins of existing pools will be done with hand tools.

   d. The number, location, and design of vernal pools to support Riverside fairy shrimp will be coordinated with the Service.

   e. Measures will be incorporated to prevent the introduction of versatile fairy shrimp (*Branchinecta lindahli*) into enhancement/restoration areas.

f. Enhancement/restoration success will be determined by measuring the ponding of water; and density of viable cysts, hatched fairy shrimp, and gravid females, within the enhanced/restored ponds. Water measurements will be taken in the enhanced/restored ponds to determine the depth, duration and quality (i.e., pH, temperature, total dissolved solids, and salinity) of ponding. Dry samples will be taken in the enhanced/restored pools to determine the density of viable cysts in the soils. Wet samples will also be taken in the enhanced and restored pools to determine the density of hatched fairy shrimp and gravid females. The enhanced and restored pools must pond for a period of time similarly to reference vernal pools during an average rainfall year and at an appropriate depth and quality to support fairy shrimp. The enhanced and restored pond's average viable cyst, hatched fairy shrimp, and gravid female density must not differ significantly ($p<0.05$) from reference pools for at least three wet seasons before a determination of success can be made.

g. Native plants and animals will be restored within the enhanced and restored pools and their watersheds. This can be accomplished by redistributing topsoil containing seeds, spores, bulbs, eggs, and other propagules from adjacent vernal pool and upland habitats; by the translocation of propagules of individual species from off-site habitats; and by the use of commercially available native plant species. Topsoil and plant materials from the native habitats to be impacted on-site will be applied to the watersheds of the enhanced and restored pools to the maximum extent practicable. Exotic weed control will be implemented within the restoration areas to protect and enhance habitat remaining on-site. The Plan will include success criteria for restoring native plants and animals.

h. A 6-year maintenance and monitoring program for the enhanced and restored pools and their contributing watersheds. The monitoring program will consist of quantitative hydrological, viable cyst, hatched fairy shrimp, and gravid female measurements as required in measure 5.f., complete floral and fauna inventories, quantitative vegetation transects, and photographic documentation.

i. If a performance criterion as defined in 5.f. is not met for any of the enhanced and restored pools in any year, or if the final success criteria are not met, the Project proponent will prepare an analysis of the cause(s) of failure and, if deemed necessary by the Service, propose remedial actions for approval. If any of the enhanced/restored pools have not met a performance criterion during the initial 6-year period, the Project proponent's maintenance and monitoring obligations will continue until the Service deems the enhancement/restoration successful, or contingency measures must be implemented.

j. Perimeter fencing on the west side of the mesa top at Wall-Hudson will be installed prior to Project construction.

k. Annual reports will be submitted to the Service by August 1 of each year. These reports will assess both the attainment of yearly success criteria and progress toward the final success criteria. The reports will also summarize the Project's compliance with the conservation measures, reasonable and prudent measures, and terms and conditions of this Opinion.

6. All habitats to be restored, enhanced, and/or preserved, as stated above, will be managed and preserved in perpetuity. FHWA and Caltrans will place restrictive covenants and prohibited uses in the deed for Wall-Hudson, Bonita Meadows, and the La Media drainage, and these sites will be managed according to a Service approved Long-Term Management Plan. The draft deed and Long-Term Management Plan will be approved by the Service prior to the start of construction.

7. Protocol level surveys for Quino will be conducted in the project area prior to the start of construction. If adult Quino are detected, clearing and grading will be postponed until the Service gives approval to resume construction. Immediately following the detection of adult Quino, the Service will be contacted and the area where the adult Quino was detected will be surveyed for dot seed plantain (*Plantago erecta*), Quino larvae and cluster webbing for pre-diapause Quino larvae. If Quino larvae and/or cluster webbing is located, the salvage efforts will be implemented in coordination with the Service.

8. All contour grading conducted near vernal pools (within the Project alignment and restoration areas) supporting federally listed species will implement the following measures:

a. Grading activities within the watershed of the fairy shrimp and button celery pools will be done when the soil is dry and outside the rainy season (i.e., May 15 through November 15) to minimize potential impacts (e.g., siltation) to the avoided and enhanced/restored pools unless erosion control measures approved by the Service and Regional Water Quality Control Board (Regional Board) are in place.

b. Contour grading will occur around the remaining watershed of pool 57 to create an area of watershed equal to that lost through project construction. The final grading plans near vernal pools will be approved by the Service and other Resource Agencies and incorporated into the upland restoration plan.

c. The Project proponent will staff a qualified biologist with a minimum three years of vernal pool experience who will be responsible for overseeing compliance with protective measures for the fairy shrimp. The biologist will be approved by the Service and will have the authority to halt all associated Project activities, which may be in violation of the terms and conditions of this Opinion. The biologist will notify the Service within 24 hours of any observed violation.

9. Within the proposed Project footprint, the soil of all pools supporting San Diego or Riverside fairy shrimp will be salvaged and stored off-site. Vernal pool soil (inoculum) will be collected when dry to avoid damaging or destroying fairy shrimp cysts. A hand trowel or similar instrument will be used to collect the inoculum. Whenever possible, soil will be collected in chunks. The trowel will be used to pry up intact chunks of soil, rather than loosening the soil by raking and shoveling.

The soil from each pond will be stored individually in labeled boxes that are adequately ventilated and kept out of direct sunlight in order to prevent the occurrence of fungus or excessive heating of the soil, and stored off-site at an appropriate facility for vernal pool inoculum. Soil will not be collected from any on-site ponds until approved by the Service. Soil collected from pools only containing San Diego fairy shrimp (pools 2, 55, and 58) will be stored off-site until an appropriate location on Otay Mesa near Spring Canyon is found to accept the inoculum from the proposed Project, as coordinated and approved by the Service.

The salvaged soil from pool 7 containing both Riverside and San Diego fairy shrimp cysts will be used to inoculate restored pools at Wall-Hudson. Following the Wall-Hudson restoration plan, the restored pools to be inoculated with Riverside fairy shrimp will be recontoured deep enough to pond water long enough to support Riverside fairy shrimp. Inoculum will not be introduced into the restored pools until after the restored ponds have been demonstrated to retain water for a minimum of 60 days, and will be placed in a manner that preserves, to the maximum extent possible, the orientation of the fairy shrimp cysts within the surface layer of soil (e.g., collected inoculum will be shallowly distributed within the pond so that cysts have the potential to be brought into solution upon inundation).

10. Prior to any disturbance to pool 56, all seed from button celery plants will be collected, placed in paper bags, and stored in a cool, dry location following Service recommended guidelines (e.g. Center for Plant Conservation). The topsoil from the vernal pool will be salvaged, stockpiled, and redistributed into enhanced pools on Wall-Hudson. The collected seed will be sown/broadcast in the same locations as the reapplied soil or onto other appropriate habitat. All plants will be removed with hand tools by digging up the root system and surrounding soil. These individuals and their associated soil will be placed in temporary containers and stored out of direct sunlight. All individuals will be replanted within the post-grading, upper pool margins at Wall-Hudson. Button celery propagules will not be introduced into the restored pools until after the pools have been demonstrated to retain water for a minimum of 60 days. Salvaged plants will be planted to the same rooting depth as existed in the original pool.

Button celery seed collected from pool 56 will be introduced along the upper margins of all enhanced and restored pools once these restored/enhanced pools meet first year hydrology success criteria as per the approved restoration plan. Some seed will be stored off-site and according to horticultural practices. This seed will be used to inoculate the enhanced and restored pools in the event that initial inoculation fails. If the initial inoculation is successful, then the seed can be used for off-site restoration activities within the Dennery Canyon/Spring Canyon watersheds as approved by the Service. The final details of the restoration effort will be outlined in the Service approved restoration plan for Wall-Hudson.

11. Impacts from fugitive dust will be offset though implementation of Caltrans Standard Specifications, including Section 7-1.01F Air Pollution Control, Section 10 Dust Control, Section 17 Watering, and Section 18 Dust Palliative. The Project biologist will periodically monitor the work area to ensure that construction-related activities do not generate excessive amounts of dust or cause other disturbances. Erosion control measures will be regularly checked by Caltrans inspectors, the biologist, and/or Resident Engineer (RE).

12. During construction and operation, runoff generated by the proposed Project will be channeled to detention basins as a means of preventing contaminated discharge from potentially entering nearby sensitive habitat. BMPs to address erosion and excess sedimentation will be incorporated into the Project plans. Measures that could be implemented include silt fencing, gravel bags, hay bales, fiber rolls, native plantings, retaining walls or other slope stabilizing techniques, and protection/velocity dissipation at drainage outlet points. Vegetation filters, such as swales or biostrips may also be used to remove sediment and other contaminants from runoff prior to off-site flow.

13. BMPs employed during construction and operation will follow the applicable Caltrans guidelines and be detailed in the Project's Storm Water Management Plan, Storm Water Pollution Prevention Plan, and Water Pollution Control Program. Specific plans will be reviewed by a biologist and modified, if necessary, prior to implementation. The biologist will have the ability to suggest changes to reduce the probability of erosion/siltation or spills of chemicals/fuels that could potentially affect sensitive habitat areas, including, but not limited to, vernal pool basins and watersheds, and rare plant populations. Photographs of installed BMPs will be submitted to the Service at least seven days prior to initial grading and clearing.

14. No invasive, exotic plant species will be seeded or planted adjacent to or near sensitive vegetation communities or waters of the U.S. In compliance with Executive Order 13112, temporarily disturbed areas will be reseeded with plant species native to the local habitat types. Species identified on Lists A & B of the California Exotic Pest Plant Council's list of Exotic Pest Plants of Greatest Ecological Concern in California as of October 1999 will be avoided to the extent practicable. Areas hydroseeded for temporary erosion control will use native plant species, as well.

15. Temporary disturbance to both upland and riparian habitat, within Spring Canyon, will be offset through native revegetation of the area upon completion of the two bridges. All seeding/planting will occur on-site within the disturbed habitat and involve replacement with in-kind/similar species, to the maximum extent practicable, or with appropriate native species, in locations where exotics were previously established. All revegetation

efforts in areas that drain directly into the MHPA or sensitive habitats will follow the Service approved restoration/mitigation plans for uplands and wetlands.

Any graded habitat (e.g., slopes, ROW) adjacent to the Spring Canyon corridor or within/near the MHPA (including the La Media drainage) will be revegetated with an appropriate native plant mix. The proposed seed palette and revegetation methods (e.g., hydroseeding, planting, duff, irrigation) will be developed in coordination with the Service and a Caltrans biologist, prior to the start of construction.

16. Revegetation with native plant species will follow grading (where applicable) and be accompanied with periodic monitoring and maintenance to ensure adequate coverage, and prevent erosion and siltation into adjacent biologically sensitive areas. Native seed will be incorporated into the Bonded-Fiber-Matrix mix and sprayed onto the exposed soils prior to the onset of the rainy season.

17. All plants used in revegetation within the ROW will comply with Federal, State, and county laws requiring inspection for disease or insect infestations. The vendor will provide certification of inspection from the County of San Diego Department of Agriculture. The plants will also be inspected by the Project Landscape Inspector before accepting delivery. In all areas where stormwater runoff from the proposed Project alignment enters drainage systems that drain into the MHPA or other sensitive habitats, landscaping plans will be developed in coordination with the Service prior to implementation.

    All container plants will be checked for the presence of Argentine ants prior to delivery to the planting locations. The potential introduction of Argentine ants could lead to the displacement of native ant species and could lead to the demise of those species which subsist on ants (e.g. horned lizards). Any containers contaminated with Argentine ants will be immediately removed from the Project area.

18. All vegetation within the Project footprint will be cleared between September 1 and February 14 to avoid the gnatcatcher breading season and minimize impacts to migratory birds and raptors. If clearing activities must occur during the gnatcatcher breeding season, then pre-construction surveys will be conducted to ensure that no breeding gnatcatchers or nesting birds are present within or immediately adjacent to the proposed clearing area. Should a breeding gnatcatcher or nest be located, then the Service will be contacted and discussions will commence to determine how to proceed.

19. Immediately prior to delineating Environmentally Sensitive Areas (ESAs) or clearing of CSS/MSS, the biologist will survey the Project area for gnatcatchers. If gnatcatchers are found within the Project footprint outside of the breeding season, the biologist will direct construction personnel to begin initial vegetation clearing/grubbing in an area away from the gnatcatchers. In addition, the biologist will walk ahead of the clearing/grubbing equipment to flush birds towards areas of CSS/MSS to be avoided. It will be the responsibility of the biologist to ensure that gnatcatchers will not be injured or killed by

initial vegetation clearing/grubbing. The biologist will also record the number and map the location of gnatcatchers disturbed by initial vegetation clearing/grubbing or project construction and report these numbers and locations to the Carlsbad Fish and Wildlife Office within 24 hours.

20. Sensitive habitat outside the proposed Project footprint will be designated an ESA and depicted as such on project maps. Sensitive vegetation types (e.g., vernal pools) or plant locations (Otay tarplant, spreading navarretia, California Orcutt grass, and Otay Mesa mint) will be marked and protected by temporary fencing (e.g., orange plastic snow fencing) or another appropriate method to prevent encroachment or unnecessary disturbance to the sites. Prior to and during construction, barriers will be established in key areas to deter public entry into the site. Additionally, fencing will be provided to restrict access to sensitive habitat adjoining the work limits. Photographs of the fencing will be submitted to the Service at least seven days prior to initiation of Project construction.

    All sensitive vegetation within the ROW, but outside of the Project footprint will be delineated by the project biologist as ESAs in coordination with other appropriate Environmental Specialists. All parties in conjunction with the Project will strictly avoid these areas. No construction activities, materials, or equipment will be permitted in the ESAs. Work areas will be marked clearly in the field and confirmed by the biologist prior to habitat clearing, and the marked boundaries maintained throughout the construction period.

21. A Service approved biologist will oversee compliance with protective measures for the biological resources in the Project area during clearing and construction activities. The biologist will be familiar with the habitats, plants, and wildlife of Otay Mesa, and maintain communications with the RE, to ensure that issues relating to biological resources are appropriately and lawfully managed. The biologist will be made available for both the pre-construction and construction phases to review grading plans, address protection of sensitive biological resources and monitor ongoing work. The biologist will specifically monitor construction activities that may affect listed species, such as vegetation removal, and the installation of BMPs and ESA fencing to ensure that all avoidance and minimization measures are properly constructed and followed. The biologist will immediately notify the RE to halt all associated Project activities which may be in violation of this Opinion. In such an event, the RE will halt all construction activities and contact the Service within 24 hours. The biologist will submit weekly reports during initial grading and clearing, and when construction occurs near sensitive biological resources; and provide a final report documenting compliance with avoidance and minimization measures within 60 days of project completion.

22. A minimum 6-foot high fence will follow the length of the alignment on both sides to preclude human access into the adjacent habitat and prevent wildlife from traversing the freeway. Near the Spring Canyon wildlife crossing, the fence will be buried to a depth of approximately one (1) foot to prevent animals from digging under the barrier. The fence

will be installed prior to opening the new road to the public. Photographs of the installed fence will be submitted to the Service within two weeks of installation.

23. An approximately 164-foot wide and 984-foot long fenced and protected wildlife corridor (consisting of a detention basin and native vegetation) will be created and maintained between the OCCS preserve and Spring Canyon.

24. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program that will be presented by the biologist, prior to working on the proposed Project. At a minimum, the program will include the following topics: occurrence of the listed and sensitive species in the area, their general ecology, species sensitivity to human activities, legal protection afforded listed species, penalties for violations of Federal and State laws, reporting requirements, and Project features designed to reduce the impacts to these species and promote their persistence/ survival within the Project area. Included in this program will be a fact sheet that includes color photographs of the listed species, which will be shown to the employees. Following the education program, the fact sheet will be posted in the contractor and RE's office, where they will remain through the duration of the Project. Caltrans and the biologist will be responsible for ensuring that employees are aware of the listed species.

25. Pile driving associated with construction of the Spring Canyon crossing will be conducted between September 1 and February 14 to reduce noise affects to nesting/breeding birds within the Project vicinity, including the coastal California gnatcatcher.

26. The changing of oil, refueling, and other actions that could result in a release of a hazardous substance will be restricted to designated areas that are a minimum of 100 feet from any sensitive plant populations, sensitive habitats, or drainages. Such designated areas will be surrounded with berms, sandbags, or other barriers to further prevent the accidental spill of fuel, oil, or chemicals. Any accidental spills will be immediately contained, cleaned up, and properly disposed.

27. Storage and staging areas will be placed as far from sensitive areas as possible, and kept free from trash and other waste. Staging areas for construction work will be located within previously disturbed sites and not adjacent to or within sensitive habitat.

28. The Project site will be kept clear of debris to avoid attracting predators to listed wildlife. All trash and food will be placed in sealed containers and regularly removed from the site.

29. No pets will be permitted inside the Project boundaries at any time.

30. Vehicle speeds on unpaved access roads to the proposed Project area will be restricted to a maximum of 25 MPH.

31. Any night lighting for Project construction will be selectively placed, shielded, and directed away from all native vegetative communities.

32. Linne soil sites will be surveyed for sensitive plant species prior to construction. In areas where the species are located, the soil will be salvaged for subsequent redistribution onto other similar, temporarily impacted areas. Soils will be stockpiled for the shortest time practicable and no taller than four (4) feet high, to assure the viability of soil biota. All work will be overseen by a project biologist familiar with the sensitive plant species associated with Linne soils. Salvaging methods will be included in the Service approved upland restoration plan.

33. Salvaging and transplantation of San Diego barrel cactus (*Ferocactus viridescens*) and other sensitive plant species will be conducted to the maximum extent practicable. A qualified biologist/restoration ecologist will oversee any seed collection, plant removal, or transplantation to ensure proper management of the salvaged materials. Salvaging methods will be included in the Service approved upland restoration plan.

34. To ensure that the construction and operation of the Project does not adversely affect the J14 vernal pool complex and other vernal pools south of the alignment and west of Spring Canyon, monitoring will be conducted throughout the rainy season to determine whether surface runoff is causing erosion and sediment delivery to the J14 complex and other vernal pools south of the alignment. Monitoring will occur during the construction of the Project and for three years following the opening of the road to the public. A monitoring report will be submitted by August 1 following each monitoring season.

35. To ensure that the construction and operation of the Project does not adversely affect the button-celery population at La Media Road immediately south of the Project footprint, monitoring will be conducted throughout the rainy season to determine whether surface runoff is causing erosion and sediment delivery to the button-celery population. Monitoring will occur during the construction of the Project and for three years following the opening of the road to the public. A monitoring report will be submitted by August 1 following each monitoring season.

36. Pursuant to the Burrowing Owl Survey Protocol and Mitigation Guidelines (CBOC 1993) and the Staff Report on Burrowing Owl Mitigation (CDFG 1995), a preconstruction survey of the Project footprint will be conducted for burrowing owls prior to clearing and grading. During the nonbreeding season (September 1 to January 31), a qualified biologist will survey and excavate all potential owl burrows within and immediately beyond the impact zone to discourage any on-site occupancy. If owls are found nesting within the ROW between February 1 and August 31, the burrow will be designated an ESA and no activities will be allowed within a 246-foot radius of the site. Surveys will be performed regularly to monitor the behavior of the owls and determine when nesting is complete, so that construction can resume.

37. The Spring Canyon Bridge will maintain design features that will provide bats with potential sites for day/night roosting.

38. Seed of Otay tarplant, Otay mesa mint, spreading navarretia, and Orcutt grass will be collected from adjacent or nearby populations and distributed throughout the vernal pools and/or uplands as part of the restoration activities on Wall-Hudson in coordination with the Service in accordance with the following guidelines:

a. Seed will be collected from areas where at least 20 individuals of each target species occur as a sub-population.

b. No more than five (5) percent of the projected annual seed production of any individual plant or discrete population of plants will be collected.

c. Collections will be made in a manner that captures the majority of the genetic variation found in the sampled populations. Different genotypes will not be intermingled during conservation activities.

d. All seed collected will be placed in brown paper bags and stored off-site at an appropriate seed storage facility.

e. Collection of seed will be conducted in a manner that will not significantly harm the reproductive potential of the population for that year.

39. The following measures will be implemented at the Wall-Hudson and Bonita Meadows restoration sites to avoid and minimize effects to gnatcatchers during the five-year restoration period:

a. When maintenance and monitoring activities are conducted during the gnatcatcher breeding season, a qualified biologist will conduct surveys for nesting gnatcatchers no more than one week prior to the start of proposed activities.

b. If nesting gnatcatchers are observed on-site, no maintenance activities will be conducted within 100 feet of a gnatcatcher nest (exclusion zone), except repairs to broken irrigation lines. If an irrigation line is broken and workers need to encroach into the 100-foot exclusion zone, then Caltrans and the Service will be notified immediately. Prior to maintenance workers accessing the 100-foot exclusion zone, Caltrans and the Service will determine the most appropriate timing and method of repair without causing harm to the nest and/or the nesting pair.

Herbicide application will occur outside of the 100-foot exclusion zone to avoid drift towards the nest. Only hand spraying downwind of the nest will be allowed.

An education program will be implemented to ensure that all maintenance workers know the location of all gnatcatcher nests and are aware of the above described conservation measures.

40. The following measures will be implemented at the Wall-Hudson restoration site to avoid and minimize affects to Quino. Conservation measures a. and b. below pertain only to initial implementation during the winter/spring. The remaining conservation measures listed below will be implemented during the entire five years of restoration:

a. Prior to the start of grading activities, the perimeter, and access to, the Wall-Hudson restoration area will be delineated with flagging. No grading or other equipment work will occur outside of the flagged limits.

b. During initial implementation, locations where dot seed plantain occur will be monitored for post-diapause Quino caterpillars by an experienced Service approved biologist. If Quino caterpillars are detected, the biologist will assist weeders with caterpillar detection and weeders will look for Quino caterpillars while weeding, and will avoid stepping on caterpillars or dot seed plantain plants. Areas where caterpillars are detected will be flagged and only hand weeding will occur within 100 feet of the flagging.

c. Beginning the first spring following restoration implementation and occurring each consecutive year thereafter, protocol level surveys for adult Quino will be conducted on the mesa fingers at Wall-Hudson.

d. Beginning the first spring following restoration implementation and occurring each consecutive year thereafter, cluster webbing surveys for pre-diapause Quino larvae will be conducted at both the Quino and vernal pool restoration sites four weeks after the first reported adult is observed (as per the Service's website for Quino protocol level surveying). These pre-diapause surveys will be conducted once a week for four weeks. Areas where webbing is detected will be flagged and only hand weeding will occur within 30 feet of flagging.

e. Beginning the first spring following restoration implementation and occurring each consecutive year thereafter, the Quino and vernal pool restoration sites will be monitored for post-diapause Quino caterpillars by an experienced Service approved biologist. The monitoring will occur at the initiation of weeding during the post-diapause season. If Quino caterpillars are detected, the biologist will assist weeders with caterpillar detection and weeders will look for Quino caterpillars while weeding, and will avoid stepping on caterpillars or dot seed plantain plants. Areas where caterpillars are detected will be flagged and only hand weeding will occur within 100 feet of the flagging.

f. In areas where caterpillars or larval cluster webbing are not detected, mechanical weeding may occur.

g. All personnel who will be conducting weeding activities will be trained by a qualified biologist to recognize Quino caterpillars. A qualified biologist will be on-site during all weeding operations to assist weeders with Quino caterpillar identification.

h. Flagging installed to denote areas where Quino larvae have been observed will be left in place until deemed ready for removal by the approved biologist in coordination with the Service. All flagging installed to denote Quino larval stages will be marked with permanent markers with the following information: date of placement, type of Quino larvae detected, and the last name of the person marking the flagging. Flagging will provide direction for all weeding activities on-site.

STATUS OF THE SPECIES

Coastal California Gnatcatcher (*Polioptila californica californica*)

Listing Status

The Service listed the gnatcatcher as threatened on March 30, 1993 (*Federal Register* 58:16742-16757). As part of the Federal listing, the Service issued a special rule, pursuant to section 4(d) of the Act, defining the conditions under which take of the gnatcatcher would not be a violation of section 9 (*Federal Register* 58: 65088-65096). This special rule recognized the State's Natural Community Conservation Planning (NCCP) Program, and several local governments' ongoing multi-species conservation planning efforts (e.g., the Multiple Species Conservation Program (MSCP)) that intend to apply Act standards to activities affecting the gnatcatcher. An interim process was established whereby jurisdictions actively involved in NCCP planning would be allowed to take up to five percent of the remaining coastal sage habitat for projects that were consistent with the NCCP conservation guidelines (CDFG and California Resources Agency 1993).

Species Description

The gnatcatcher is a small (length: 11 centimeters; weight: 6 grams), long-tailed member of the old-world warbler and gnatcatcher family *Sylviidae* (American Ornithologists' Union 1998). The bird's plumage is dark blue-gray above and grayish-white below. The tail is mostly black above and below. The male has a distinctive black cap which is absent during the winter. Both sexes have a distinctive white eye-ring.

The coastal California gnatcatcher is one of three subspecies of the California gnatcatcher (*Polioptila californica*) (Atwood 1991). Prior to 1989, the California gnatcatcher was classified as a subspecies of the Black-tailed gnatcatcher (*Polioptila melanura*). Atwood (1980, 1988) concluded that the species was distinct from *P. melanura*, based on differences in ecology and behavior. Recent mitochondrial DNA sequencing confirmed the species-level recognition of the California gnatcatcher (Zink and Blackwell 1998).

Distribution

Gnatcatchers occur on coastal slopes in southern California, ranging from southern Ventura southward through Palos Verdes Peninsula in Los Angeles County through Orange, Riverside, San Bernardino and San Diego Counties into Baja California to El Rosario, Mexico, at about 30 degrees north latitude (Atwood 1991). In 1990, Atwood reported that ninety-nine percent of all gnatcatcher locality records occurred at or below an elevation of 300 meters (m) (984 feet (ft)). In 1992, Atwood and Bolsinger reported that, of 324 sites of recent occurrence, 272 (84 percent) were located below 250 m (820 ft) in elevation, 315 (97 percent) were below 500 m (1,640 ft), and 324 (100 percent) were below 750 m (2,460 ft). Since that time, additional data collected at higher elevations shows that this species may occur as high as 912 m (3,000 ft) and that more than 99 percent of the known gnatcatcher locations occurred below 770 m (2,500 ft) (Service 2000a).

Habitat Affinities

Gnatcatchers typically occur in or near coastal sage scrub habitat. Coastal sage scrub is patchily distributed throughout the range of the gnatcatcher, and the gnatcatcher is not uniformly distributed within the structurally and floristically variable coastal sage scrub community. Rather, the subspecies tends to occur most frequently within California sagebrush (*Artemisia californica*)-dominated stands on mesas, gently sloping areas, and along the lower slopes of the coast ranges (Atwood 1990). An analysis of the percent gap in shrub canopy supports the hypothesis that gnatcatchers prefer relatively open stands of coastal sage scrub (Weaver 1998). The gnatcatcher occurs in high frequencies and densities in scrub with an open or broken canopy while it is absent from scrub dominated by tall shrubs and occurs in low frequencies and densities in low scrub with a closed canopy (Weaver 1998). Territory size increases as vegetation density decreases and with distance from the coast, probably due to food resource availability.

Gnatcatchers also use chaparral, grassland, and riparian habitats where they occur adjacent to sage scrub (Campbell *et al.* 1998). The use of these habitats appears to be most frequent during late summer, autumn, and winter, with smaller numbers of birds using such areas during the breeding season. These non-sage scrub habitats are used for dispersal, but data on dispersal use are largely anecdotal (Campbell *et al.* 1998). Linkages of habitat along linear features such as highways and power-line corridors may be of significant value in linking populations of the gnatcatcher (Famolaro and Newman 1998). Although existing quantitative data may reveal relatively little about gnatcatcher use of these other habitats, these areas may be critical during certain times of year for dispersal or as foraging areas during drought conditions (Campbell *et al.* 1998). Breeding territories have also been documented in non-sage scrub habitat. Campbell *et al.* (1998) discuss likely scenarios explaining why habitats other than coastal sage scrub are used by gnatcatchers including food source availability, dispersal areas for juveniles, temperature extremes, fire avoidance, and lowered predation rate for fledglings.

Critical Habitat

Final determination of critical habitat for the gnatcatcher was published in the *Federal Register* on October 24, 2000 (Service 2000a). On June 11, 2002, the U.S. District Court for the Central District of California remanded the critical habitat rule to the Service so that we may prepare a new economic analysis. Areas previously designated as critical habitat for the gnatcatcher in 2000, will remain in place until such time as a new, final designation becomes effective. On April 24, the Service re-proposed critical habitat for the gnatcatcher (*Federal Register* 68:20228-20312).

Critical habitat for the gnatcatcher includes 207,868 hectares (ha) (513,650 acres [ac]) of Federal, state, local, and private land in Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties (Service 2000a). Primary constituent elements for the gnatcatcher are those habitat components that are essential for the primary biological needs of foraging, nesting, rearing of young, intra-specific communication, roosting, dispersal, genetic exchange, or sheltering (Atwood 1990). Primary constituent elements are provided in (1) undeveloped areas, including agricultural lands, that support or have the potential to support, through natural successional processes, various types of sage scrub, or (2) undeveloped areas that support chaparral, grassland, or riparian habitats where they occur proximal to sage scrub and where they may be utilized for the biological needs of dispersal and foraging, and (3) undeveloped areas, including agricultural areas, that provide or could provide connectivity or linkage between or within larger core areas, including open space and disturbed areas that may receive only periodic use.

Life History

The gnatcatcher is primarily insectivorous, nonmigratory, and exhibits strong site tenacity (Atwood 1990). Diet deduced from fecal samples resulted in leaf- and plant-hoppers and spiders predominating the samples. True bugs, wasps, bees, and ants were only minor components of the diet (Burger *et al.* 1999). Gnatcatcher adults selected prey to feed their young that was larger than expected given the distribution of arthropods available in their environment. Both adults and young consumed more sessile than active prey items (Burger *et al.* 1999).

The gnatcatcher seems to become highly territorial by late February or early March each year, as males become more vocal during this time period (Mock *et al.* 1990). In southwestern San Diego County the mean breeding season territory size ranged from 5 to 11 ha (12 to 27 ac) per pair and non-breeding season territory size ranged from 5 to 17 ha (12 to 42 ac) per pair (Preston *et al.* 1998). During the non-breeding season, gnatcatchers have been observed to wander in adjacent territories and unoccupied habitat increasing their home range size to approximately 78 percent larger than their breeding territory (Preston *et al.* 1998).

The breeding season of the gnatcatcher extends from mid-February through the end of August, with the peak of nesting activity occurring from mid-March through mid-May. The gnatcatcher's nest is a small, cup-shaped basket usually found 0.3 to 1 m (1 to 3 ft) above the ground in a small shrub or cactus. Clutch sizes range between three and five eggs, with the average being four. Juvenile birds associate with their parents for several weeks (sometimes months) after fledging

(Atwood 1990). Nest building begins in mid-March with the earliest recorded egg date of March 20 (Mock *et al.* 1990). Post-breeding dispersal of fledglings occurs between late May and late November. Nest predation is the most common cause of nest failure (Grishaver *et al.* 1998). Gnatcatchers are persistent nest builders and often attempt multiple broods, which is suggestive of a high reproductive potential. This is, however, typically offset by high rates of nest predation and brood parasitism (Atwood 1990). Nest site attendance by male gnatcatchers was determined to be equal to that of females for the first nest attempt and then decline to almost a third of female nest attendance for later nesting attempts (Sockman 1998).

Gnatcatchers typically live for two to three years, although ages of up to five years have been recorded for some banded birds (Dudek and Associates 2000). Observations indicate that gnatcatchers are highly vulnerable to extreme cold, wet weather (Mock *et al.* 1990). Predation occurs in greater proportion in the upper and lower third of the nest shrub. Predation is lower in nests with full clutch sizes (Sockman 1997). Potential nest predators are numerous, and include snakes, raccoons, and corvids (Grishaver *et al.* 1998). The California gnatcatcher also is known to be affected by nest parasitism of the brown-headed cowbird (*Molothrus ater*). Nest parasitism apparently has resulted in earlier nesting dates of the gnatcatcher which may help compensate for the negative effect of parasitism (Patten and Campbell 1998). However, the gains in nest success from decreased nest parasitism appear to be negated by increased nest abandonment due to predation before cowbirds have migrated into an area (Braden *et al.* 1997).

The natal dispersal, for a nonmigratory bird, such as the gnatcatcher, is an important aspect of the biology of the species (Galvin 1998). The mean dispersal distance of gnatcatchers banded in San Diego County is reported at less than 1.9 miles (Bailey and Mock 1998). Although the mean dispersal distances that have been documented above are relatively low, dispersal of juveniles is difficult to observe and to document without extensive banding studies. Therefore, it is likely that the few current studies underestimate the gnatcatcher's typical dispersal capacity (Bailey and Mock 1998). Juvenile gnatcatchers are apparently able to traverse highly man-modified landscapes for at least short distances (Bailey and Mock 1998). Natural and restored coastal sage scrub habitat along highway corridors is used for foraging and nesting by gnatcatchers and may serve important dispersal functions (Famolaro and Newman 1998). Typically, however, the dispersal of juveniles requires a corridor of native vegetation which provides foraging and cover opportunities to link larger patches of appropriate sage scrub vegetation (Soulé 1991). These dispersal corridors may facilitate the exchange of genetic material and provide a path for recolonization of areas from which the species has been extirpated (Soulé 1991, Galvin 1998).

Population Trend

The gnatcatcher was considered locally common in the mid-1940's, but by the 1960's this subspecies had declined substantially in the United States owing to widespread destruction of its habitat (Atwood 1990). By 1980, Atwood (1980) estimated that no more than 1,000 to 1,500 pairs remained in the United States. In 1993, at the time the gnatcatcher was listed as threatened, the Service estimated that approximately 2,562 pairs of gnatcatchers occurred in the United States. Of these, 30 pairs occurred in Los Angeles County, 757 pairs occurred in Orange County, 261 pairs occurred in Riverside County, and 1,514 pairs occurred in San Diego County (Service

1993a). In October 1996, the total number of gnatcatchers in the United States was estimated at 2,899 pairs with two-thirds occurring in San Diego County (Service 1996), after subtracting out all gnatcatcher pairs authorized for take under Habitat Loss Permits, approved Natural Community Conservation Plans, Habitat Conservation Plans, and section 7 consultations. These population estimates were intended to represent a coarse approximation of the number of gnatcatchers in southern California. Confidence intervals have not been calculated for these estimates and therefore, we can not be sure of their precision. Recent fires across southern California have significantly reduced quality gnatcatcher habitat which may result in a reduction in gnatcatcher populations, particularly in San Diego County where the Paradise, Cedar, and Otay fires consumed large areas of occupied gnatcatcher habitat. CSS is fire adapted and should recover over time. It is unknown what the long-term affect to the gnatcatcher population will be due to the unprecedented size of the fires.

Threats

The loss, fragmentation, and adverse modification of habitat are the principal reasons for the gnatcatcher's federally threatened status (Service 1993a). The amount of coastal sage scrub available to gnatcatchers has continued to decrease during the period after the listing of the species. It is estimated that up to 90 percent of coastal sage scrub vegetation has been lost as a result of development and land conversion (Westman 1981a, 1981b, Barbour and Major 1977), and coastal sage scrub is considered to be one of the most depleted habitat-types in the United States (Kirkpatrick and Hutchinson 1977, O'Leary 1990). The fragmentation of habitat may artificially increase populations in adjacent preserved habitat; however, these population surpluses may be lost in subsequent years due to crowding and lack of resources (Scott 1993). In addition, agricultural use, such as grazing and field crops, urbanization, air pollution, and the introduction of non-native plants have all had an adverse impact on extant sage scrub habitat. A consequence of urbanization that is contributing to the loss, degradation, and fragmentation of coastal sage scrub is an increase in wildfires due to anthropogenic ignitions. High fire frequencies and the lag period associated with recovery of the vegetation may significantly reduce the viability of affected subpopulations (Dudek and Associates 2000). Furthermore, nest-parasitism by the brown-headed cowbird (Unitt 1984) and nest predation threaten the recovery of the gnatcatcher (Atwood 1980, Unitt 1984).

San Diego fairy shrimp (*Branchinecta sandiegonenis*)

Listing Status

The San Diego fairy shrimp was federally listed as endangered on February 3, 1997 (62 FR 4925). A vernal pool recovery plan which included San Diego fairy shrimp was published in September 1998 (Service 1998a). Critical habitat was proposed for this species on April 23, 2003 (68 FR:19888).

Species Description

Branchinecta sandiegonenis, is a small aquatic crustacean (Order: *Anostraca*) restricted to vernal pools. *B. sandiegonenis* was originally described by Fugate (1993) from samples collected on Del Mar Mesa, San Diego County. Mature individuals lack a carapace (hard outer covering of the head and thorax) and have a delicate elongate body, large stalked compound eyes, and 11 pairs of swimming legs (Service 2000b). Adult male San Diego fairy shrimp range in size form 9 to 16 millimeters (0.35 to 0.63 in); adult females are 8 to 14 millimeters (0.31 to 0.55 in) long. The second pair of antennae in males are greatly enlarged and specialized for clasping the females during copulation, while the second pair of antennae in the females are cylindrical and elongate. Refer to Fugate (1993) for a detailed description of the identifying characteristics of *B. sandiegonenis*.

Distribution

San Diego fairy shrimp occur in vernal pools from Marine Corps Base Camp Pendleton, inland to Ramona and south through Del Mar Mesa, Proctor Valley, and Otay Mesa, San Diego County, California. The species has recently been documented in Orange County in the Fairview Park vernal pools and at Saddleback Meadows (Service 1997a). In Baja California, it has been recorded at two localities (Valle de Palmas, south of Tecate and Baja Mar, north of Ensenada) and a single isolated female was reported from vernal pools in Isla Vista, Santa Barbara County, California (Service 1995).

Habitat Affinities

San Diego fairy shrimp tend to inhabit shallow, small vernal pools and vernal pool-like depressions (e.g., ruts in dirt roads) with water temperatures of 10-26° C. They are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors that likely include specific salinity, conductivity, dissolved solids, and pH levels. Gonzalez *et al.* (1996) found water chemistry as an important factor in determining the distribution of the San Diego fairy shrimp.

Life History

San Diego fairy shrimp are non-selective particle filter-feeders, or omnivores. Detritus, bacteria, algal cells, and other items between 0.3 to 100 microns may be filtered and ingested (Eriksen and Belk 1999). Adult fairy shrimp are usually observed from January to March; however, in years with early or late rainfall, the hatching period may be extended (Service 2000b). This species hatches in 3 to 8 days and matures in about 7 to 17 days depending on water temperature (Hathaway and Simovich 1996). San Diego fairy shrimp may only persist for about 4 to 6 weeks after hatching (Hathaway and Simovich 1996). The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks (Service 2000b). Eggs may persist in the substrate for several years. When the pools refill in the same or subsequent rainy seasons, some but not all of the eggs may hatch (Service 2000b). Fairy shrimp may be eaten by a wide variety of species, including beetles, dragonfly larvae, and other arthropods, frog, salamander, and toad tadpoles, shorebirds, ducks, and even other fairy shrimp.

Population Trend

San Diego fairy shrimp are known to occur in most of the vernal pool complexes in coastal San Diego County (Service, 1998a). Many populations of San Diego fairy shrimp have likely been extirpated or have experienced drastic declines due to the substantial loss of habitat in southern California. The majority of the vernal pools within the range of the San Diego fairy shrimp were lost prior to 1990 (Service 1998a). The greatest recent losses of vernal pool habitat in San Diego County have occurred in Mira Mesa, Rancho Penasquitos, and Kearny Mesa, which accounted for 73 percent of all the pools destroyed in the region from 1979 to 1986 (Keeler-Wolf *et al.* 1998). Other substantial losses have occurred in the Otay Mesa area, where over 40 percent of the vernal pools were destroyed between 1979 and 1990. Similar to San Diego County, vernal pool habitat was once extensive on the coastal plain of Los Angeles and Orange counties. Unfortunately, there has been a near total loss of vernal pool habitat in these areas (Keeler-Wolf *et al.* 1998).

Threats

The San Diego fairy shrimp is especially vulnerable to alteration in hydrology, thus the protection of watershed function is critical to its survival. San Diego fairy shrimp are also threatened by urban, agricultural development, modified hydrology due to adjacent road construction, and illegal trash dumping. Unpredictable natural events such as drought or fire may extirpate the San Diego fairy shrimp due to its fragmented and restricted range. They are also vulnerable to contaminants in runoff waters and watershed quality. Low levels of genetic variability may affect the species potential for long term viability (Service 1997a).

Riverside fairy shrimp (*Streptocephalus woottoni*)

Listing Status

The Riverside fairy shrimp was listed as endangered on August 3, 1993 (58 FR 41391). A vernal pool recovery plan, which included Riverside fairy shrimp, was published in September 1998 (Service 1998a). Critical habitat was proposed on April 27, 2004 (69 FR 23024).

Species Description

Streptocephalus woottoni is a small freshwater crustacean in the Family *Streptocephalidae*, of the Order *Anostraca*. The species was first collected in 1979 by Dr. Clyde Erickson and formally described as a new species in 1990 (Eng *et al.* 1990). Mature males are between 13 and 25 millimeters (0.5 to 1.0 in) long. The cercopods (structures that enhance the rudder-like function of the abdomen) are separate with plumose setae (feathery bristles) along the borders. Mature females are between about 13 and 22 millimeters (0.5 to 0.87 in) in length. The brood pouch extends to the seventh, eighth, or ninth abdominal segment. The cercopods of females are the same as in males. The species most taxonomically similar to *S. woottoni* is *S. seali* (Eng *et al.* 1990). However, in *S. woottoni*, both the male and the female have the red color of the cercopods covering the ninth and 30 to 40 percent of the eighth abdominal segments (Eng *et al.* 1990). No red extends onto the abdominal segments in living *S. seali* of either sex (Eng *et al.* 1990). A full description of identifying characteristics for this species is given by Eng *et al.* (1990).

Distribution

The Riverside fairy shrimp is believed to have the most restricted distribution of an endemic California fairy shrimp (Eng *et al.* 1990, Simovich and Fugate 1992). The northern distribution limit for the Riverside fairy shrimp is Cruzan Mesa, Los Angeles County and the former Carlsberg Ranch, Ventura County (Service 2001a). In Baja California, Mexico it has been documented at two locations: Valle de Las Palmas, south of Tecate, and Bajamar, north of Ensenada (Brown *et al.* 1993). With the exception of the Riverside populations, all populations are within 15 kilometers of the coast over a north-south distance of about 140 kilometers (Eriksen and Belk 1999). All known populations lie between 30 and 415 meters in elevation. In San Diego County it is known to occur at Marine Corps Base Camp Pendleton, City of Carlsbad, one complex at Marine Corps Air Station Miramar, and on Otay Mesa.

Habitat Affinities

Riverside fairy shrimp are restricted to deep (greater than 25 cm in depth) seasonal vernal pools, vernal pool like ephemeral ponds, and stock ponds (Eng *et al.* 1990, Service 1993b). They prefer warm-water pools that have low to moderate dissolved solids (Eriksen and Belk 1999). Pools are generally open and unvegetated with turbid water conditions and low total dissolved solids, alkalinity, and chloride levels, as evidenced by approximately neutral pH values (Eng *et al.* 1990). All known habitat lies within annual grasslands, which may be interspersed through chaparral or coastal sage scrub vegetation.

Life History

Riverside fairy shrimp are non-selective particle-feeding filter-feeders, or omnivores. Detritus, bacteria, algal cells, and other items between 0.3 to 100 microns may be filtered and ingested (Eriksen and Belk 1999). Females produce between 17 and 427 cysts over their lifetime (Simovich and Hathaway 1997). Presumably because of the ephemeral and unpredictable nature of the pool resource, few of the available cysts hatch at a time (Eriksen and Belk 1999). Cysts may hatch when water temperature is at 10° C but develop slowly below 15° C (Eriksen and Belk 1999). Hathoway and Simovich (1996) found that Riverside fairy shrimp hatched in 7 to 12 days when water temperature was between 10° and 20° C and maturity was noted between 48 to 56 days. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks (Service 2001a). Eggs may persist in the substrate for several years. When the pools refill in the same or subsequent rainy seasons, some but not all of the eggs may hatch (Service 2001a). Fairy shrimp may be eaten by a wide variety of species, including beetles, dragonfly larvae, and other arthropods, frog, salamander, and toad tadpoles, shorebirds, ducks, and even other fairy shrimp.

Population Trends

Many populations of Riverside fairy shrimp have likely been extirpated or have experienced drastic declines due to the substantial loss of habitat in southern California. The majority of the vernal pools within the range of the Riverside fairy shrimp were lost prior to 1990 (Service 1998a). Substantial losses have occurred in the Otay Mesa area, where over 40 percent of the vernal pools were destroyed between 1979 and 1990. Similar to San Diego County, vernal pool habitat was once extensive on the coastal plain of Los Angeles and Orange counties. Unfortunately, there has been a near total loss of vernal pool habitat in these areas (Keeler-Wolf *et al.* 1998). Significant losses of vernal pools supporting this species have also occurred in Riverside County (Service 2001a).

Threats

The Riverside fairy shrimp is especially vulnerable to alteration in hydrology, thus the protection of watershed function is critical to its survival. Riverside fairy shrimp are also threatened by urban and agricultural development, modified hydrology due to adjacent road construction, and illegal trash dumping. Unpredictable natural events such as drought or fire may extirpate the Riverside fairy shrimp due to its fragmented and restricted range. They are also vulnerable to contaminants in runoff waters and watershed quality. Low levels of genetic variability may affect the species potential for long term viability (Service 1993b). With the long distance isolation between the few remaining pools, gene flow is greatly if not completely reduced.

The Riverside fairy shrimp faces threats throughout its range. These threats can be divided into three major categories: 1) direct destruction of vernal pools and vernal pool habitat as a result of construction, vehicle traffic, domestic animal grazing, dumping, and deep plowing; 2) indirect threats which degrade or destroy vernal pools and vernal pool habitat over time including altered hydrology (e.g., damming or draining), invasion of alien species, habitat fragmentation, and associated deleterious effects resulting from adjoining urban land uses; and 3) long-term threats including the effect of isolation on genetic diversity and locally adapted genotypes, air and water pollution, climatic variations, and changes in nutrient availability (Bauder 1986; Service 1993b).

Quino Checkerspot Butterfly (*Euphydryas editha quino*)

Listing Status

On August 4, 1994, the Service published a petition finding in the Federal Register (*Federal Register* 59: 39868) with a proposed rule to list the Quino checkerspot butterfly as endangered. We published the final rule listing the species on January 16, 1997 (*Federal Register* 62: 2313). We proposed designating critical habitat for the Quino checkerspot butterfly on February 7, 2002 (*Federal Register* 66: 9476), and finalized the designation on April 15, 2002 (*Federal Register* 67: 18356). A final recovery plan for this species was issued on August 11, 2003.

Species Description

The Quino checkerspot butterfly (*Euphydryas editha quino*) is a recognized subspecies of Edith's checkerspot (*E. editha*), and is a member of the Nymphalidae family, the brush-footed butterflies, and the Melitaeinae subfamily, checkerspots and fritillaries. Quino differs from the other *E. editha* subspecies in size, wing coloration, and larval and pupal phenotypes (Mattoni *et al* 1997). Among the other subspecies of *E. editha*, Quino is moderate in size with a wingspan of approximately 4 cm (1.5 in). The dorsal (top) side of its wings is covered with a red, black, and cream colored checkered pattern, the ventral (bottom) side is mottled with tan and gold. Its abdomen generally has bright red stripes across the top. Quino larvae are black and have a row of nine, orange-colored tubercles (fleshy/hairy extensions) on their back. Pupae are extremely cryptic and are mottled black and blue-gray.

Distribution

Quino was historically distributed throughout the coastal slopes of southern California, including Los Angeles, Orange, Riverside, San Diego, and San Bernardino counties, and northern Baja California, Mexico (Mattoni *et al.* 1997; Service database). That distribution included the westernmost slopes of the Santa Monica Mountains, the Los Angeles Plain and Transverse Ranges to the edge of the upper Anza-Borrego Desert, and south to El Rosario in Baja California, Mexico (Emmel and Emmel 1973; Mattoni *et al.* 1997; Service database). Although historical collection records allow for an estimate of a species' range, such records usually underestimate the number of historical sites and extent of local distributions. Collectors tended to frequent well-known sites, and no systematic or comprehensive surveys for Quino have ever been conducted (Mattoni *et al.* 1997).

As recently as the 1950's, collectors described Quino as occurring on every coastal bluff, inland mesa top, and lower mountain slope in San Diego County and coastal northern Baja California. These observations indicate that Quino was historically widespread throughout the southern California landscape, and occurred in a variety of vegetation types, including coastal sage scrub, open chaparral, juniper woodland, meadows, and grasslands. By the 1970's, most of the coastal bluff and mesa habitats in southern California had been urbanized or otherwise disturbed. However, Quino still occupied known habitat locations inland and at higher elevations including Dictionary Hill, Otay Lakes, and San Miguel Mountain in San Diego County, and the Gavilan Hills in Riverside County. By the middle 1980's the species was thought to have disappeared from the known locations; the petition to list the species in 1988 suggested that it might be extinct. Nonetheless, new populations were discovered in Riverside County, Quino was rediscovered in San Diego County, and the species continued to survive in northern Baja California, Mexico. Current information suggests that Quino has been extirpated from Los Angeles, Orange, and San Bernardino Counties.

Habitat Affinities

In southwestern San Diego County, the primary host plant for Quino is the dot-seed plantain (*Plantago erecta*), however Quino may use other species of plantain (*Plantago* spp.) and annual owl's-clover (*Castilleja exserta*) as primary or secondary host plants. Another apparently important, but only recently documented, primary host plant is white snapdragon (*Antirrhinum coulterianum*; Pratt 2001). Quino is generally found in open areas and ecotone situations which may occur in a number of plant communities, including grasslands, coastal sage scrub, chaparral, and sparse native woodlands. Open areas within a given vegetation community seem to be a critical landscape feature for butterfly populations. Optimal habitat appears to contain little or no invasive exotic vegetation, and especially, a well-developed cryptogramic crust. In its adult stage, Quino uses a number of flowering plants as nectar sources.

Life History

The life cycle of Quino typically entails one generation of adults per year, with a 4- to 6-week flight period occurring generally February to May, depending on weather conditions (Emmel and Emmel 1973, Orsak 1978). During the flight period, adult butterflies move about and search for nectar sources and mates. Females lay multiple masses of 20 to150 eggs (M. Singer, C. Parmesan, and G. Pratt unpubl. data) with a single female capable of producing more than 1,000 eggs. The eggs hatch in about 10 days and the larvae begin to feed immediately. At lower elevations in San Diego County, the primary host plant for Quino is the dot-seed plantain (*Plantago erecta*), however Quino may use other species of plantain (*Plantago* spp.) and annual owl's-clover (*Castilleja exserta*). As the larvae grow, they periodically shed their skin. Each phase between skin molts is referred to as an "instar" with the first instar being the first larval stage after hatching.

As summer approaches the food plants dry out. In their third or fourth instar, larvae enter into an obligatory diapause. Diapause is a low-metabolic resting state that may last for a year or more, depending on conditions. Diapause allows larvae to survive the regular seasonal climatic extremes and also to better survive times of extended adverse conditions, such as drought. After termination of diapause, larvae become active and feed. They then enter their pupal stage and within two to six weeks, transform into the adults and emerge as butterflies. The butterflies feed, disperse, reproduce, and then die.

Adult Quino, and *E. editha* in general, are sedentary by nature and generally fly close to the ground. Evidence from the bay checkerspot (*E. editha bayensis*; bay checkerspot) suggests that long-distance dispersal is rare (Ehrlich 1961, Brussard and Ehrlich 1970, Ehrlich and Murphy 1981). *Bay checkerspots* have been documented to move up to about 4.5 km (2.8 mi) to colonize distant habitat patches (Harrison 1989). For Quino, many experts familiar with the species believe that Quino populations separated by more than about 3 km (approximately 2 mi) may be demographically isolated. However, responses to abiotic factors, such as weather, may increase the distance butterflies will move (Ehrlich and Murphy 1987). Additionally, adult Quino are known to "hilltop". Hilltopping is a behavior where the males butterflies form territories on hilltops, ridgelines, and other prominent geographic features in order to locate mates.

Population Trend

Until as recently as the 1980s, Quino may have been one of the most abundant butterflies in coastal southern California. More than 75 percent of Quino's historic range has been lost (Brown 1991; Service database), and more than 90 percent of the species' coastal mesa and bluff habitat, where most historic records are located, has been destroyed by habitat fragmentation, degradation, and loss (Service database). It is estimated that Quino population density range-wide has been reduced 95 percent by human-caused impacts. Sources of habitat loss and habitat degradation include competition from non-native plants, livestock grazing, off-road vehicle activity, and fire management practices. Additionally, the butterfly larva are susceptible to predation by exotic invertebrates.

Recent studies have shown competitive exclusion by non-native plants may be accelerated by nitrogen deposition from atmospheric pollution in southern California vegetation communities (Allen et al. 1997, Eliason and Allen 1997, Padgett and Allen 1999, Padgett et al. 1999). The non-native weeds may also directly out-compete the native plants, including butterfly host-plant species. This effect has been documented in a native plant community that supports Bay checkerspot in the San Francisco Bay area (Weiss 1999). Not only does the increase in weeds degrade the quality of the native habitat, it may also increase the frequency or severity of wildfires, further impacting the vegetation community and the wildlife species inhabiting it. Recent fires across southern California have significantly reduced quality Quino habitat which may result in a reduction in Quino populations, particularly in San Diego County where the Cedar and Otay fires consumed large areas of occupied Quino habitat. The vegetation comprising Quino habitat is fire adapted and should recover over time. It is unknown what the long-term affect to the Quino population will be due to the unprecedented size of the fires.

Threats

Quino is threatened primarily by urban and agricultural development, non-native plant species invasion, off-road vehicle use, grazing, and fire management practices (*Federal Register* 62: 2313). These threats destroy and degrade the quality of habitat and result in the extirpation of local Quino populations. Quino population decline likely has been, and will continue to be, caused in part by enhanced nitrogen deposition, elevated atmospheric carbon dioxide concentrations, and climate change. Nonetheless, urban development poses the greatest threat and exacerbates all other threats. Activities resulting in habitat fragmentation or host or nectar plant removal reduce habitat quality and increase the probability of local Quino population extirpation and species extinction.

Other threats to the species identified in the final listing rule (*Federal Register* 62: 2313) include illegal trash dumping and predation. Dumping, a documented problem for some populations (G. Pratt *fide Federal Register* 67: 18356), is detrimental because of resulting habitat degradation and destruction. Over-collection by butterfly hobbyists and dealers is a probable threat, although the magnitude of this activity is unknown. Stamp (1984) and White (1986) examined the effects of parasitism and predation on the genus *Euphydryas*, although it is not clear whether these mortality factors pose a significant threat to this species. Predation by Argentine ants

(*Iridomyrmex humilis*) has been observed in colonies of the butterfly in the laboratory (G. Pratt *fide Federal Register* 67: 18356) and intense predation by nonnative Brazilian fire ants (*Solenopsis invicta*) is likely where they co-occur with Quino (Porter and Savignano 1990). Brazilian fire ants were documented in 1998 in the vicinity of historic Quino habitat in Orange County and have subsequently been found in Riverside and Los Angeles Counties (California Department of Food and Agriculture 1999).

San Diego Button-Celery (*Eryngium aristulatum* var. *parishii*)

Listing Status

San Diego button-celery was federally listed as endangered on August 3, 1993 (*Federal Register* 58: 41391), after the Service determined that the present range and continued existence of the species was being rapidly destroyed by habitat loss and degradation due to urban and agricultural development, grazing, off-road vehicle use, trampling, invasion from weedy non-native plants and other factors. It has been listed as endangered in the State of California since July 1979. Critical habitat has not been designated for this species. A vernal pool recovery plan which included San Diego button-celery was published in September 1998 (U.S. Fish and Wildlife Service 1998b).

Species Description

San Diego button-celery is a perennial herb with a persistent tap root. The plant has a spreading to erect habit, reaching a height of 41 centimeters (16 inches) or more. The stems and toothed leaves are gray green with spinose lobes, giving it a prickly appearance. Inflorescences form on short peduncles (stalks) with few to many-flowered heads. Flowers are white and vary in length from 1.7 to 2.8 mm (Munz 1974, Hickman 1996).

San Diego button-celery is one of three subspecies of *Eryngium aristulatum* and belongs to the family *Apiaceae* (Hickman 1996). *Eryngium aristulatum* var. *parishii* is separated from *Eryngium aristulatum* var. *aristulatum* by having styles in fruit that are about the same length as the calyx (outer whorl of protective leaves around the flower) and is separated from *Eryngium aristulatum* var. *hooveri* by having bractlets (modified leaves) without callused margins (Hickman 1996). The majority of populations once identified as *Eryngium aristulatum* var. *parishii* on Camp Pendleton Marine Corps Base have been placed under a recently described species: *Eryngium pendletonensis* (Marsden and Simpson 1999). San Diego button celery is distinguished from *Eryngium pendletonensis* by a combination of leaf and flower structures.

Distribution

San Diego button-celery occurs in vernal pools from the Santa Rosa Plateau, Riverside County, California, south to the mesas north of Ensenada, Mesa de Colonet, and San Quintin, Baja California, Mexico ([K. Marsden, pers. comm,. 1997] in Service 1998). In San Diego County it is found in pools on Del Mar Mesa, Mira Mesa, Kearny Mesa, Marine Corps Air Station Miramar, Marine Corps Base Camp Pendleton, and at sites within the cities of Tierrasanta, San

Marcos, Carlsbad, and Ramona; it was extirpated from a site in the city of La Jolla (Bauder 1986). San Diego button-celery is also found in the southern portion of San Diego County on Otay Mesa, near the Lower Otay Reservoir and in Proctor Valley. It also was found near the Tijuana Airport, but is believed to be extirpated at this locale. There are no known herbarium collections of San Diego button-celery from the San Diego Mesa (e.g., Normal Heights, San Diego State University) (Service 1998). The California Native Plant Society (2001) notes that this plant has been found at elevations from 20-620 meters above mean-sea-level.

Habitat Affinities

San Diego button-celery is associated with white clay bottom vernal pools devoid of hardpans (Service 1993c). However, this species is somewhat more tolerant of peripheral vernal pool habitat than most obligate vernal pool species such as San Diego Mesa mint (*Pogogyne abramsii*) with which it sometimes grows (Reiser 1996).

Life History

Most commonly a perennial herb with a persistent tap root, San Diego button-celery is occasionally an annual under less favorable conditions. San Diego button-celery blooms from April to June. It reproduces by outcrossing and is presumably insect-pollinated (Ogden Environmental *et al.* 2000). It is reliant on vernally wet conditions and has developed mechanisms such as Aerenchyma tissue that promotes gas exchange underwater to cope with this habitat.

Population Trend

In 1979, San Diego button-celery was known from 65 pool groups; by 1986, this plant remained in 61 pool groups (Service 1993c); and by 1998, San Diego button celery continued to exist in 61 pool groups (Service 1998b). Although several sites receive some protection, Reiser (1996) stated that this subspecies is severely declining with continued losses. Many existing pool groups are remnant colonies of once larger populations and are subject to various forms of authorized and unauthorized disturbance (Service 1993c, Reiser 1996).

Threats

This species is threatened by land conversions, habitat fragmentation and degradation, livestock grazing, competition from non-native plant species, and other factors. Urban development remains the primary threat to vernal pool complexes inhabited by San Diego button celery (Bauder 1987). Some proposed projects include expansion of airports and landfills, construction of major roadways, utility infrastructure, resorts and recreational facilities, commercial and industrial properties, and residential housing tracts. Generally, these projects directly impact pools through elimination of the habitat (Service 1998b).

Where pools remain, dumping, trampling, vehicular activity, runoff, and intrusion of non-native species are continued threats. Hydrological changes and erosion can cause profound changes in the pool flora (Bauder 1987, 1992). Trenching for utilities, on-going operations within easements and lease holding, responses to emergencies such as fire or air crashes, fuel and chemical spills, and recreational activities, such as off-highway-vehicle (OHV) use, can all cause serious damage to vernal pools, particularly during the aquatic or drying phases when soils are most vulnerable and the organisms are growing or reproducing. When disturbance is sever, it can lead to local extirpations of pool species (Service 1998b).

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of State and private actions which are contemporaneous with the consultation in progress.

The entire alignment of the proposed Project occurs within an approved NCCP/HCP that is referred to as the MSCP. The MSCP Planning Area encompasses 582,000 acres within southwestern San Diego County. Except for Bonita Meadows, the proposed Project lies wholly within the City of San Diego's MSCP boundaries. Bonita Meadows is within the San Diego County MSCP boundaries. With the exception of Quino, all species addressed in this Opinion are covered species[1] under the MSCP. Taking of covered species will be allowed in accordance with approved subarea plans and implementing agreement, therefore most of the anticipated impacts associated with private actions (i.e., urban development) have already been analyzed through this program. Table 3-5 "Species Evaluated for Coverage Under the MSCP" of the MSCP (August 1998) outlines the anticipated conservation and impacts for each species. Other federal actions in the action area include the Immigration and Naturalization Service border fence and associated activities, and SR-125.

Coastal California gnatcatcher

The gnatcatcher occupies numerous territories in Spring Canyon both within the proposed Project footprint and in the adjacent side and main canyons to the south of the proposed road corridor. Spring Canyon is preserved as part of the City of San Diego's MSCP and is designated as MHPA lands. Prior to 1999, five gnatcatcher pairs were detected within or adjacent to the study corridor. During surveys conducted in 2002, a new location supporting one gnatcatcher pair was detected west of Old Otay Mesa Road, one pair and one individual were observed in the central section of Spring Canyon to the east of Caliente Avenue, two gnatcatcher pairs were detected to the west of Heritage Road, one pair and one individual was detected in the canyon

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[1]"Covered species" means those species within the MSCP Area which will be adequately conserved by the MSCP when the MSCP is implemented through the subarea plans for which will be adequately conserved through the permitting process pursuant to Section 404 of the Clean Water Act, 33 U.S.S. § 1344

near the southern end of Heritage Road. During surveys for rare plants and Quino, gnatcatchers were observed within and immediately adjacent to the proposed Project footprint. Gnatcatchers are also known from Dennery Canyon adjacent to Wall-Hudson and at Bonita Meadows.

Quino checkerspot butterfly

Quino historically occurred throughout Otay Mesa. Habitat for Quino exists in areas along the proposed Project alignment. Focused surveys for Quino resulted in no Quino being detected within the action area. In 2001, an adult female Quino was detected within the perimeter of the OCCS preserve, adjacent to the proposed Project alignment. The larval host plant, dot seed plantain (*Plantago erecta*), is found along the upper canyon rims throughout the action area.

During the last few years, Quino have been detected within the Otay River drainage to the north of the proposed Project. Dennery Canyon drains into Otay River and there is the potential that Quino occupy areas within Dennery Canyon and the adjacent Otay River.

Vernal Pool Species

Riverside fairy shrimp, San Diego fairy shrimp, and San Diego button celery historically occurred in vernal pool complexes throughout the Otay Mesa ecosystem which is part of the San Diego: Southern Coastal Mesa Management Area identified in the Vernal Pool Recovery Plan (Service 1998). Many of these vernal pool complexes have been developed, converted to agriculture, or degraded by OHV use. Most of the historic vernal pool habitat in the northwestern portion of Otay Mesa have either been graded or developed as part of the Pardee Development Projects. Impacts from these development projects have been offset at the Dennery Canyon vernal pool preserve along the southern side of Dennery Canyon and at the OCCS preserve. In addition, the City of San Diego has restored a vernal pool complex adjacent to Dennery Canyon vernal pool preserve for impacts by construction of Otay Mesa Road. The City of San Diego has also purchased property containing the J16-18 vernal pool complexes immediately south of the ROW adjacent to Spring Canyon. Northeast of the Pardee developments and along Dennery Canyon is a vernal pool mitigation site for the Robinhood Ridge Development. To offset impacts to Riverside fairy shrimp and San Diego fairy shrimp from construction of the international border triple fence (Border Infrastructure System), the ACOE Planning is currently restoring 20 acres of vernal pool habitat for south of the ROW adjacent of Spring Canyon. Several other smaller mitigation sites also occur in the vicinity of Spring Canyon. The remaining vernal pool habitat is on private property and receives no management or monitoring.

The vernal pool complexes in the Spring Canyon area have been degraded by OHV activity. Due to recent construction north of Otay Mesa Road, there appears to be increased activity south of Otay Mesa Road. The pools continue to be degraded due to lack of management.

Prior to 1999, and within the three alignments of the central alternative, San Diego fairy shrimp were found in eleven vernal pools and four road pools. Six of these pools are currently within the OCCS preserve. Of the remaining pools, two are now outside of the proposed alignment and seven pools have been destroyed by development or disturbance. In 2002, San Diego fairy shrimp were detected within six vernal pools and four road pools within the project ROW. In addition, 27 pools within the OCCS preserve support San Diego fairy shrimp. San Diego fairy shrimp are known to occur within pools on the terraces above Spring Canyon south of the Project (e.g., J14 complex) and to the north around Dennery Canyon including Wall-Hudson.

In southern San Diego County, Riverside fairy shrimp historically occurred in eight pool complexes on Otay Mesa near the U.S./Mexico border. A number of these pool complexes have been converted for residential or commercial use. Within the Project survey area, Riverside fairy shrimp were detected in five vernal pools, three of which are situated near Spring Canyon and two to the west near Caliente Boulevard near the intersection of Otay mesa road and Airway Road. Twenty pools within the OCCS preserve also support Riverside fairy shrimp.

Within the Spring Canyon watershed, there are ten historic vernal pool complexes that may still contain extant populations of San Diego button celery. In addition to the Dennery Canyon vernal pool preserve, there is a vernal pool complex that supports button-celery immediately north of Otay Mesa Road on the Saint Jerome's Church property. This parcel is currently undeveloped. Recent surveys conducted in 2003 detected San Diego button celery within the parcel boundaries. To the east of Arnie's Point (near La Media Road) and immediately north of the Mexican border is an area where three vernal pool complexes containing San Diego button celery historically occurred. The current status of these vernal pool complexes is unknown. North of this area and to the southwest of the intersection of Otay Mesa Road and La Media Road is an emergent wetland that is dominated by non-native grasses. Surveys of this wetland for the proposed Project detected approximately 5221 individuals of San Diego button celery (Waldecker 2003). Directly north of these complexes and immediately north of Brown Field Airport are two historic vernal pool complexes that contain San Diego button celery.

Within the proposed alignment, three pools support San Diego fairy shrimp, one pool supports both San Diego fairy shrimp and Riverside fairy shrimp, and one pool supports fifteen individuals of San Diego button celery. Fairy shrimp surveys at the Wall-Hudson property detected San Diego fairy shrimp in four of the five pools on the north mesa and 20 of the 34 pools on the south mesa.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Effects to the Natural Community Conservation Planning Program

The proposed Project will directly effect 11.75 acres within the MSCP's MHPA including 2.7 acres of MSS, 2.9 acres of CSS, 5.3 acres of non-native grassland, 0.05 acre of vernal pool surface area, and 0.08 acre of southern willow scrub/mulefat scrub. The proposed Project will temporally and indirectly effect 5.88 acre of MSS and 14.76 acre of CSS within the MSCP's MHPA. To avoid reducing the size of the MHPA in the area, 9.06 acres of mesa top immediately adjacent to the MHPA on the Wall-Hudson property in Dennery Canyon will be restored/ enhanced and preserved in perpetuity. In addition, 6.24 acres of upland/wetland habitat will be created along the relocated drainage channel west of La Media Road including 3.28 acres of southern willow scrub/freshwater marsh and 2.96 acre of adjacent upland habitat. The La Media drainage is immediately upstream from and drains into a San Diego button-celery preserve which is immediately adjacent to and drains into the MHPA.

The Bonita Meadows Open Space Preserve is within the NCCP planning areas, but outside of the MHPA and the preserve design for the City of Chula Vista Sub-area Plan. To offset impacts to non-native grasslands within the proposed ROW, 44.7 acres of disturbed native grassland will be preserved and managed in perpetuity. In addition, 14.03 acres of ACOE and CDFG jurisdictional areas will be created/restored/enhanced within the drainage corridor of the unnamed creek that crosses Bonita Meadows Open Space Preserve. Much of the remaining acreage at the Bonita Meadows Open Space Preserve is preserved to offset impacts to Otay tarplant from the construction of SR-125 and to offset impacts to CSS and gnatcatchers from the construction of the managed lanes on I-15. The remaining habitat available at the Bonita Meadows Open Space Preserve will be available to offset impacts from future Caltrans projects in the area.

Coastal California gnatcatcher

The proposed Project has the potential to directly affect the gnatcatcher. Direct effects will occur from the temporary and permanent removal of habitat, potential effects of noise during construction, potential effects of lighting during construction, and restoration activities to offset permanent and temporary impacts.

Direct effects to one gnatcatcher pair are expected from the permanent removal of 12.3 acres of CSS and 3.2 acres of MSS, and portions of the 134.1 acres of non-native grassland. Although gnatcatchers were not observed directly within the proposed ROW, one pair was detected immediately adjacent to the Project footprint. Since the occupied CSS and MSS are continuous with the occupied gnatcatcher habitat, it is likely that the removal of CSS, MSS and non-native grassland will harm the gnatcatchers in these areas. To offset direct impacts from habitat destruction to the gnatcatcher, 12.3 acres of CSS and 6.2 acres of MSS will be preserved at the Wall-Hudson property. An additional 67.1 acres of disturbed native grassland will be preserved at Wall-Hudson (22.4 acres) and Bonita Meadows (44.7 acres).

Gnatcatchers typically maintain year-round territories that fluctuate in size (breeding vs. non-breeding seasons) and may shift slightly between years (Preston *et al.* 1998). If construction is conducted during the breeding season (February 15 through August 31), noise and disturbance associated with construction would likely adversely affect gnatcatchers in adjacent occupied habitat by disrupting breeding and foraging, and causing the birds to frequently flush from the nest, endangering eggs and chicks. Construction noise is a concern if it is at such a level that it masks vital communication signals (Awbrey 1993), normal singing behavior, or alters the ability to detect conspecific encroachments, defend a territory, attract a mate, detect or warn of the approach of a predator or other interspecific intruder, and/or forage adequately. Direct effects to one pair of gnatcatchers west of Otay Mesa Road, and another pair of gnatcatcher pairs in the central section of Spring Canyon, detected within 500 feet of the ROW are expected due to construction and operational noise. Indirect effects from construction noise were quantified as occurring within an area 500 feet wide along the length of the ROW, and impacts to 16.72 acres of CSS and 6.25 acres of MSS within this 500-foot wide corridor will be considered permanent. To offset these impacts, 22.97 acres of CSS/MSS will be preserved in perpetuity at Wall-Hudson.

The proposed Project will be constructed during the daytime and nighttime hours. Lighting introduced onto the project site during construction may adversely affect adjacent habitat areas and facilitate predation of gnatcatchers. However, Caltrans proposes to reduce the potential for such impacts by selectively placing, shielding, and directing lights away from adjacent habitat.

Although no gnatcatchers were detected within the Wall-Hudson restoration site, gnatcatchers may occur on lands adjacent to, or within the restoration area. In addition, gnatcatchers do occupy the CSS adjacent to the riparian corridor at Bonita Meadows where restoration will occur to offset impacts to State and Federal jurisdictional waters. Therefore, restoration and maintenance activities during the gnatcatcher breeding season could potentially disrupt breeding and foraging, and cause the birds to frequently flush from the nest, endangering eggs and chicks. To avoid and minimize potential direct effects to breeding gnatcatchers during restoration and maintenance activities, a qualified biologist will monitor the restoration site and adjacent habitat for breeding activity prior to initiating restoration and maintenance activities. A qualified biologist will locate gnatcatcher nests at the restoration site prior to initiating maintenance work. If a nest is detected, maintenance activities will occur by hand and outside of a 100-foot exclusion zone around the nest. Details of the restoration program will be developed in coordination with the Service.

Any direct impacts to designated critical habitat for the gnatcatcher at Bonita Meadows will be beneficial. Enhancing and restoring the riparian habitat along the stream corridor at Bonita Meadows will ultimately benefit the gnatcatcher.

Quino checkerspot butterfly

The proposed Project has the potential to directly affect Quino. Direct effects would occur due to the temporary and permanent removal of habitat, fragmentation of breeding and foraging habitat, restoration activities to offset permanent and temporary impacts, fugitive dust during construction, and adult Quino colliding with construction equipment and personal vehicles of construction staff.

The proposed Project has the potential to harm or kill Quino during clearing and grading activities. All individuals living within the ROW that will be cleared and graded will be killed when the habitat that they occupy is destroyed. All individuals living adjacent to the ROW may be harmed by the loss of available breeding habitat. To offset this loss, 4.66 acres of mesa top and upper canyon rim at Wall-Hudson will be restored/enhanced to support the life stages of Quino. In addition, the entire ROW will be surveyed for adult Quino prior to the start of construction. If adult Quino are detected, then larval surveys will be conducted and if detected, salvaging of Quino larvae will occur with the salvaged material being translocated to an appropriate location within Dennery Canyon.

In addition, the proposed Project will fragment the mesa tops around the northern portion of Spring Canyon. The mesa tops to the east and west of Spring Canyon are continuous from Otay Mesa Road to the Mexican border. The proposed Project will completely separate the mesa tops to the south with the mesa tops to the north, including the OCCS preserve. Since Quino were sighted within the OCCS preserve, Quino that attempt to fly between the areas on the north side of the ROW and areas to the south of the ROW will have to cross SR905 increasing the chances of collisions with motor vehicles. To reduce the effects of fragmentation, Spring Canyon will be spanned by two bridges creating a wildlife corridor. In addition, a corridor along the northern ROW will connect Spring Canyon with the OCCS preserve.

During restoration activities, there is the potential to harm or kill Quino larvae by inadvertently stepping on individuals, pulling weedy plants that may have Quino larvae on them, or by crushing individuals during grading activities. To avoid and minimize impacts to Quino during restoration activities, restoration areas on the mesa tops at Wall-Hudson will implement conservation measures that include surveying areas with dot seed plantain for Quino larvae, flagging and avoiding areas where Quino larvae are detected, and hand weeding within 10 meters of flagged areas.

To offset impacts from fugitive dust, dust control BMPs will be implemented according the Caltrans Standard Specifications, including Section 7-1.01F Air Pollution Control, Section 10 Dust control, Section 17 Watering, and Section 18 Dust palliative. To avoid and minimize the potential for collisions of adult Quino with motor construction vehicles and personal vehicles of construction staff, vehicle speeds on access roads to the proposed Project footprint will be maintained at below 25 MPH.

Vernal Pool Species

The rarity of the vernal pool species is clearly related to their adaptation to a very specialized and naturally rare habitat. The continued existence fo these species is entirely dependent upon the long-term survival of a functioning vernal pool ecosystem. Destruction of the remaining vernal pools, including pools which are suitable but presently unoccupied by listed species, precludes potential recovery efforts for the many listed species dependent upon vernal pools. Task 2 in the Vernal Pool Recovery Plan states that "Restoration and reintroduction are necessary to expand the current ranges of these (vernal pool species) endemic species to reduce risk of extinction through random and natural events." The proposed Project alignment between Caliente

Boulevard and Heritage Road crosses Stockpen gravelly clay loam soils (Stockpen soils). Stockpen soils on Otay Mesa support numerous vernal pool complexes including J14 between Caliente Boulevard and Heritage Road. The loss of Stockpen soils due to constructing the proposed Project will reduce the amount of suitable land available for the restoration and reintroduction of vernal pools and listed vernal pool species respectively.

Clearing and grading activities will directly effect three pools supporting San Diego fairy shrimp, one pool supporting both San Diego and Riverside fairy shrimp and one pool containing 15 button-celery plants. Direct impacts to 0.14 acre of pool habitat and the contributing watersheds will be offset by restoring/enhancing 0.39 acre of pool surface area and 3.9 acres of contributing watershed for a total of 4.29 acres of vernal pool complex at Wall-Hudson. In addition, the enhancement activities to offset impacts to Quino would include enhancing vernal pools and their contributing watersheds.

To minimize impacts to San Diego and Riverside fairy shrimp, a series of conservation measures directing the planning and implementation of restoration efforts at Wall-Hudson are discussed above, including the collection of topsoil from vernal pools to be impacted that area occupied by fairy shrimp. However, there is the potential for the loss of fairy shrimp cysts during the salvage and storage of soils containing vernal pool inoculum. The longer inoculum is stored, the higher the potential for loss of fairy shrimp cysts because of unknown factors such as, natural aging and loss of viability; and infestation by disease, fungus, or some other pest. The Project proponent will implement conservation measures to salvage correctly and store the soil inoculum for one year until the restored pools to be inoculated pond water for a sufficient period of time to support the life cycle of Riverside fairy shrimp.

Indirect Effects

Indirect effects to the gnatcatcher, Quino and, the three vernal pool species may occur from operation and maintenance activities within the road effect zone. The estimates of indirect effects used a habitat-based approach and considered: (1) the degradation of habitat adjacent to the highway as a result of vehicle traffic noise and other proximity effects (wildlife/vehicle collisions) altering the mobility and behavior patterns of wildlife species within the area, (2) the isolation or fragmentation of remaining adjacent habitat following highway construction and the effect on wildlife corridors between these areas, and (3) the introduction and spread of exotic plant species has the potential to convert native habitat into disturbed habitat unsuitable for federally threatened and endangered species.

The road effect zone (Forman *et al.* 1997, 2000) is the area from the road edge to some outer limit within which road traffic has significant ecological effects on wildlife. The effect distance of the road effect zone is based on traffic intensity, whether the road is a two lane or greater than two lane roadway, the species present along the roadway, and a variety of ecological variables. Changes in traffic intensity can alter the effect of roads and the width of the road effect zone. For each species, there is a threshold where the distance of the road effect zone stabilizes. For the SR-125 South Project, Caltrans established a road effect zone threshold width of 300 feet on each side of the roadway where habitat exists. The 300 foot distance is based on the reasonable assumption that most effects would be diminished to an inconsequential level beyond this distance.

Indirect effects to the gnatcatcher and Quino may occur from operational impacts of SR905 (roadkill, fugitive dust, elevated noise levels) and the introduction and spread of exotic plant species. During the operation of the SR 905 Extension, gnatcatchers and adult Quino that travel into the ROW have the potential to be struck by vehicles. In addition, habitat can become degraded from elevated noise levels and fugitive dust settling on native vegetation. To offset indirect effects to gnatcatchers and Quino from vehicle strikes, fugitive dust and elevated noise levels, 6.5 acres of CSS and 4.8 acres of MSS will be preserved at Wall-Hudson. This acreage overlaps the direct impacts from the temporal habitat loss and therefore is included in offsetting measures for direct temporal loss of habitat.

Invasive species are now recognized as a threat to biodiversity within native vegetation, second only to direct habitat loss and fragmentation (Pimm and Gilpin 1989, Scott and Wilcove 1998). Non-native, weedy species may out-compete and exclude native species potentially altering the structure of the vegetation, degrading or eliminating habitat needed by the gnatcatcher for breeding and foraging south of the ROW, riparian communities downstream of the ROW, vernal pool species adjacent to the ROW and east of the POE, and providing food and cover for undesirable non-native animals (Bossard *et al* 2000).

Caltrans has a history of using invasive exotic species as part of their planting pallette along roads within their ROW. In our April 24, 1998, letter to the Chief Landscape Architect and our September 9, 1998, letter to the Wildflower Program Coordinator at Caltrans, we expressed our concern with the continued use of invasive plant species in road construction and improvement projects. We encouraged Caltrans to follow Executive Order 11987 to "restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States." Caltrans landscape architects continue to design landscaping plans using invasive species such as iceplant (*Mesembryanthemum crystallinum*) and cat's claw (*Acacia* ssp.). Caltrans landscape architects also continue to incorporate new, unknown exotic plant species into their project designs. The long-term affect of these new plants on the natural environment is often unknown until it is too late when the species becomes problematic. We have been working with Caltrans to transition away from using known invasive exotics, but continue to meet with resistance to change, even though our 1998, letters resulted in a Memorandum from the Chief of the Office of State Landscape Architecture encouraging local Districts to "Use regionally-appropriate native plant materials wherever possible, and avoid the use on non-native plant materials in areas near natural open space or wildlands, which may escape and colonize, or hybridize with native species." The indirect effects from introducing invasive exotic plant species along road sides continues to be problematic. To minimize the potential effects to gnatcatchers, and Riverside and San Diego fairy shrimp due to exotic plant invasion into natural habitat, the Service will coordinate with Caltrans Landscape Architects to develop appropriate planting palettes for the Project.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

We anticipate that a wide range of activities within the action area may affect the species addressed in this Opinion. Such activities include, but are not limited to, urban, water, flood control, highway, and utility projects; as well as conversion or degradation of habitat resulting from agricultural use. Many of these activities will be reviewed under section 7 of the Act as a result of a federal nexus and therefore would not be considered cumulative impacts. However, emergency repairs to water and sewer infrastructure often never receive permits from regulatory agencies or the permitting occurs after-the-fact. In addition, gnatcatcher, Quino, and vernal pool habitat continues to be degraded from the lack of effective habitat management and protection from off road vehicles, illegal dumping, and invasive weeds. In particular, invasive weeds such as bromes (*Bromus* spp.), artichoke thistle (*Cynara cardunculus*), sweet fennel (*Foeniculum vulgare*) and mustards (*Brassica* spp.) are changing the habitat characteristics to be unfavorable to the long term viability of sensitive and listed plant species.

CONCLUSION

After reviewing the current status of the species at issue, the environmental baseline for the action area, the effects of the proposed SR-905 Extension Project, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the coastal California gnatcatcher, Quino checkerspot butterfly, San Diego fairy shrimp, Riverside fairy shrimp, and San Diego button-celery; and will not adversely affect designated critical habitat for the gnatcatcher.

We present this conclusion based on the following reasons:

1. The proposed action would harm three (3) pairs of gnatcatchers, a small portion of the range-wide populations of this species. The permanent and temporal loss of 29.02 acres of CSS and 9.45 acres of MSS is not large relative to the extent of habitat remaining over the coastal California gnatcatcher's range. The anticipated loss of CSS and MSS will be minimized by preserving 38.47 acres of CSS/MSS at Wall-Hudson.

2. The anticipated loss of CSS, MSS, and non-native grassland near Spring Canyon and the OCCS preserve is not expected to significantly decrease the long-term viability of the Quino checkerspot butterfly. To minimize impacts to Quino, 4.61 acres of canyon rim and mesa top will be enhanced/restored at Dennery Canyon.

3. The anticipated loss of three pools containing San Diego fairy shrimp and one pool supporting San Diego and Riverside fairy shrimp, and the permanent disturbance of one pool supporting 15 San Diego button-celery plants is not expected to significantly

decrease the long-term viability of these three vernal pool species. The loss of 0.14 acre of pool surface area and contributing watershed is not large relative to the extent of habitat remaining over the San Diego button-celery's range, and the San Diego and Riverside fairy shrimp's range. To minimize impacts to these three species, 0.39 acre of vernal pool surface area and 3.9 acres of contributing watershed will be restored/ enhanced on the mesa tops at Wall-Hudson. To further minimize impacts to San Diego button-celery, seed will collected from the impact area and distributed within pools at Wall-Hudson and the fifteen individuals within the proposed Project footprint will be salvaged and transplanted within pools at Wall-Hudson.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by FHWA and/or agencies and individuals designated by FHWA, as the lead federal agency for the project. FHWA has ongoing responsibility to regulate the activity that is covered by this incidental take statement. If FHWA: (1) fails to assume and implement the terms and conditions or (2) fails to require its designated agency(ies) and individual(s) to adhere to the terms and conditions of this incidental take statement through enforceable terms incorporated into contracts, grants, and permits related to work activities associated with the project, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of the incidental take, FHWA or its designated agency(ies) or individual(s), must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(I)(3)].

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

The Service will not refer the incidental take of any such migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including the amount and/or number) specified herein.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that three (3) pairs of gnatcatchers could be harmed as a result of this proposed action. The take of one pair of gnatcatchers may be in the form of harm as a result of the removal of 12.3 acres of CSS and 3.2 acres of MSS and temporal loss of 16.72 acres of CSS and 6.25 acres of MSS that otherwise could be utilized by the gnatcatcher as foraging and/or nesting habitat. The take of the other two pairs of gnatcatchers detected within 500 feet of the ROW may be in the form of harm from construction and operational noise.

The Service anticipates that an unknown, but small number of Quino could be harmed as a result of this proposed action. The take may be in the form of harm due to fugitive dust during construction, adult Quino colliding with construction equipment and personal vehicles of construction staff, removal of potential Quino habitat in the Project ROW adjacent to the OCCS preserve and Spring Canyon. Take may also occur during restoration activities at Wall-Hudson.

The Service anticipates that an unknown, but small percentage of the populations of cysts/eggs of San Diego and Riverside fairy shrimp in the bottom substrate within the four pools could be harmed by the proposed action. The take may be in the form of harm as a result of the salvaging of pool substrate and the grading and recontouring of the areas containing vernal and road pools.

EFFECT OF THE TAKE

This level of take is not likely to result in jeopardy to the coastal California gnatcatcher, Quino checkerspot butterfly, San Diego fairy shrimp and the Riverside fairy shrimp.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measure is necessary and appropriate to minimize take of gnatcatchers, Quino, San Diego fairy shrimp, and Riverside fairy shrimp:

1. The FHWA and their representatives shall ensure that construction activities, and anthropogenic disturbances to listed species and their habitats are avoided and/or minimized.

2. Unavoidable Project impacts will be offset by the implementation of the mitigation as described in the EIS, Biological Assessment, and biological opinion.

3. The Project proponent shall ensure that the conservation goals for the covered species and habitat types of the MSCP are not adversely affected due to the subject Project.

4. To minimize the potential take of Riverside and San Diego fairy shrimp due to loss of cysts in stored inoculum, fairy shrimp vernal pool restoration will commence the first summer/fall season prior to or concurrently with the start of Project construction.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, FHWA and their representatives must comply with the following term and condition, which implements the reasonable and prudent measures described above and outline required reporting/monitoring requirements. This term and condition is non-discretionary.

The FHWA shall implement reasonable and prudent measures 1, 2, and 3 through the following terms and conditions:

1. The FHWA and their representatives shall fully implement all of the Conservation Measures included as part of the project description of this Opinion.

2. The FHWA and their representatives shall submit all landscape designs and planting palettes to the Service for approval at least 60 days prior to scheduled implementation. All landscaping for the Project shall follow the Service approved landscaping plans.

The FHWA shall implement reasonable and prudent measure 4 through the following term and condition:

1. Because stored fairy shrimp cyst viability may decrease and the probability that cysts may be otherwise be harmed in storage (e.g., fungus, heat, etc...) increases over time, any temporal loss of vernal pools caused by delays in initiating restoration shall be compensated through additional fairy shrimp occupied vernal pool preservation and/or restoration at a 0.5:1 ratio for every 6 months of delay (i.e., 1:1 for 12 months delay, 1.5:1 for 18 months delay, etc.). The Service shall waive the requirement for additional vernal pool preservation an/or restoration only if a justification for any delay is provided to us in writing and we concur with the justification.

The Service retains the right to access and inspect the project site for compliance with the proposed project description and with the term and condition of this biological opinion. Any habitat destroyed that is not in the identified project footprint should be disclosed immediately to the Service for possible reinitiation of consultation. Compensation for such habitat loss will be requested at a minimum ratio of 5:1 (habitat in kind).

Reporting Requirements

In order to demonstrate compliance with the foregoing Project Description and Conservation Measures, FHWA, or its designated contact, shall submit an annual report to the Service that describes and summarizes the implementation of the proposed project and its associated Conservation Measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information.

1. FHWA and their representative agencies should implement a process that leads to the discontinuance of invasive exotic plant species in their landscaping plans and transition into using only non-reproducing exotic plant species and local native plant species.

2. FHWA and their representative agencies should purchase for long-term preservation, all lands supporting the J14 vernal pool complex and other properties with vernal pools on Stockpen gravelly clay loam soils within parcel boundaries required to be purchased for the SR905 ROW. These lands should be added to the MHPA.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the SR-905 Extension Project outlined in the initiation request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions or concerns about this biological opinion, please contact John DiGregoria of my staff at (760) 431-9440.

Sincerely,

for

Therese O'Rourke
Assistant Field Supervisor

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PRELIMINARY FOUNDATION REPORT
OTAY MESA ROAD UNDERCROSSING,
CALTRANS BRIDGE NOS. 571202R/L
STATE ROUTE 125 – KILOMETER POST 1.09,
SAN DIEGO COUNTY, CALIFORNIA

Prepared For

PARSONS
110 West "A" Street, Suite 1050
San Diego, California 92101

Project No. 600158-905

September 27, 2007

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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Project No. 600158-905

To: Parsons
110 West "A" Street, Suite 1050
San Diego, California 92101

Attention: Ms. Marie Santos, PE

Subject: Preliminary Foundation Report, Otay Mesa Road Undercrossing, Caltrans Bridge Nos. 571202R/L State Route 125 - Kilometer Post 1.09, San Diego County, California

In accordance with your request and authorization, we have conducted a preliminary foundation study for the proposed Otay Mesa Road Undercrossing located in southwestern San Diego County. The bridge project is to consist of two bridge structures associated with the SR-125 Otay Mesa Road Undercrossing located approximately 1.3 kilometers (km) east of the La Media Road. The accompanying report presents a summary of our preliminary study and provides preliminary geotechnical conclusions and recommendations relative to the proposed bridge project.

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,

LEIGHTON CONSULTING, INC.

Robert C. Stroh, CEG 2099
Senior Project Geologist

REGISTERED GEOLOGIST · ROBERT C. STROH NO. 2099 CERTIFIED ENGINEERING GEOLOGIST EXP 10/31/09 · STATE OF CALIFORNIA

Sean Colorado, GE, 2507
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER · SEAN A. COLORADO No. 2507 Exp: 12/31/07 · GEOTECHNICAL · STATE OF CALIFORNIA

RCS/SAC/jss

Distribution: (5) Addressee

3934 Murphy Canyon Road, Suite B205 ■ San Diego, CA 92123-4425
858.569.6914 ■ Fax 858.292.0771 ■ www.leightonconsulting.com

TABLE OF CONTENTS

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TABLE OF CONTENTS (Continued)

1.0 INTRODUCTION

The purpose of our preliminary foundation report is to provide a preliminary evaluation of geotechnical site conditions and to provide preliminary recommendations for design of the proposed Otay Mesa Road Undercrossing bridge structures. The scope of our investigation included review of information for nearby sites, limited field investigation, and preparing this geotechnical report for the bridge. This report was prepared in accordance with the current Caltrans Guidelines for Structures Foundation Reports, Version 2.0, dated March 2006.

1.1 Project Location

The project is located in southwestern San Diego County 2.3 kilometers (km) north of the U.S. border with Mexico and approximately 1.3 km east of the La Media Road. The bridge structures are part of the Connector between the SR-125 Toll Road and the future SR-905. The overall project alignment and specific project location are depicted on Figure 1.

1.2 Project Description

Specifically, the bridge project consists of two similar bridge structures, one Northbound (Right) and one Southbound (Left). Each structure will consist of a two span, cast-in-place prestressed concrete box-girder structure. Based on our review of the Bridge Site Data Submittal (BSDS) dated July 23, 2007, for the Otay Mesa Road Undercrossing, by Parsons, the bridge lengths are approximately 75 meters (m) for both the Right and Left bridges. Span lengths range from approximately 31 m to 44 m. Each bridge deck measures approximately 12.6 m wide with a clear space between bridges of approximately 22 m. Existing grades in the area range between elevation 157 m on the south side (Abutments 1R and 1L) and elevation 161 m on the north side (Abutments 3R and 3L). The bridge alignments as described above are depicted on Figure 2.

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Subsurface Exploration

Our subsurface investigation consisted of the excavation of five small-diameter hollow-stem auger (HSA) exploratory borings. An additional sixth HSA boring is to be performed at a later date at Bent 2L where current access conflicts exist. The purpose of these explorations was to evaluate the engineering characteristics of the onsite soils with regard to the proposed bridge structure. The borings allowed evaluation of the onsite soils, including those likely to be encountered at and below the proposed foundation elevations and provided samples for laboratory testing. The boring logs are presented in Appendix B.

The exploratory soil borings were excavated to depths ranging from 12.5 m to 24.5 m below ground surface (bgs). The soil borings are designated B-1 (Abutment 3L), B-2 (Abutment 3R), B-3 (Bent 2R), B-4 (Abutment 1L), and B-5 (Abutment 1R) and were drilled and sampled on July 27, 30, 31, 26, and July 27, 2007, respectively. Rick Engineering surveyed the proposed boring locations based on the locations provided in our work plan dated July 3, 2007, prior to our drilling the locations. Final borehole locations are presented on Figure 2. Tri-County Drilling of San Diego, California provided the drilling rig and performed the soil boring work under subcontract to Leighton Consulting. Fieldwork was coordinated and directed by Leighton Consulting.

Each soil boring was advanced using a CME 75 drill rig with 200 mm diameter hollow stem augers. Our field geologist maintained a log of each soil boring, visually classified soils encountered according to the Unified Soil Classification System (ASTM D 2488), and obtained samples of the subsurface materials. Ground water was observed and measured in the soil borings. While local perched zones were noted, the regional ground water table was not encountered. Soil borings were backfilled with bentonite-cement grout.

Soil samples were generally obtained from the borings at 1.5 m intervals using either a SPT sampler (51 mm O.D. and 35 mm I.D) or a California sampler (76 mm O.D and 61 mm I.D.) with 150 mm long sample tubes. The samplers were driven into the subsurface materials with an automatic trip hammer (63.5 kg hammer dropping 760 mm). Blow counts were recorded at 150 mm intervals for each sample, except where sampler refusal was encountered at a lesser increment (greater than 50 blows per 150 mm).

The blow counts recorded on the boring logs represent the raw field data and have not been corrected for the effects of overburden pressure, rod effects, borehole diameter, variation in sampler size, or hammer energy correction. Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our San Diego laboratory for further testing.

2.2 Previous Studies

One soil boring and three test pit excavations were previously performed at this site. The soil boring was performed for a report entitled "State Route 125 Toll Road Stations 27+00 to 168+30, San Diego County, California, Phase 1 Preliminary Geotechnical Design Report and Phase 1 Preliminary Bridge Foundation Reports," prepared by Ninyo and Moore and dated September 17, 1999. The boring is designated as B-1 and is shown on Figure 2. It was drilled to 20 meters with a CME 750. The three test pits were excavated for a report titled "Geotechnical Design Report State Route 125 South Toll Road Segment 1A/K.P. 2.7 To 8.2 San Diego, California, May 2005," prepared by Ninyo and Moore and dated May 16, 2005. The test pits are designated TP-136, TP-137, and TP-138. All three test pits were excavated with a Cat 416C Backhoe. The total depth of the excavation on TP-136 is 1.4 meters, the total depth of the excavation on TP-137 is 1.5 meters, and the total depth of the excavation on TP-138 is 0.9 meters. Previous boring and test pit logs are provided in Appendix C.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Regional Geologic Setting

The subject 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. 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 on the basement complex. Together the Santiago Peak Volcanics and the granitics of the Southern California batholith make up the basement complex that these units are deposited onto (Kennedy, 1975).

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. Accelerated fluvial erosion during periods of heavy rainfall, coupled with the lowering of the base sea level during Quaternary time, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms we see in the general site area today. Specifically, the site is located within the southeast portion of the San Diego Embayment in an area characterized by the presence of terraced coastal sedimentary formations of Quaternary to Tertiary age.

3.2 Site-Specific Geology

Based on our subsurface exploration, and review of pertinent geologic literature and maps, the primary bedrock unit at the site is Tertiary-age Otay Formation, which is generally overlain by surficial units consisting of topsoil and both documented (part of SR-905 grading operations) and undocumented fills. The approximate areal extent of the geologic units encountered during our exploration are depicted on Figure 2. A brief description of the geologic units encountered on the site is presented below.

3.2.1 Undocumented Fill (Afu)

Based on mapping performed at the site during our geologic reconnaissance, localized areas of undocumented fill (less than 0.5 m in thickness) exist across the project area. The fills appear associated with the minor grading of the site associated with the current roadways (Otay Mesa Road and SR-905). It is noted that deeper undocumented fills associated with utility trenches or other underground improvements are present at the bridge site. Based on our observations, undocumented fill materials generally consisted of dark brown clayey sands and sandy clays with scattered rock fragments. We estimate that undocumented fill thicknesses range up to approximately 0.5 m locally and potentially up to 3.0 m in the vicinity of Bent 2R, where existing underground utilities are located. In their current condition, these materials are not suitable for the support of structural improvements.

3.2.2 Documented Fill (Afd)

Based on mapping performed at the site during our geologic reconnaissance, areas of documented fill exist to the north and south of the proposed bridge structures. The fills are associated with grading for the on-going roadway construction of the SR-125 Toll Road and stockpile activities for the SR-905. Based on our observations the fill materials generally consisted of light brown to brown clayey sands and sandy clays.

3.2.3 Topsoil (unmapped)

A layer of topsoil mantles the site area. As encountered in our exploratory borings, the topsoil generally consists of brown to dark brown, dry to moist, stiff to hard, locally porous, sandy silty clay with a trace of scattered fine gravel. As encountered in our exploration borings the topsoil reached a maximum thickness of approximately 1.5 m along the southeastern portion of the site (Abutment 1R). As encountered the topsoil was generally dense desiccated with abundant rootlets. Therefore, in their current condition, the topsoil materials are not suitable for the support of structural improvements.

3.2.4 Otay Formation (To)

The entire site is underlain at depth by bedrock material consisting of Tertiary-aged Otay Formation. This unit was encountered in each of the exploration borings below the surficial materials to the total depth explored (maximum 24.7 m). During our drilling exploration, this material generally excavated to light brown to brown, moist, silty fine sand. Where undisturbed, these materials can be classified as a "soft-rock" and are essentially intermediate in physical strength between soil and rock. For the purpose of physical description, we have utilized soil descriptions modified with "stone" to characterize the relatively higher strength of the unit relative to the soil counterpart.

3.3 Geologic Structure

Based on our review of available literature (Appendix A) and our preliminary site investigation, the underlying geologic unit (Otay Formation) contains generally flat-lying bedding. It should be noted however, that locally, portions of the Otay Formation have been observed to contain bentonite clay seams of various strengths and thicknesses. Although these seams may not be oriented in a structurally adverse direction, potential increased loading overlying the seams could result in gross instability. Therefore, where large surcharges are placed on existing grades the presence of clay seams should be addressed regarding gross stability. To address the above potential regarding gross stability and the presence of clay seams, Boring B-6 is proposed to be completed for the Otay Mesa Road UC Final Foundation Report. Boring B-6 will be a "soil core" in the upper portions of the Otay Formation which will provide a continuous sample for the visual evaluation of potential clay seams.

3.4 Ground Water

Ground water was encountered underlying the site at depths ranging between approximately 6.1 and 10.7 m below the existing ground surface (i.e., elevation 154.5 m and 148.3 above mean sea level). Based on site topography, surface water likely drains as sheet flow across the site during rainy periods in a southerly direction. 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 structure.

3.5 Engineering Characteristics of On-site Soils

Based on the results of our laboratory testing of representative on-site soils, and our professional experience on adjacent sites with similar soils, the engineering characteristics of the on-site soils are discussed below.

3.5.1 Expansion Potential

Topsoil across the site is observed to have large desiccation cracks, which are a common indicator or expansive soil movement. In addition, previously completed grading in the site vicinity indicates that topsoil in the area have high to very high expansion potential. Regarding the underlying bedrock units of the Otay Formation, past experience indicates that much of the clay component of the Otay Formation is expansive. In addition, interbeds of waxy pink bentonite are generally considered common within the Otay Formation. Therefore, the expansion potential of the claystone portions of the Otay Formation are anticipated to be high and locally range up to very high. The granular portions of the Otay Formation are anticipated to range from low to medium expansion potential.

3.5.2 Soil Corrosivity

Table 1 below presents soil corrosion tests results from samples collected in borings at the site.

Table 1
Corrosion Test Results

Sample Location	Depth (m)	pH	Minimum Resistivity (ohm-cm)	Soluble Sulfate (ppm)	Chloride Content (ppm)
Boring B-1	0.3 to 1.5	7.9	1850	600	1980
Boring B-1	10.7 to 11.0	7.9	1507	<150	642
Boring B-2	24.4-24.5	8.2	2672	150	647
Boring B-4	0.3 to 1.5	7.9	2603	180	120

Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less. Based on initial test results, the site is considered corrosive. Structural corrosion mitigation measures are provided in Article 8.22 of the Bridge Design Specifications.

Proposed reinforced concrete structures should conform to Caltrans Standards (reinforced concrete footings and piles). Concrete in contact with the ground should be batched using cement in accordance with the Caltrans Standard Specifications. Adequate concrete cover over reinforcing steel should be provided in accordance with good construction practices and Caltrans design standards.

3.5.3 Excavation Characteristics

The site is underlain by clay and sand to silty sandstones and claystones. It is anticipated these on-site materials can be excavated with conventional heavy-duty construction equipment.

3.5.4 Scour

The bridge foundations will not be constructed on an existing waterway, therefore scour potential at the site is considered nil.

4.0 SEISMICITY AND GEOLOGIC HAZARDS

4.1 Faulting and Seismicity

A review of available geologic literature pertaining to the site indicates that there are no known active regional faults that transect or project toward the subject site (Appendix A). The nearest known active regional fault is the Rose Canyon fault located approximately 11.6 km west of the site (Mualchin, 1996).

The closest fault to the site location is the La Nacion fault (Kennedy and Tan, 1977). The La Nacion fault extends south from near Mission Valley across the international border with Mexico. It consists of a broad zone of several fault segments over 1.5 km wide in the region of Chula Vista. The closest fault segment is located approximately 8.3 km west of the site (Trieman, 1993). The La Nacion Fault is not known to offset Holocene material and therefore has been classified as potentially active. The La Nacion Fault is not included as an active fault on the 1996 Caltrans Seismic Hazard Map.

4.1.1 Shallow Ground Rupture

No active or potentially faults are mapped crossing the site and the site is not located within a mapped Alquist-Priolo Earthquake Fault Zone. The nearest mapped segment of the Rose Canyon Fault extends to within approximately 11.6 km west of the site. Cracking due to shaking from distant seismic events is not considered a significant hazard, although it is possible at any site in southern California.

4.1.2 Liquefaction

Liquefaction of soils can be caused by strong vibratory motion due to earthquakes. Both research and historical data indicate that loose, saturated, granular soils are susceptible to liquefaction and dynamic settlement. Liquefaction is typified by a reduction in of shear strength in the affected soil layer. Liquefaction may be manifested by excessive settlement, sand boils, and bearing failure.

Subsurface data underlying the site for the Otay Formation indicated dense granular to moderately indurated fine-grained soils, which correspond to Soil Profile Type C per Table B.1, 2006 Caltrans Seismic Design Criteria. Type C soil is characterized by very dense soil and soft rock with shear wave velocity of 360m/s < $v_s \leq$ 760m/s, standard penetration resistance N>50, or undrained shear strength $S_u \geq$ 100kPa. Due to its density, Type C soil is not considered liquefiable.

4.1.3 Earthquake-Induced Settlement

Granular soils tend to densify when subjected to shear strains induced by ground shaking during earthquakes. Simplified methods were proposed by Tokimatsu and Seed (1987) and Ishihara and Yoshimine (1992) involving SPT N-values used to estimate earthquake-induced soil settlement.

Due to low susceptibility of the site to liquefaction, the potential for earthquake-induced settlements is considered to be low during strong ground shaking. Earthquake-induced settlements tend to be most damaging when differential settlements result. Earthquake-induced total and differential settlement are expected to be negligible.

4.1.4 Seismic Slope Instability

Slope instability, in the form of landslides and mudslides, is a potential adverse impact associated with seismic shaking. The proposed 1:2 (vertical:horizontal) fill-over-cut slope at the north abutments, if properly constructed in accordance with Caltrans Standard Specifications, are anticipated to be stable under seismic shaking.

4.1.5 Lateral Spread

Empirical relationships have been derived by Youd and others (Youd, 1993; Bartlett and Youd, 1995; and Youd et. al., 1999) to estimate the magnitude of lateral spread due to liquefaction. These relationships include parameters such as earthquake magnitude, distance of the earthquake from the site, slope height and angle, the thickness of liquefiable soil, and gradation characteristics of the soil.

The susceptibility to earthquake-induced lateral spread is considered to be low for the site because of the low susceptibility to liquefaction.

4.1.6 Tsunamis and Seiches

Based on the distance between the site and large, open bodies of water, barriers between the site and the open ocean, and the elevation of the site with respect to sea level, the possibility of seiches and/or tsunamis is considered to be nil.

4.2 Landslides

No landslides or indications of deep-seated landsliding were noted at the site during our field exploration or our review of available geologic literature, topographic maps, and stereoscopic aerial photographs (Appendix A). A geologic map covering the subject area, and our field study, indicate that the site is generally underlain by favorable oriented geologic structure, such as topsoil and generally massive Otay Formation. In addition, a lack of topographic expression across the site does not support the potential for landsliding. Therefore, the potential for significant landslides or large-scale slope instability at the site is considered nil.

4.3 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. In addition, based on our review of dam inundation and topographic maps, the site is not located within a dam inundation zone.

5.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

5.1 Seismic Design Considerations

The proposed bridge is located within the seismically active region of southern California and should be designed in accordance with current Caltrans Seismic Design Criteria (June, 2006). Our preliminary recommendations for seismic design of the bridge are described in the following sections.

5.1.1 Peak Bedrock Acceleration

The dominant active seismic source for the project is the Rose Canyon Fault, which is located approximately 11.6 km west of the site. This fault is mapped by Caltrans as the Newport Inglewood-Rose Canyon Fault-East, or NIE (Mualchin, 1996). The NIE fault is capable of producing a Maximum Credible Earthquake (MCE) with a moment magnitude Mw of 7.0 (Mualchin, 1996). The site lies between the 0.3g and 0.4g contours of the Caltrans 1996 Seismic Hazards Map. To verify the appropriateness of the mapped values, a check was performed using that attenuation relationship of Sadigh et (1997) using a Mw of 7.2 as identified as the maximum magnitude by the California Geologic Survey (CGS, 2003). That calculation indicated a peak bedrock acceleration of 0.36g (Figure 4). We recommend using a design bedrock acceleration of 0.4g for evaluating the seismic response of the bridge.

5.1.2 Acceleration Response Spectra Curve

Based on our subsurface exploration and experience regarding the Otay Formation at adjacent sites, the formational soils (Otay Formation) below the site are classified as Type C, very dense soil/soft rock. Our classification is based on average standard penetration "N-Values" greater than 50 blows/300 mm, undrained strengths greater than 100 kPa, and our field observations. Therefore, we recommend using soil profile Type C, Magnitude Group 7.25±0.25, and a peak bedrock acceleration of 0.4g to determine the appropriate 5% damped acceleration response spectra (ARS) curve for seismic design.

Because the site is within 15 kilometers of an active fault, the standard ARS curve should be modified to account for near-source effects in accordance with Caltrans criteria. The recommended modifications, as referenced to the bridge period (T) are as follows:

- Spectral acceleration magnification is not required for $T \leq 0.5$ second.
- Increase the spectral accelerations for $T \geq 1.0$ second by 20 percent.
- Linear interpolate spectral accelerations for $0.5 \leq T \leq 1.0$.

The adjusted ARS curve for periods of 0 to 4 seconds is shown on Figure 4.

5.2 General Foundation Conditions

Based on our field exploration and a review of the available geologic data, the existing subsurface conditions at the bridge site appear to consist primarily of Otay Formation (To), overlain by shallow layers (less than 1.5 m) of topsoil and fill. Topsoils and fills are likely to be very clayey and highly expansive, while the Otay Formation consists of dense granular soils having a low to medium expansion potential. Locally deeper fill associated with underground utilities at the site is expected. Approximately 9 to 10 m of new fill will be placed at the bridge abutments.

From a foundation standpoint, the Otay Formation will provide good bearing support for the planned bridge foundations. These materials will also provide a relatively incompressible foundation for the proposed abutment fills.

5.2.1 Anticipated Foundation Type

We anticipate that Abutments 1 and 3, and Bent 2 will be supported on spread footings. Depending on construction sequencing, the spread footings will be founded on competent Otay Formation (To), or compacted engineered fill. Although individual footings may be supported on formation or on engineered fill, transitions from formation to fill beneath individual footings are to be avoided.

CIDH Piles (minimum 600 mm diameter) may be considered for support of the proposed bridge foundations, but shallow foundations are considered more appropriate considering the relatively shallow depth to formation and lighter structural loads. Driven piles are not considered feasible due to the dense to indurated state of the underlying Formation.

5.2.2 Foundation Subgrade Preparation

As previously mentioned, to reach competent bearing strata, remedial removals of topsoil and undocumented fill will be required. Where footings are founded in Otay Formation, removals of the overlying topsoil and fill materials will be required. In addition, the upper portions of the Otay Formation will also need to be removed to competent unweathered materials. We anticipate that topsoil and fill removals will range up to approximately 1.5 m in depth from original grade and locally up to 3 m at the locations of underground utilities. Removals within the Otay Formation will range up to approximately 1.5 m in depth to reach competent materials.

Should footings at the abutments be founded in compacted engineered fill, existing topsoils, fill soils and weathered formation in that area must be removed to competent Otay Formation prior to placement of the engineered fill. Where the footings will be founded in undisturbed sedimentary formational materials (Otay Formation), the subgrade preparation should consist of the removal of all loose soil and debris.

All footing excavations are recommended to be observed by a qualified geotechnical engineer or engineering geologist prior to placing reinforcing steel or concrete. For rough excavated surfaces, a lean concrete leveling pad may be poured prior to placing reinforcing steel or structural concrete to facilitate construction, and to reduce the potential for wetting and saturation of the underlying subgrade during wet weather. Footings should not span a cut-fill transition from formational material to engineered fill. Should such a condition occur, the footing excavation is recommended to be deepened, as necessary, such that the footing is supported entirely on undisturbed sedimentary formational materials (Otay Formation), as verified by the project geotechnical engineer or engineering geologist.

5.2.3 Allowable Footing Bearing Pressure

For preliminary design, spread footings may be designed using the net allowable bearing capacities provided in Table 2. For preliminary load factor design, nominal resistance may be taken as 3 times the allowable bearing capacity (Caltrans Memo to Designers 4-1).

Table 2 Spread Footing Bearing Capacity	
Foundation Subgrade Material	Allowable Bearing Capacity (kPa)
Granular Import Base Materials	285
Otay Formation	335

5.2.4 Settlement

To mitigate the potential for settlement, the preliminary bearing pressures assume that granular base materials will be utilized as structural fill beneath the proposed abutment and bent foundations, or that the footings will be deepened to bear on formational materials. Where foundations are placed on fill, the fill prism should extend down to competent formation at an inclination of 1V:1H from an offset 1 meter from the bottom of the proposed foundations, including abutment wing walls. Based on our preliminary settlement analyses, we estimate the total elastic settlement for the spread footings will be less than 25 mm, and differential settlement between support. locations will be less than 13 mm.

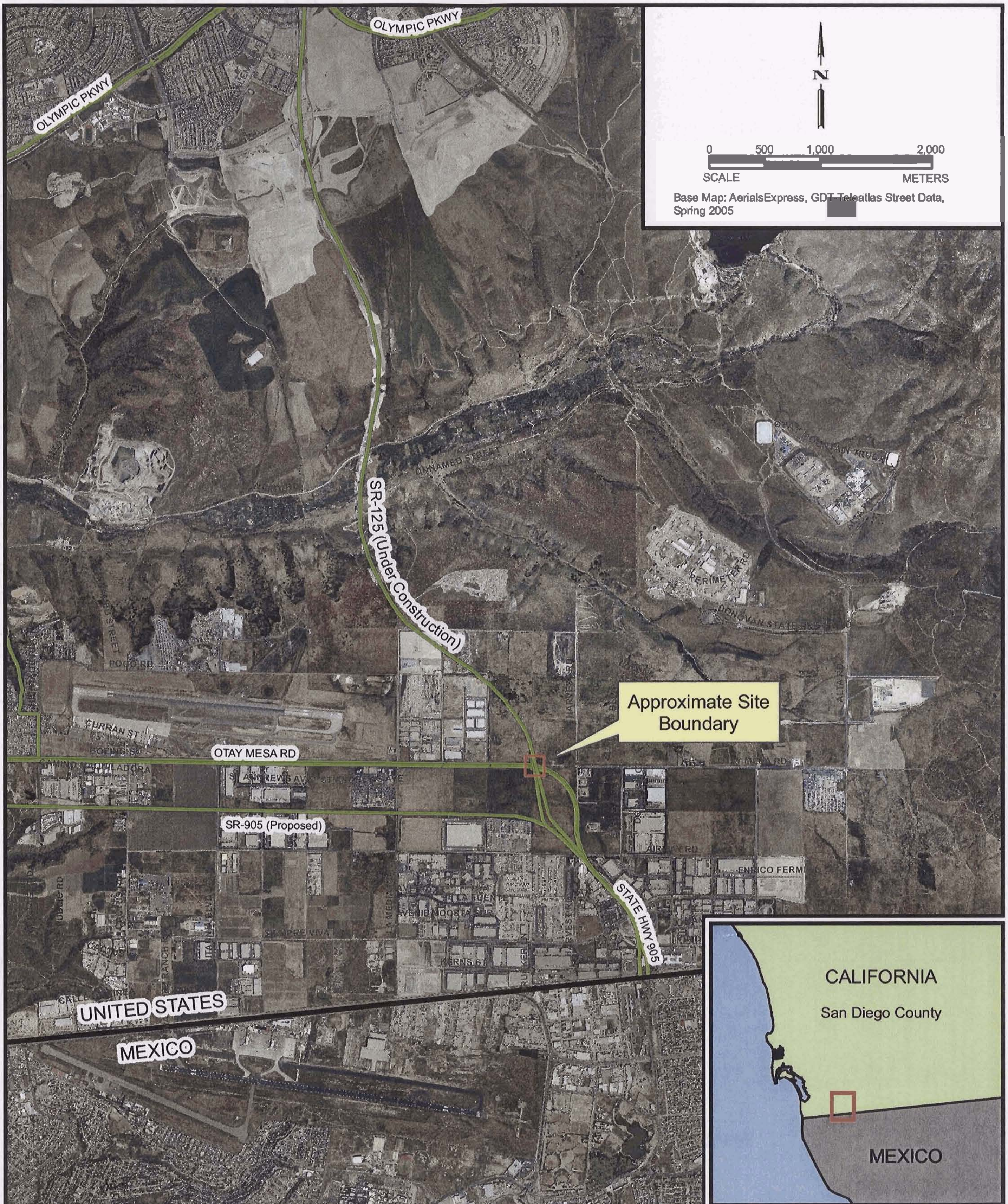
6.0 LIMITATIONS

The recommendations contained in this report are based on preliminary project information regarding structure type, location, and design loads that have been provided by Parsons. Conceptual changes made during final project design, should be reviewed by Leighton Consulting, Inc. during Foundation Report preparation to determine if these foundation recommendations are still applicable. Any questions regarding the contents of this report should be directed to the attention of Sean Colorado, GE, (858) 300-8490 or Robert Stroh, CEG, (858) 300-4090 of Leighton Consulting, Inc.

Please also note that our evaluation was limited to assessment of the preliminary geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

Figures

Leighton



OTAY MESA ROAD UNDERCROSSING SR125/905 Connector San Diego, California	SITE LOCATION MAP	Project No. 600158-905 Date September 2007 Figure 1

\\GIS\project\600158_905_Interchange\905\600158-905_SiteLocationMap.mxd

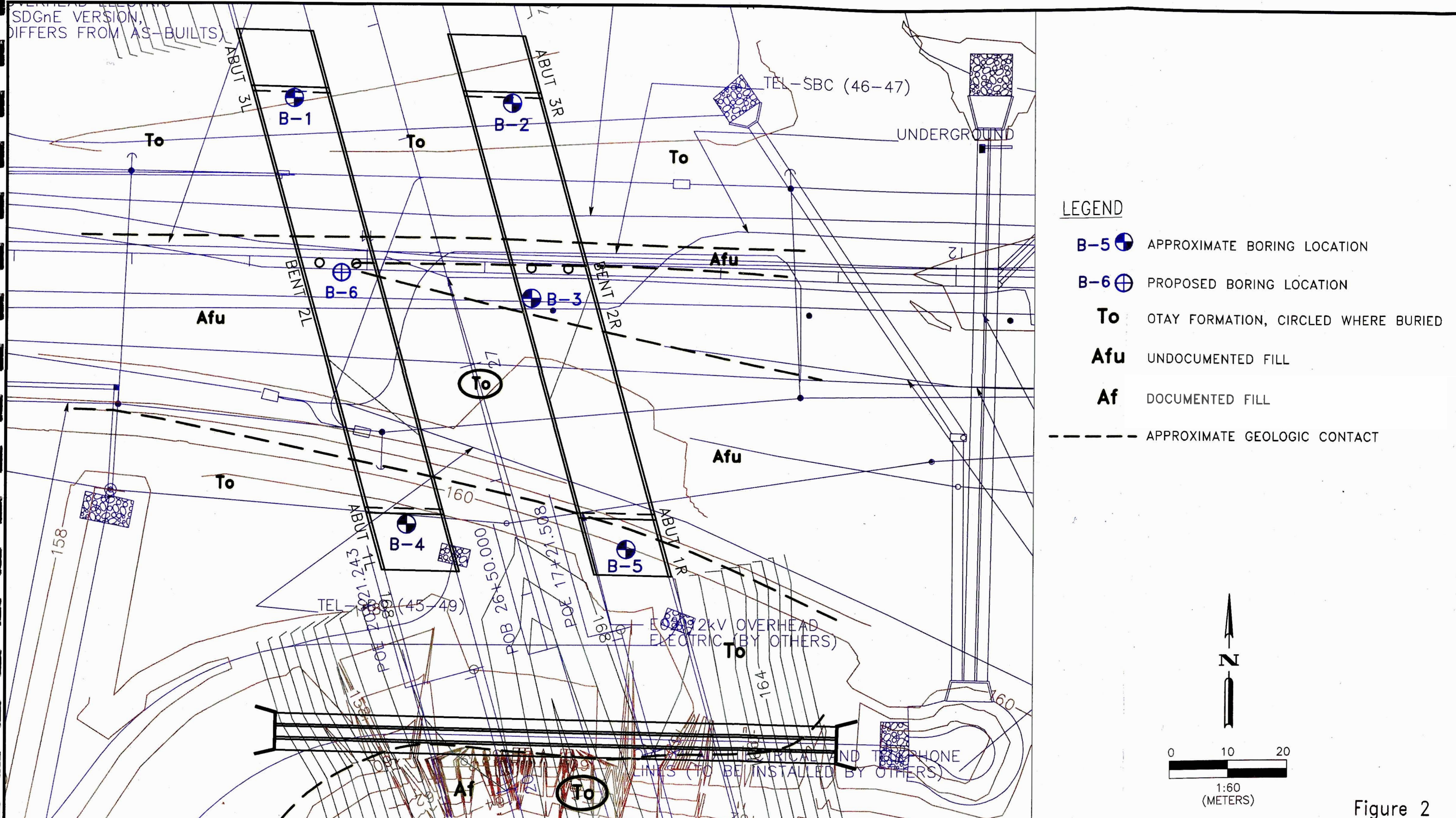


Figure 2

GEOTECHNICAL EXPLORATION MAP

OTAY MESA ROAD UNDERCROSSING
SR125/SR905 CONNECTOR
SAN DIEGO, CALIFORNIA

Leighton

Proj: 600158-905	Scale: 1:60	Date: 9/07
Eng./Geol. SAC/RCS	Drafted By: MAM	CP By: SAC

P:\DRAFTING\600158\905\OF_07-09-26\FIGURE 2.DWG (09-27-07 8:05:26AM) Plotted by: mmurphy

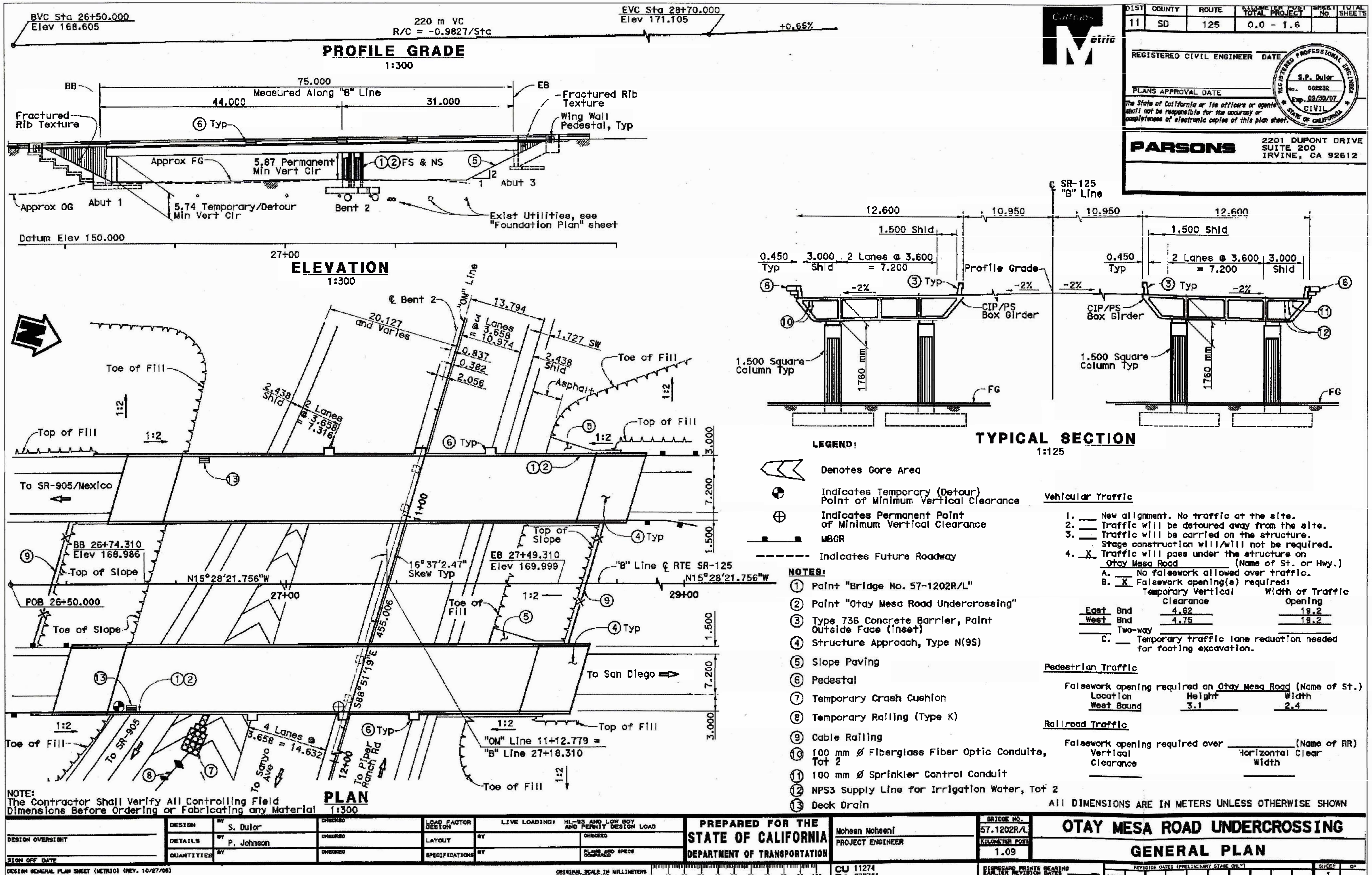


Figure 3

GENERAL PLAN

OTAY MESA ROAD UNDERCROSSING
SR125/SR905 CONNECTOR
SAN DIEGO, CALIFORNIA

Leighton

Proj: 600158-905	Scale: NTS	Date: 9/07
Eng./Geol. SAC/RCS	Drafted By: MAM	CP By: SAC

P:\DRAFTING\600158\905\OF_07-09-26\FIGURE 3.DWG (09-27-07 8:11:14AM) Plotted by: mmurphy

CALTRANS DESIGN ARS SPECTRUM

Project:	Otay Mesa Road UC - SR125/SR905 Connector	Calculation by: SC	Date: 8/22/2007
Project Number:	600158-905		
Location:	San Diego, California	Reviewed by: RCS	Date: 8/22/2007

SEISMIC DESIGN CRITERIA, JUNE 2006 - VERSION 1.4

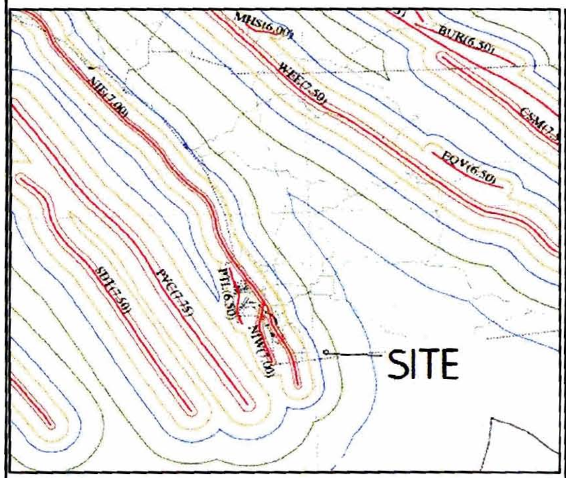
Seismic Parameters

PBA	Peak Bedrock Acceleration	0.4	*g*
M_w	Magnitude Group	7.25 ± 0.25	
r_{rup}	Distance to Rupture Plane	11.6	*km*
S	NEHRP Soil Type	C	*Soft rock and very dense soil*
	Verification Calculation		
	Sadigh et al. (1993, 1997)	0.36	*g*

Adjustment of Standard Curve

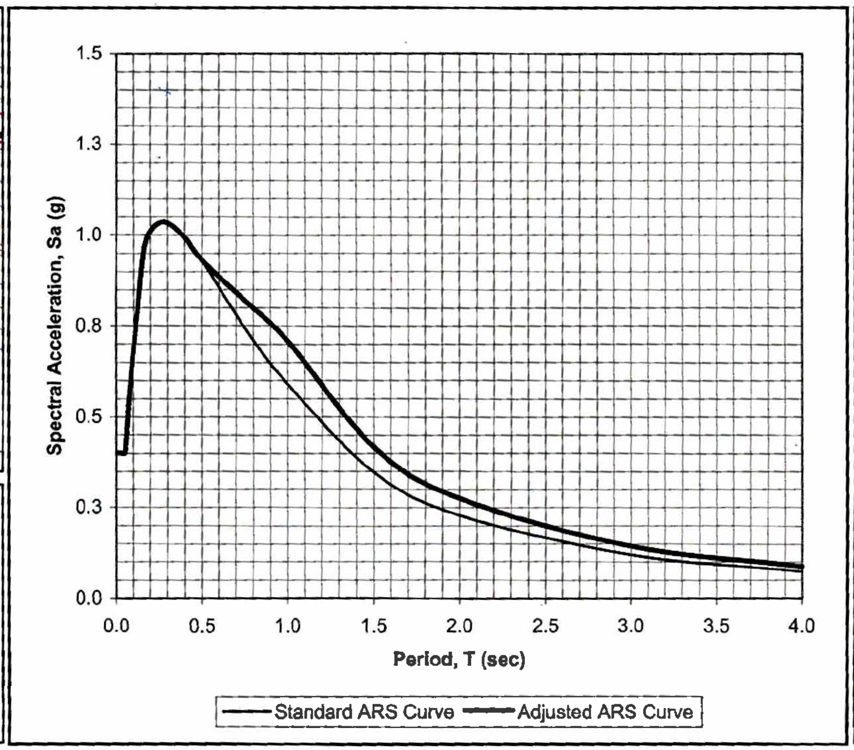
For preliminary design of structures within 15km of an active fault:

- No increase in Sa for T ≤ 0.5 second
- Increase Sa values 20% for T ≥ 1.0 second
- Linear interpolate for 0.5 ≤ T ≤ 1.0 second



LEGEND:

0.7g Peak Acceleration Contour
0.6g Peak Acceleration Contour
0.5g Peak Acceleration Contour
0.4g Peak Acceleration Contour
0.3g Peak Acceleration Contour
0.2g Peak Acceleration Contour
0.1g Peak Acceleration Contour
Special Seismic Source (SSS)
Faults with Fault Codes (MCE)



PERIOD T (s)	STANDARD ARS CURVE Sa (g)	ADJUSTED ARS CURVE Sa (g)
0.010	0.4002	0.4002
0.020	0.4002	0.4002
0.030	0.4002	0.4002
0.050	0.4002	0.4002
0.075	0.5499	0.5499
0.100	0.6795	0.6795
0.120	0.7677	0.7677
0.150	0.9145	0.9145
0.170	0.9744	0.9744
0.200	1.0099	1.0099
0.240	1.0311	1.0311
0.300	1.0330	1.0330
0.400	0.9937	0.9937
0.500	0.9315	0.9315
0.750	0.7455	0.8204
1.000	0.5910	0.7092
1.500	0.3475	0.4170
2.000	0.2293	0.2751
3.000	0.1197	0.1436
4.000	0.0737	0.0884

Figure 4

Appendix A

References

APPENDIX A

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APPENDIX A (Continued)

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Appendix B

Boring Logs

GEOTECHNICAL BORING LOG KEY

Date ______ Sheet 1 of 1

Project KEY TO BORING LOG GRAPHICS Project No. -

Drilling Co. ______ Type of Rig ______

Hole Diameter ______ Drive Weight ______ Drop ______

Borehole Elevation(m) ______ Location ______

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By ______ Sampled By ______	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	
	1							CH		
								OL		
								ML	Inorganic silt; clayey silt with low plasticity	
	2							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	
	3							GP	Poorly graded gravel; gravel-sand mixture, little or no fines	
								GM		
								GC	Clayey gravel; gravel-sand-clay mixture	
								SW	Well-graded sand; gravelly sand, little or no fines	
	4							SP	Poorly graded sand; gravelly sand, little or no fines	
								SM	Silty sand; poorly graded sand-silt mixture	
								SC		
	5								Bedrock	
▽									Ground water encountered at time of drilling	
	6			B-1					Bulk Sample	
				C-1					Core Sample	
				G-1					Grab Sample	
	7			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.)	
	8									
	9									
	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-1

Date 7-27-07 | Sheet 1 of 2

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri County Drilling | Type of Rig CME-75

Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76 m

Borehole Elevation(m) 160.5 | Location Station 27+52/17m left of B-Line

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.5	0							SC	**TOPSOIL** Disturbed clayey SAND; dry and loose along dirt road shoulder; scattered road base gravel intermixed **OTAY FORMATION**	EI,SA,H,CR
159.5	1			B-1						
				R-1	38	12.88	30.2		@ 1.5m: Light gray-brown and pinkish-gray clayey SILTSTONE (ML) and silty CLAYSTONE (CL), slightly moist, very stiff; weathered with blocky texture	CN
158.5	2									
157.5	3									
				S-1	50				@ 3.1m: Light gray silty SANDSTONE (SM), moist, medium dense; fine-grained; friable; trace clay	PI,SA
156.5	4									
				R-2	98	17.57	12.1		@ 4.6m: Upper sample is gray silty SANDSTONE (SM), very moist, dense; micaceous, fine-grained. Lower sample is gray-brown clayey SILTSTONE (ML), moist, stiff; indurated, low to medium plasticity	DS
155.5	5									
154.5	6									
				S-2	69				@ 6.1m: Light gray-brown to clayey SILTSTONE (ML); moist, hard; homogeneous; low plasticity (similar to much of B-4). Note some moisture on outside of sampler	
153.5	7									
				R-3	50/ 130mm	15.61	23.7		@ 7.6m: Light brownish gray, fine sandy SILTSTONE (ML) to silty SANDSTONE with trace clay; moist, very dense; micaceous, very fine grained	DS
152.5	8									
151.5	9									
				S-3	54				@ 9.1m: Light gray-brown, very fine sandy SILTSTONE (ML) with trace clay, generally similar to sample at 7.6m	PI,SA
150.5	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-1

Date: 7-27-07 | Sheet 2 of 2
Project: SR125/905 Interchange | Project No. 600158-905
Drilling Co.: Tri County Drilling | Type of Rig: CME-75
Hole Diameter: 0.20m | Drive Weight: 63.5 kg | Drop: 0.76 m
Borehole Elevation(m): 160.5 | Location: Station 27+52/17m left of B-Line

Logged By: BJO
Sampled By: BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
149.5	11			R-4	72	12.83	36.5		@ 10.7m: Light gray-brown and pinkish gray-brown, silty CLAYSTONE (CL), slightly moist, stiff to very stiff; thinly bedded and somewhat fissile; blocky weathered texture, otherwise tight; waxy with low to medium plasticity; siltier upper sample	CR
148.5	12			S-4	50/ 130mm				@ 12.2m: Light brown, very fine sandy SILTSTONE (ML) to silty SANDSTONE (SM), moist, very dense/stiff; only minor clay	
147.5	13								Total Depth = 12.5m Minor seepage at 4.6m to 5.5m No ground water in hole prior to backfill Backfilled with bentonite cement slurry on 7/27/07	
146.5	14									
145.5	15									
144.5	16									
143.5	17									
142.5	18									
141.5	19									
140.5	20									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

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GEOTECHNICAL BORING LOG B-2

Date 7-27-07
Sheet 1 of 3
Project SR125/905 Interchange
Project No. 600158-905
Drilling Co. Tri County Drilling
Type of Rig CME-75
Hole Diameter 0.20m
Drive Weight 63.5 kg
Drop 0.76m
Borehole Elevation(m) 160.6
Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.6	0					CL	**TOPSOIL** Dark brown, silty CLAY, damp, firm, abundant rootlets; dessicated	
							OTAY FORMATION @ 1.5m: Light brown, silty SANDSTONE (SM), fine-grained, damp, medium dense, friable, mottled with medium brown	
159.6	1							
		S-1	27					
158.6	2							MD,DS,HC
		B-1						
157.6	3	R-1	50/ 130mm	16.29	16.0		@ 3.1m: Dense, very friable	TR
156.6	4							
		S-2	77				@ 4.6m: Moist, slightly more clayey	
155.6	5							
154.6 ▽	6	R-2	50/ 50mm	16.81	17.8		@ 6.1m: Increase clay content, moist to wet, fine- to coarse-grained, friable	CN
153.6	7							
		S-3	91/ 180mm				@ 7.6: Light brown to light olive-brown, moist, slightly friable	
152.6	8							
151.6	9	R-3	50/ 150mm	18.85	10.9		@ 9.1m: Light brown to light pink brown SILTSTONE (ML), moist, hard, mottled with light brown to tan carbonates	TR
150.6	10							

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 7-27-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.6 | Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
149.6	11			S-4	32				@ 10.7m: Light brown to light olive-brown, SILTSTONE (ML) to CLAYSTONE (CL), moist, hard, blocky, trace thin (less than 1 mm) maganese and clay infilled fractures	PI,H
148.6	12			R-4	50/ 130mm	11.58	14.6		@ 12.2m: Light gray-brown SILTSTONE (ML), moist, very dense, slightly cemented, trace mica, thinly laminated	
147.6	13									
146.6	14			S-5	50/ 130mm				@ 13.7m: Water in sample, light gray-brown SILTSTONE (ML), sample interbedded with pink bentonite clay seam (3 cm thick)	
145.6	15			R-5	50/ 100mm	14.72	26.2		@ 15.2m: Gray-brown, silty SANDSTONE (SM), fine-grained, very dense, friable, wet	TR
144.6	16									
143.6	17			S-6	70				@ 16.8m: Brown to pinkish brown CLAYSTONE (CL), wet, hard	SA,H
142.6	18			R-6	50/ 130mm				@ 18.3m: Brown CLAYSTONE (CL), wet, hard, slightly less plastic than previous	TR
141.6	19									
140.6	20			S-7	98/				@ 19.8m: Brown, slightly clayey SILTSTONE (ML), wet, very dense,	

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANALYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 7-27-07 | Sheet 3 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.6 | Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
					230mm				slightly friable, trace maganese oxide blebs, trace mica	
139.6	21									
				R-7	50/ 130mm	15.31	24.2		@ 21.3m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	DS
138.6	22									
137.6	23			S-8	50/ 76mm				@ 22.9m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	SA
136.6	24								@ 24.4m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	
				R-8	50/ 100mm	15.73	27.0		Total Depth = 24.5m Ground water measured at 6.1m below ground surface at completion of drilling Backfilled with bentonite cement slurry on 7/31/07	CR
135.6	25									
134.6	26									
133.6	27									
132.6	28									
131.6	29									
130.6	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** Dark brown sandy CLAY, damp, stiff to hard, abundant rootlets, trace fine gravel	
158.0	1								**OTAY FORMATION** @ 0.9m: Light brown, silty SANDSTONE (SM); fine-grained, slightly moist, dense	
157.0	2									
156.0	3			R-1	50/ 100mm	16.81	19.8		@ 3.1m: Light brown, silty SANDSTONE (SM), fine-grained, slightly moist, dense, moderately friable, slightly mottled with pinkish brown, massive	CN
155.0	4			B-1						
				S-1	58				@ 4.6m: Very dense	SA
154.0	5									
153.0	6			R-2	50/ 100mm	17.07	18.5		@ 6.1m: Slight increase in moisture and clay content	CN
152.0	7									
				S-2	50/ 75mm				@ 7.6m: Strongly cemented silty SANDSTONE (SM); layer approximately 0.46m thick	
151.0	8									
150.0	9			R-3	50/ 100mm	17.71	14.7		@ 9.1m: Moist	
149.0	10									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
148.0	11			S-3	31				@ 10.7m: Light brown to light olive-brown SILTSTONE (ML); wet, very stiff to hard, well indurated, slightly micaceous, massive	SA
147.0	12			R-4	50/ 130mm	15.98	23.5		@ 12.2m: Thin pinkish brown CLAYSTONE (CL) interbed @ 12.3m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
146.0	13									
145.0	14			S-4	50/ 100m				@ 13.7m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
144.0	15			R-5	50 130mm				@ 15.2m: Micaceous	
143.0	16								Total Depth = 15.4m Ground water measured at 10.7m below ground surface at completion of drilling Backfilled with bentonite cement slurry on 7/31/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date 7-26-07
Project SR125/905 Interchange
Drilling Co. Tri County Drilling
Hole Diameter 0.20m Drive Weight 63.5 kg Drop 0.76m
Borehole Elevation(m) 158.9 Location Station 26+77.5/17m left of B-Line

Project No. 600158-905
Type of Rig CME-75

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
158.9	0								**OTAY FORMATION**	
									Light gray-brown to olive-brown, clayey SILTSTONE (ML), slightly moist; low to medium plasticity, trace sand	MD,EI,PI, DS,H,CR
157.9	1			B-1						
156.9	2			R-1	24	13.51	34.0		@ 1.5m: Light gray-brown, silty CLAYSTONE (CL); slightly moist, stiff; low to medium plasticity; clayey silt in sampler, tips cohesive with slightly blocky texture	HC
155.9	3			S-1	20				@ 3.1m: Light gray-brown, clayey SILTSTONE (ML); moist, stiff; some light gray caliche stains, slightly plastic, homogeneous color	SA,H
154.9	4									
153.9	5			R-2	86/ 250mm	15.95	24.4		@ 4.6m: Wet, seepage or ground water encountered	HC
152.9	6			S-2	44				@ 6.1m: Light gray-brown, silty SANDSTONE (SM), wet, very dense; fine-grained; similar color/appearance to above; trace clay	
151.9	7									
150.9	8			S-3	71				@ 7.6m: Light gray-brown SILTSTONE (ML) to sandy SILTSTONE (ML), moist to wet, very stiff; ground water appears perched above	SA
149.9	9			R-3	85	14.97	27.3		@ 9.1m: Light brownish-gray, sandy SILTSTONE (ML), moist, hard; fine-grained; indurated but weakly fissile along near-horizontal planes	CN
148.9	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-4

Date 7-26-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 158.9 | Location Station 26+77.5/17m left of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									@ 10.7m: Light gray-brown, silty CLAYSTONE (CL) to clayey SILTSTONE (ML), slightly moist, hard; massive; pinkish hue to sample tip	
147.9	11			S-4	60					
									@ 11.6m: Ground water encountered, perched	
146.9	12									
				S-5	75				@ 12.2m: Light brown, silty SANDSTONE (SM), wet, very dense; friable, massive; some very fine mica	
145.9	13									
				R-4	50/ 50mm	15.27	24.3		@ 13.7m: Light brown, fine sandy to clayey SILTSTONE (ML), moist, hard; well indurated; moist to wet; slightly blocky texture, otherwise massive	
144.9	14									
143.9	15									
				S-6	83/ 280mm				@ 15.2m: Light gray-brown, clayey SILTSTONE (ML), moist, very stiff; well indurated; pinkish hue similar 10.7m	
142.9	16									
				R-5	50/ 130mm				@ 16.8m: Light pinkish brown clayey SILTSTONE (ML), moist, very stiff; minor very fine sand and mica flake; still indurated with soMe blocky texture; slightly sandier in upper sample; low to medium plasticity	CN
141.9	17									
140.9	18									
				S-7	40				@ 18.3m: Light gray-brown, clayey to fine sandy SILTSTONE (ML), slightly moist to moist, stiff; upper and lower sample sandiest; homogeneous appearance	
139.9	19									
				R-6	50/	15.61	23.7		@ 19.8m: Light gray-brown silty SANDSTONE (SM); moist, dense;	TR
138.9	20									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
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TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date: 7-26-07
Project: SR125/905 Interchange
Drilling Co.: Tri County Drilling
Hole Diameter: 0.20m
Borehole Elevation(m): 158.9
Drive Weight: 63.5 kg
Location: Station 26+77.5/17m left of B-Line
Sheet 3 of 3
Project No.: 600158-905
Type of Rig: CME-75
Drop: 0.76m

Logged By: BJO
Sampled By: BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
					75mm				fine-grained; micaceous; generally similar to above	
137.9	21									
				S-8	79				@ 21.3m: Light gray-brown SILTSTONE (ML); moist, hard, some minor fine sand and clay; slightly plastic, otherwise similar to above	
136.9	22									
135.9	23			S-9	50/ 50mm				@ 22.9m: Light gray-brown, silty, very fine-grained SANDSTONE (SM); moist to wet, very dense; friable; very fine-grained	
134.9	24									
				R-7	50/ 130mm	16.69	17.8		@ 24.4m: Light gray-brown SILTSTONE (ML) with some clay and very fine sand; slightly moist, very dense to hard; generally similar to 21.3m	
133.9	25								Total Depth = 24.7m Ground water noted at 4.6m to7.3m and 11.6m to 13.4m Measured at approximately 6.4m prior to backfill Backfilled with bentonite cement slurry on 7/26/07	
132.9	26									
131.9	27									
130.9	28									
129.9	29									
128.9	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 26+63.5/17 m right of B-Line

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** Dark brown, silty CLAY, moist, stiff, abundant organics to fine rootlets, trace fine-grained gravel; approximately 1m thick, but discontinuous elsewhere across the site	
158.0	1								**OTAY FORMATION** @1.5m: Light reddish-brown, silty SANDSTONE (SM), moist, slightly compact, mottled with light brown, fine-grained	
				S-1	15					
157.0	2									
				B-1						SA
156.0	3								@ 3.1m': Light brown to light olive-brown, silty SANDSTONE (SM), fine-grained, mottled with reddish-brown, moist, dense	DS
				R-1	91	16.10	23.0			
155.0	4									
				S-2	54				@ 4.6m: Light gray silty SANDSTONE (SM), moist, dense; fine-grained; mottled with reddish brown	
154.0	5									
153.0	6									
				R-2	82	17.47	18.2		@ 6.1m: Light brownish-gray silty to clayey SANDSTONE (SC); moist dense; homogeneous and unstained; upper sampler includes orange-brown silty claystone bed, moist, stiff, and waxy, displays dip of 10 to 20 degrees Driller notes ground water encountered	DS
152.0	7									
				S-3	52				@ 7.6m: Light gray, silty to clayey SANDSTONE (SM), moist, dense; fine-grained as above	
151.0	8									
150.0	9									
				R-3	77	15.25	28.3		@ 9.1m: Generally light gray silty SANDSTONE (SM), similar to above; sampler tip is sandy SILTSTONE (ML)with clay; moist, stiff; some pinkish stain/hue locally	
149.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07 — Sheet 2 of 2
Project SR125/905 Interchange — Project No. 600158-905
Drilling Co. Tri County Drilling — Type of Rig CME-75
Hole Diameter 0.20m — Drive Weight 63.5 kg — Drop 0.76m
Borehole Elevation(m) 159.0 — Location Station 26+63.5/17 m right of B-Line

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
148.0	11			S-4	30				@ 10.7m: Light brownish-gray, clayey SILTSTONE (ML), wet, medium stiff	
147.0	12			R-4	50/ 130mm	16.65	21.9		Ground water appears perched above @ 12.2m: Light gray-brown, silty to clayey SANDSTONE (SC), moist to wet, dense; Note, sands may have flowed, fine-grained	
146.0	13									
145.0	14			S-5	50/ 100mm				@ 13.7m: Light gray-brown SILTSTONE (ML), moist, very dense; sample tip is light brown claystone; moist, very stiff to hard	
144.0	15			R-5	50/ 130mm	16.88	21.2		@ 15.2m: Light gray-brown, very fine sandy SILTSTONE (ML), moist, very stiff to hard; localized medium	DS
143.0	16								Total Depth = 15.4m Ground water noted at 6.7m to 11.9m approximately Ground water measured at 5.2m prior to backfill Backfilled with bentonite cement slurry on 7/27/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
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SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

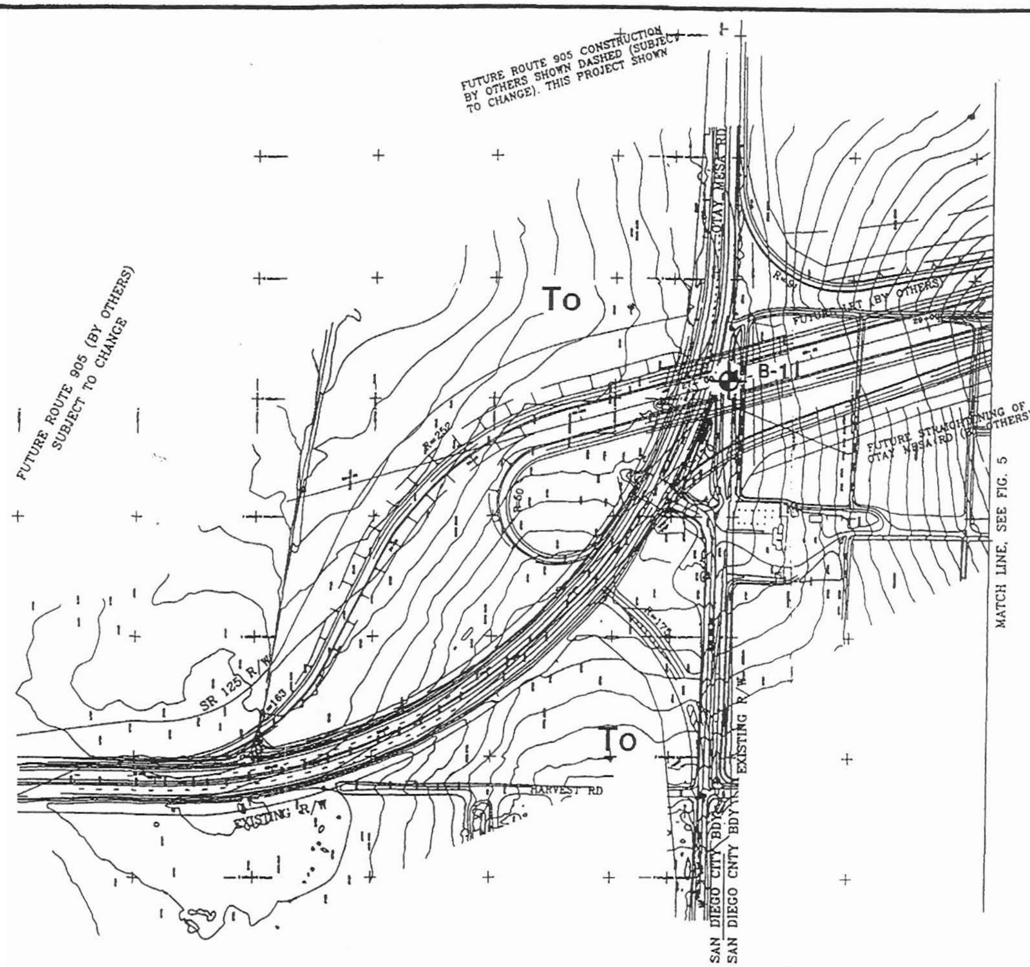
LEIGHTON

Appendix C

Previous Studies

LEGEND

Qal	Alluvium
Qls(?)	Possible Landslide Deposits
Qt_1	Terrace Deposits One
Qt_2	Terrace Deposits Two
To	Otay Formation
Tsw	Sweetwater Formation
Tmv	Mission Valley Formation
KJ_{gs}	Granitic and Metavolcanic Rock
— —	Approximate location of geologic contact, queried where uncertain
TP-18	Approximate location of exploratory test pit
B-14	Approximate location of exploratory boring
SL-10	Approximate location of seismic refraction traverse



N

Scale 1:4 000

Ninyo & Moore

PRELIMINARY GEOTECHNICAL MAP

STATE ROUTE 125 TOLL ROAD
STA 27+00 TO 128+30
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
103936-01	9/99	4

BORING LOG

1 of 4

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
	1	CAL	6 13 14	16"	Sandy Lean Clay (CL) hard, dry to moist, gray-brown w/ root hairs — Topsoil	
					Colluvium	
					Lean Clay (CL) stiff, moist, dk gray-brown w/many clasts of pale brown sandy silt to silty fine sand (ML/SM)	
5	2	SPT	2 4 8	8"		
	3	BULK			Fine Sandy Clay (CL) stiff, moist, lt. gray w/some clasts of fine sandy silt to silty fine sand (ML/SM)	
					Older Alluvium or Terrace Deposits?	>4.5
	4	CAL	7 20 31	18"	Interlayered Lean to Fat Clay (CL-CH) hard, moist, gray-brown and Fine Sandy Silt to Silty Fine Sand (SM-ML) hard/dense, moist, gray-brown (interlayers typically 1/4-1" thick)	
15	5	SPT	9 20 22			
	6	BULK			Lean to Fat Clay (CL/CH) Stiff, moist, olive-gray	
20					Otay Formation	

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road OTAY MESA Rd U.C.	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
20	7	CAL	19 37 40/1"	13"	Otay Fm (cont'd.) Silty V. Fine Sand (SM) v. dense, moist, lt. gray-brown w/few interlayers of Fine Sandy Lean Clay (CL) hard, moist, olive gray	
25	8	SPT	12 23 31	18"		
	9	CAL	26 60/5"	11"	Silty Fine Sand (SM) v. dense, moist, gray-brown	
					Sandy Lean to Fat Clay (CL/CH) hard, moist, gray-brown w/trace fine sand	
35	10	SPT	11 18 18	18"		>4.5
					Fat Clay (CH) hard, moist, gray-white bentonite	
40						

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road O.M.R.U.C.	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
ILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
40	11	CAL	50/5"	5"	Silty Fine Sand (SM) Otay Fm. (Cont'd) v. dense, gray-brown, moist light to mod. cementation ∇ A.T.D.	
45					becomes wet, not cemented	
	12	SPT	13 29 50/3"	9"	Clayey Fine Sand (SC) v. dense, moist, gray-brown	
					Silty F. Sand (SM) v. dense, moist, gray-brown w/ flakes of mica light to mod. cementation	
	13	CAL	27 50/5"	11"		
					Clayey F. Sand (SC) v. dense, moist, gray-brown	
55	14	SPT	28 50/5"	11"	Sandy Lean Clay (CL) hard, moist, mottled gray-brown	>4.5
60						

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR125 Toll Road OMRUC	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

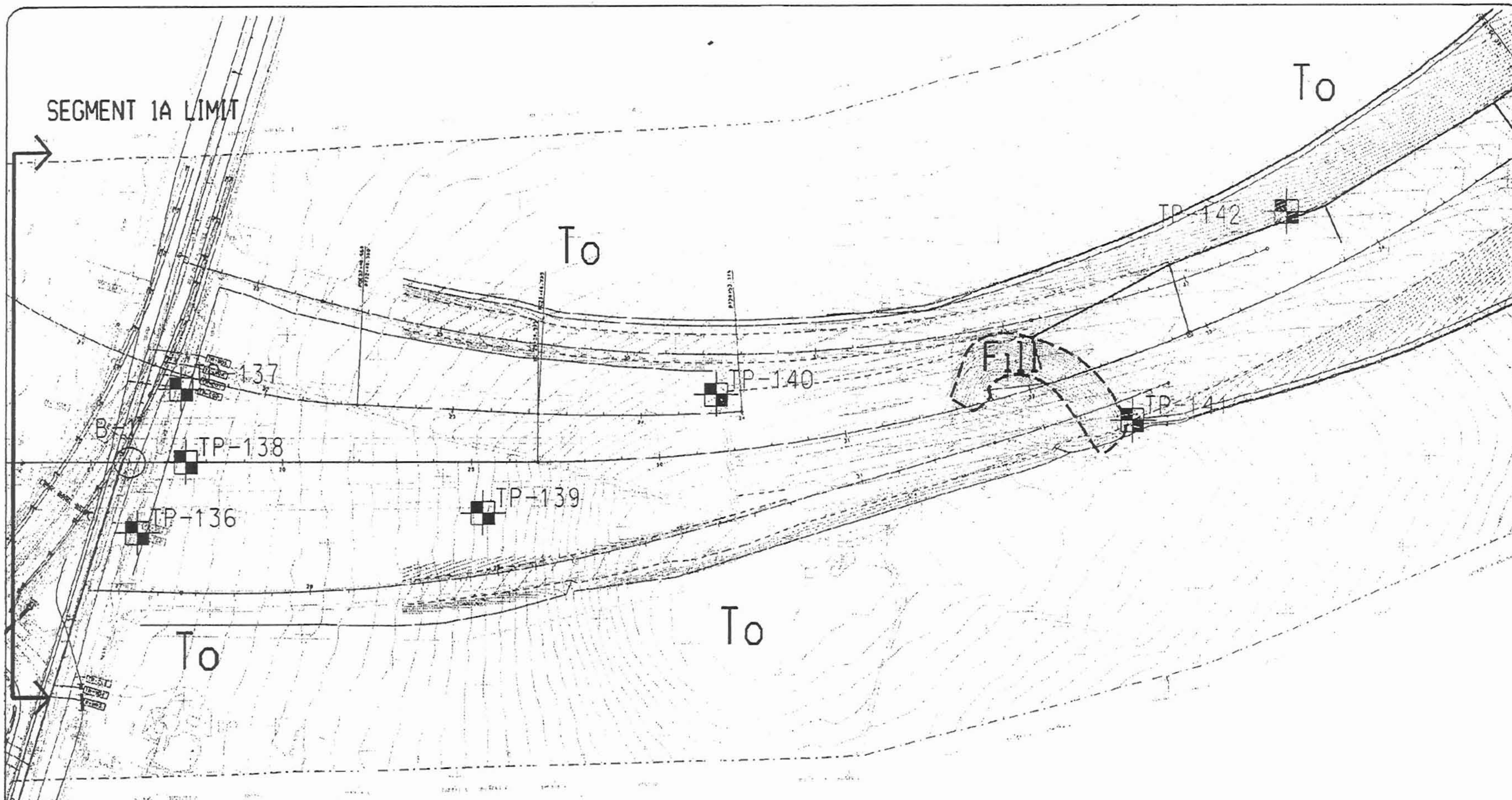
LOGGED BY: CS	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION
60	15	CAL	32 50/5"	11"	Silty to locally Clayey V. Fine Sand (SM, SC) v. dense, moist, lt. gray-brown
65	16	SPT	27 27 50/4"	16"	
					Boring terminated @ 66'4" Groundwater @ 42' A.T.D. Backfilled with cuttings.
15					
20					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road OMRUC	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists



LEGEND

- Location of exploratory test pit
- Location of 900mm diameter exploratory boring
- Location of 200mm diameter exploratory boring
- Approximate location of exploratory boring (Ninyo & Moore, 1999)
- Approximate location of exploratory test pit (Ninyo & Moore, 1999)
- Approximate location of 200mm exploratory boring (Kleinfelder, 2004)
- Cross section
- Fill — Fill
- Qsw — Slope Wash
- Qal — Alluvium
- Qls — Landslide Deposits
- Qt — Terrace Deposits
- To — Otay Formation
- ? — — Approximate location of geologic contact, queried where uncertain

50 0 50
Approximate Scale in Meters
1:2002

g:105096001 'A FIGS dgn

Ninyo & Moore

LOCATION OF EXPLORATIONS AND GEOLOGIC MAP

SR 125 SOUTH
SEGMENT 1A
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
105096001	5/05	14.2-1

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

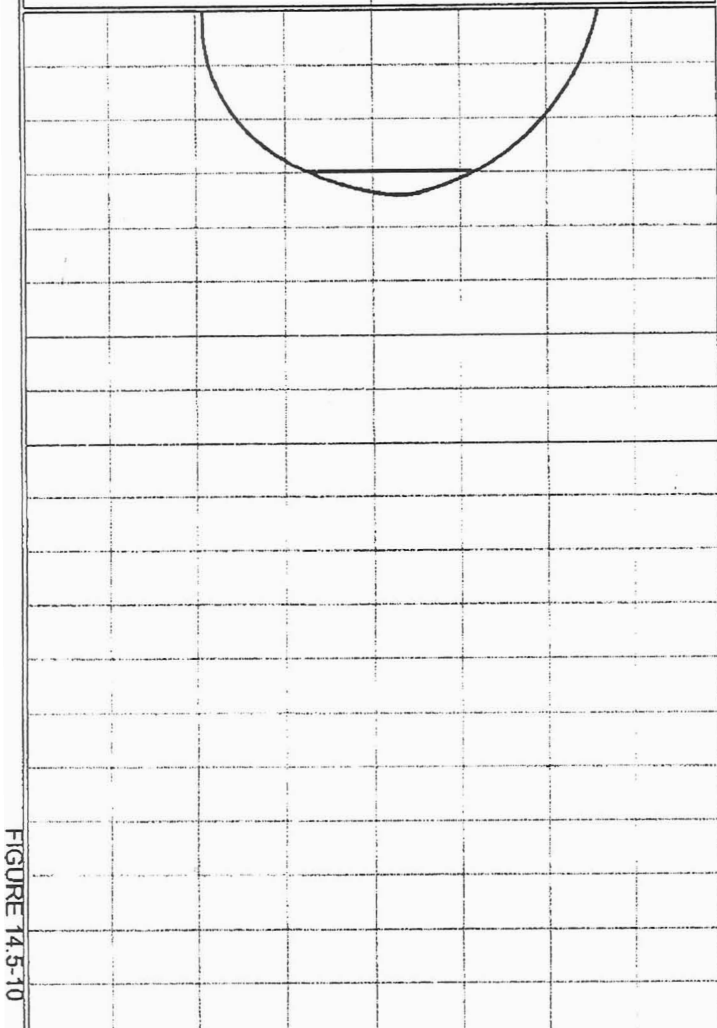
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-136

GROUND ELEVATION 160 m± (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m³)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SC	TOPSOIL: Dark brown, moist, loose, clayey fine to medium SAND with scattered gravel and cobbles.
							OTAY FORMATION: Light grayish brown, moist, weakly cemented, clayey fine-grained SANDSTONE.
							Total Depth = 1.4 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

SCALE: 10 mm =0.50 m

FIGURE 14.5-10

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

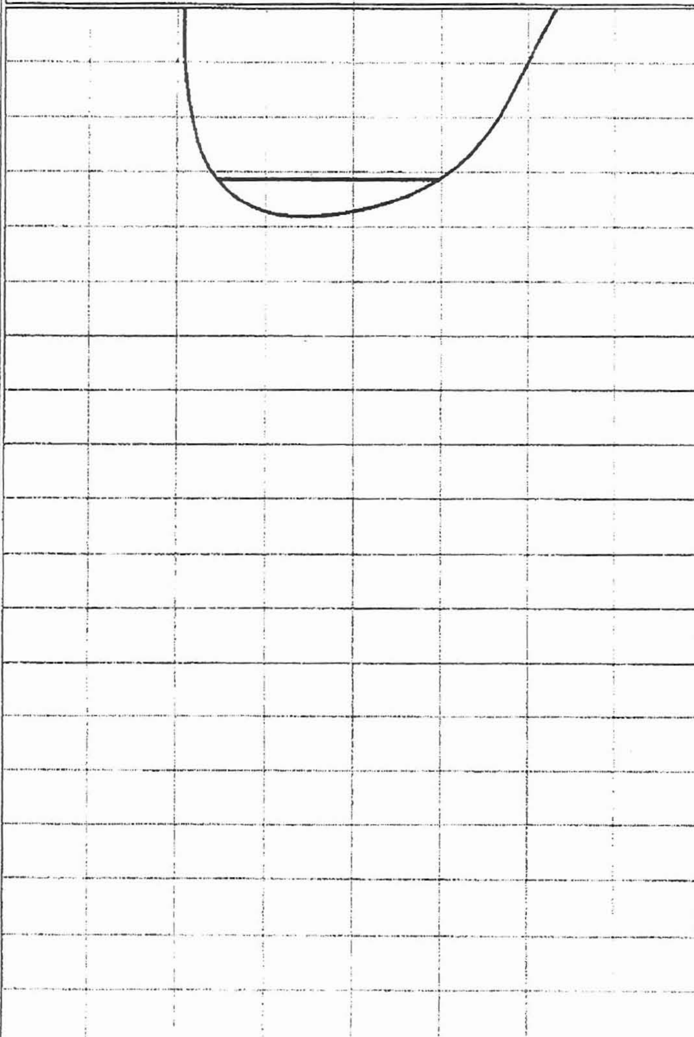
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-137

GROUND ELEVATION 160.5 m (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m 3)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0	■					SC	TOPSOIL: Dark brown, moist, loose, clayey fine SAND.
							OTAY FORMATION: Light grayish brown, moist, weakly cemented, clayey fine-grained SANDSTONE.
							Total Depth = 1.5 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

SCALE: 10 n.... =0.50 m

FIGURE 14.5-11

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

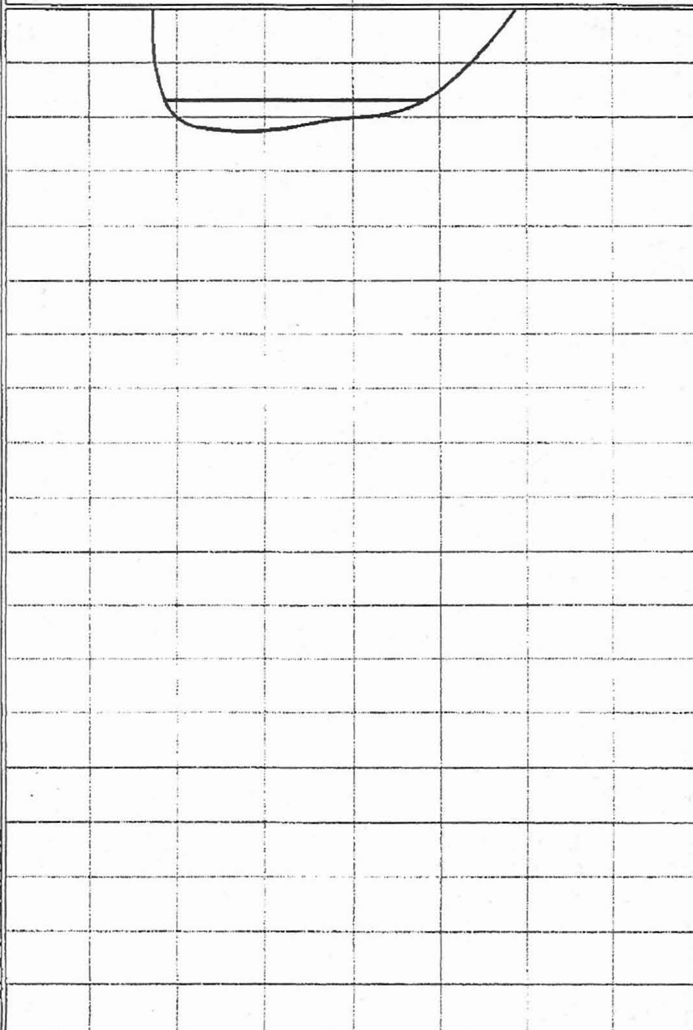
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-138

GROUND ELEVATION 161.6 m (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m³)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SC	TOPSOIL: Dark brown, moist, loose, clayey fine SAND.
							OTAY FORMATION: Light brown, moist, weakly cemented, clayey diatomaceous SILTSTONE.
							Total Depth = 0.9 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

SCALE: 10 mm =0.50 m

FIGURE 14.5-12

State of California
Business, Transportation and Housing Agency

Memorandum

To:	**Katie Basinski** Environmental Planner Environmental Analysis	Date: File: PM: EA: PI:	August 28, 2013 11-SD-11, 125, 905 Various 288814 1113000167
From:	**Joel Kloth** Engineering Geologist Environmental Engineering		

Subject: Hazardous Materials Review, Route 11, 125, 905 Interchange Connector Construction, San Diego, California

A review of the potential for hazardous materials for the subject realignment project on Route 11, 125, 905 Interchange connector ramp project has been performed by Environmental Engineering. The potential for encountering hazardous waste within the project limits is not anticipated for this project. The following are recommended for health and safety during construction.

The wood sign posts, telephone poles, and guardrail posts have been treated, and handling and disposal must follow SSP 14-11.09. The wood must be handled and disposed in accordance with Local, State, and Federal guidelines. When treated wood is removed, it cannot be relinquished to the contractor. The treated wood must be disposed at a composite-lined solid waste landfill facility permitted to accept such wastes.

If traffic paint striping or thermoplastic pavement marking is to be removed by itself as part of the scope of the subject project, it shall be removed according to SSP 15-2.02C(2) for non-hazardous lead-based paint removal so that worker and public exposure is minimized. A lead compliance plan (LCP) shall be prepared for conducting the paint removal activities. The LCP shall describe proper handling and disposal methods of the paint material and shall provide information regarding limiting exposure to lead chromate containing paint materials. If you have questions or comments call (619) 688-3146.

Joel Kloth, PG
Engineering Geologist
Environmental Engineering
Hazardous Waste Division

cc: Jayne Dowda

DIVISION OF
ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL SUPPORT
GEOTECHNICAL LABORATORY
5900 Folsom Boulevard
Sacramento, CA 95819

Date: 11/22/2013

To: TM Liao / GDS-2

From: Lilibeth C. Purta / (916) 227-5239

RE: Laboratory Test Report -- EA: 11-288811
Project: 1113000167
GL 13-068

Final test results.

Note: All remaining test specimens will be disposed of in 30 calendar days from the release date of the final test results.

AASHTO R18

CALIFORNIA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL LABORATORY

GL TRACKING NO : 13-068
Dist - EA: 11-288811
Report Date: November 22, 2013
Page: 1/1

CLASSIFICATION TEST SUMMARY

SAMPLE ID	% FINER THAN																ATTERBERG LIMITS		AS RECEIVED		Gs
	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	5μ	1μ	LL	PI	γ_d (pcf)	%m	
RC-13-001_09									100	97	95	92	81	53	29	7	4		NP		17.8	2.77
RC-13-002_07									100	97	96	96	95	89	65	6	3		NP		24.4	2.79
RC-13-002_21								100	97	92	91	90	87	82	78	7	3		NP		23.1	2.78

CONSOLIDATION TEST DATA

Project: Otay Mesa Road UC
Boring No.: RC-13-001
Sample No.: 09
Test No.: 13-007-G3

Location: 11-SD-125-0.9-
Tested By: jg
Test Date: 11/18/13
Sample Type: 2"core/soil

Project No.: 11-288811
Checked By: WP 11/22
Depth: ----------
Elevation: 13-068

Soil Description: Moist: Gray: Sand silty
Remarks: Swell V inundated @ 2400 psf

Measured Specific Gravity: 2.77
Initial Void Ratio: 0.67
Final Void Ratio: 0.46

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Initial Height: 1.00 in
Specimen Diameter: 2.38 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID		RING		
Wt. Container + Wet Soil, gm	231.7	231.7	228.1	228.1
Wt. Container + Dry Soil, gm	208	208	208	208
Wt. Container, gm	87.5	87.5	87.5	87.5
Wt. Dry Soil, gm	120.5	120.5	120.5	120.5
Water Content, %	19.67	19.67	16.68	16.68
Void Ratio	---	0.67	0.46	---
Degree of Saturation, %	---	81.50	99.68	---
Dry Unit Weight, pcf	---	103.62	118.13	---

CONSOLIDATION TEST DATA

Project: Otay Mesa Road UC
Boring No.: RC-13-001
Sample No.: 09
Test No.: 13-007-G3

Location: 11-SD-125-0.9-
Tested By: jg
Test Date: 11/18/13
Sample Type: 2"core/soil

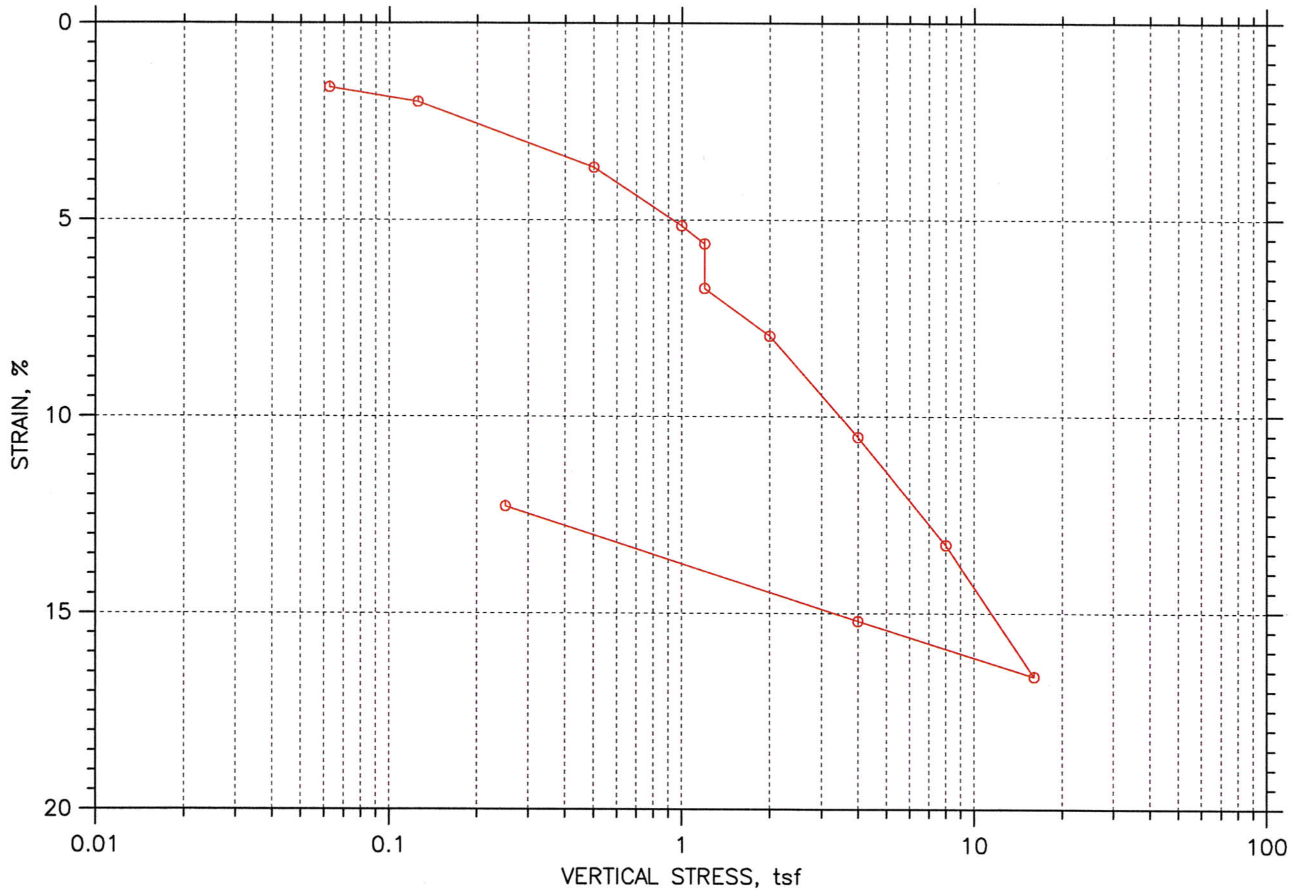
Project No.: 11-288811
Checked By:
Depth: ----------
Elevation: 13-068

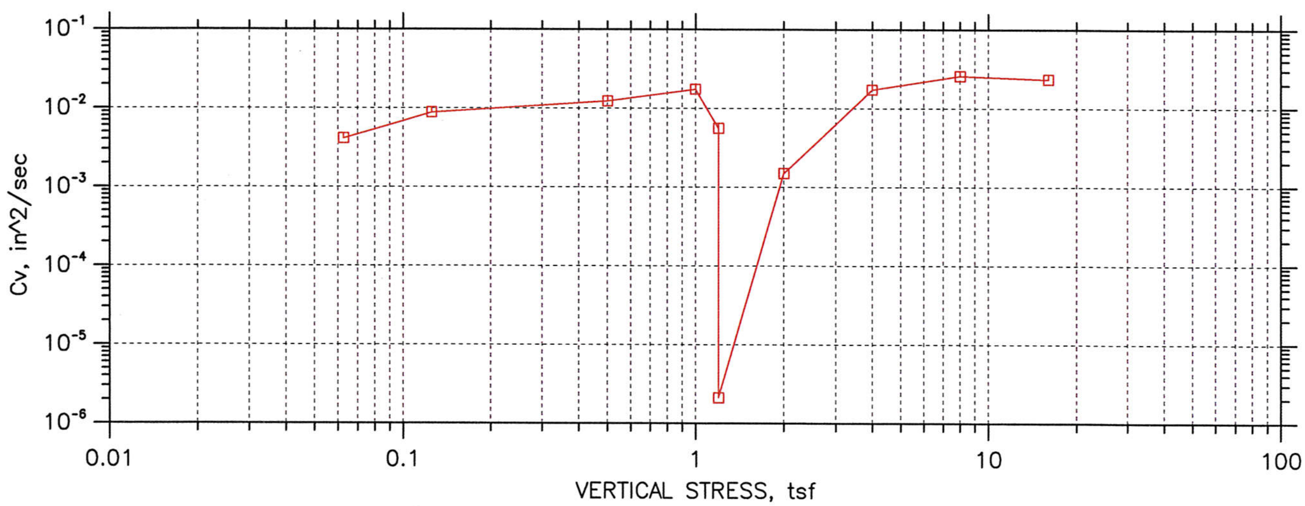
Soil Description: Moist: Gray: Sand silty
Remarks: Swell V inundated @ 2400 psf

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. in^2/sec	Coefficient of Consolidation Log in^2/sec	Coefficient of Consolidation Ave. in^2/sec
1	0.0625	0.01628	0.641	1.63	0.2	0.2	4.13e-003	4.07e-003	4.10e-003
2	0.125	0.01996	0.635	2.00	0.1	0.1	7.84e-003	9.97e-003	8.78e-003
3	0.5	0.03662	0.607	3.66	0.1	0.1	1.07e-002	1.43e-002	1.22e-002
4	1	0.05146	0.582	5.15	0.0	0.0	1.64e-002	1.86e-002	1.74e-002
5	1.2	0.05607	0.575	5.61	0.1	0.1	5.17e-003	5.99e-003	5.55e-003
6	1.2	0.06738	0.556	6.74	343.1	0.0	2.11e-006	0.00e+000	2.11e-006
7	2	0.07952	0.536	7.95	0.5	0.0	1.49e-003	0.00e+000	1.49e-003
8	4	0.1052	0.493	10.52	0.1	0.0	1.16e-002	3.30e-002	1.72e-002
9	8	0.1326	0.447	13.26	0.0	0.0	2.09e-002	3.36e-002	2.57e-002
10	16	0.1661	0.391	16.61	0.0	0.0	1.90e-002	3.04e-002	2.34e-002
11	4	0.152	0.415	15.20	0.0	0.0	3.95e-002	0.00e+000	3.95e-002
12	0.25	0.1228	0.463	12.28	0.1	0.0	5.96e-003	2.23e-002	9.41e-003

CONSOLIDATION TEST DATA

SUMMARY REPORT



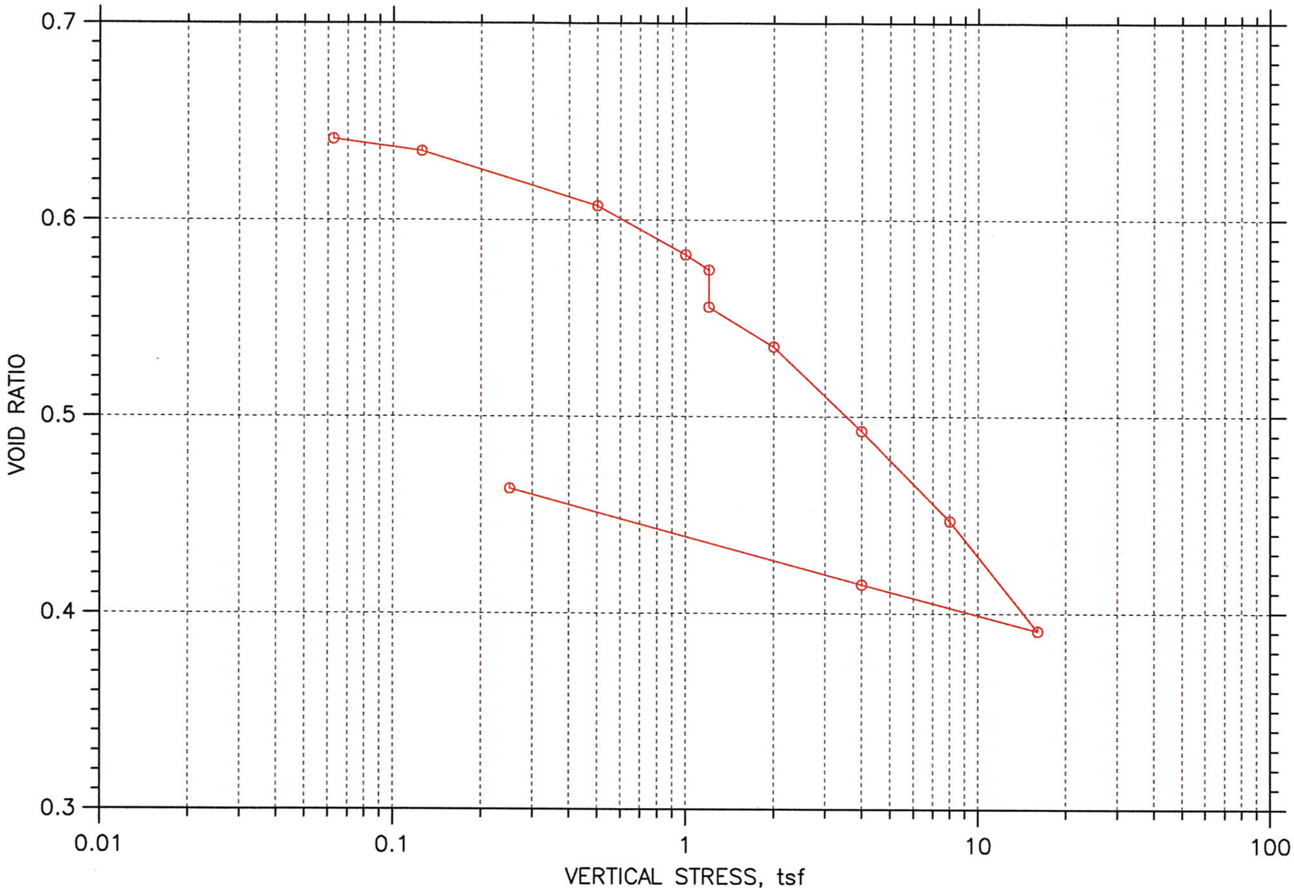


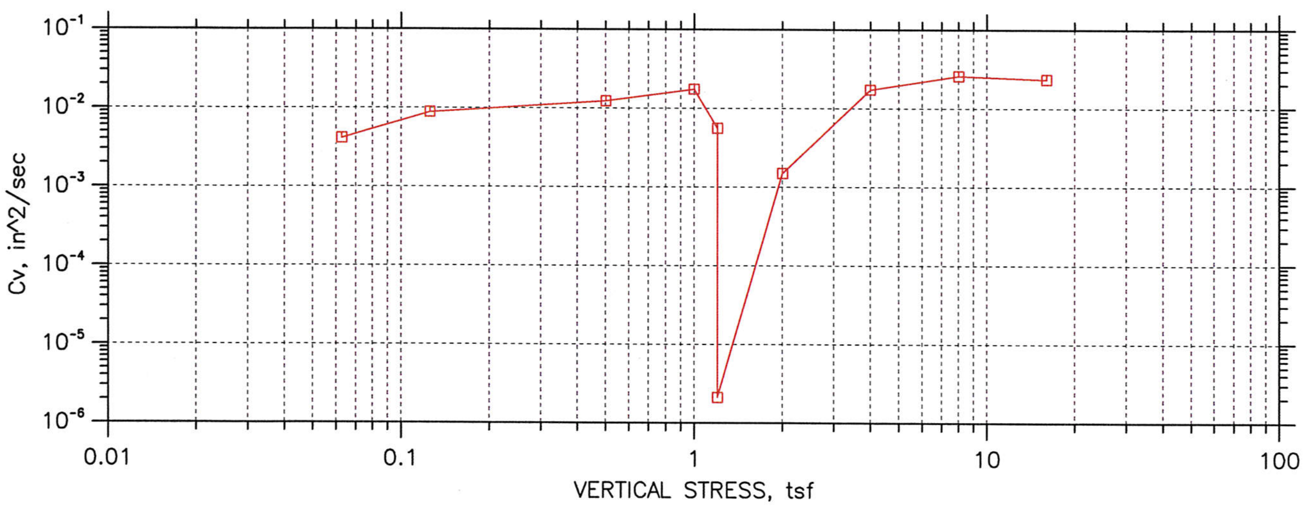
	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9-	Project No.: 11-288811
	Boring No.: RC-13-001	Tested By: jg	Checked By:
	Sample No.: 09	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-007-G3	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Sand silty		
	Remarks: Swell V inundated @ 2400 psf		

Fri, 22-NOV-2013 13:40:43

CONSOLIDATION TEST DATA

SUMMARY REPORT



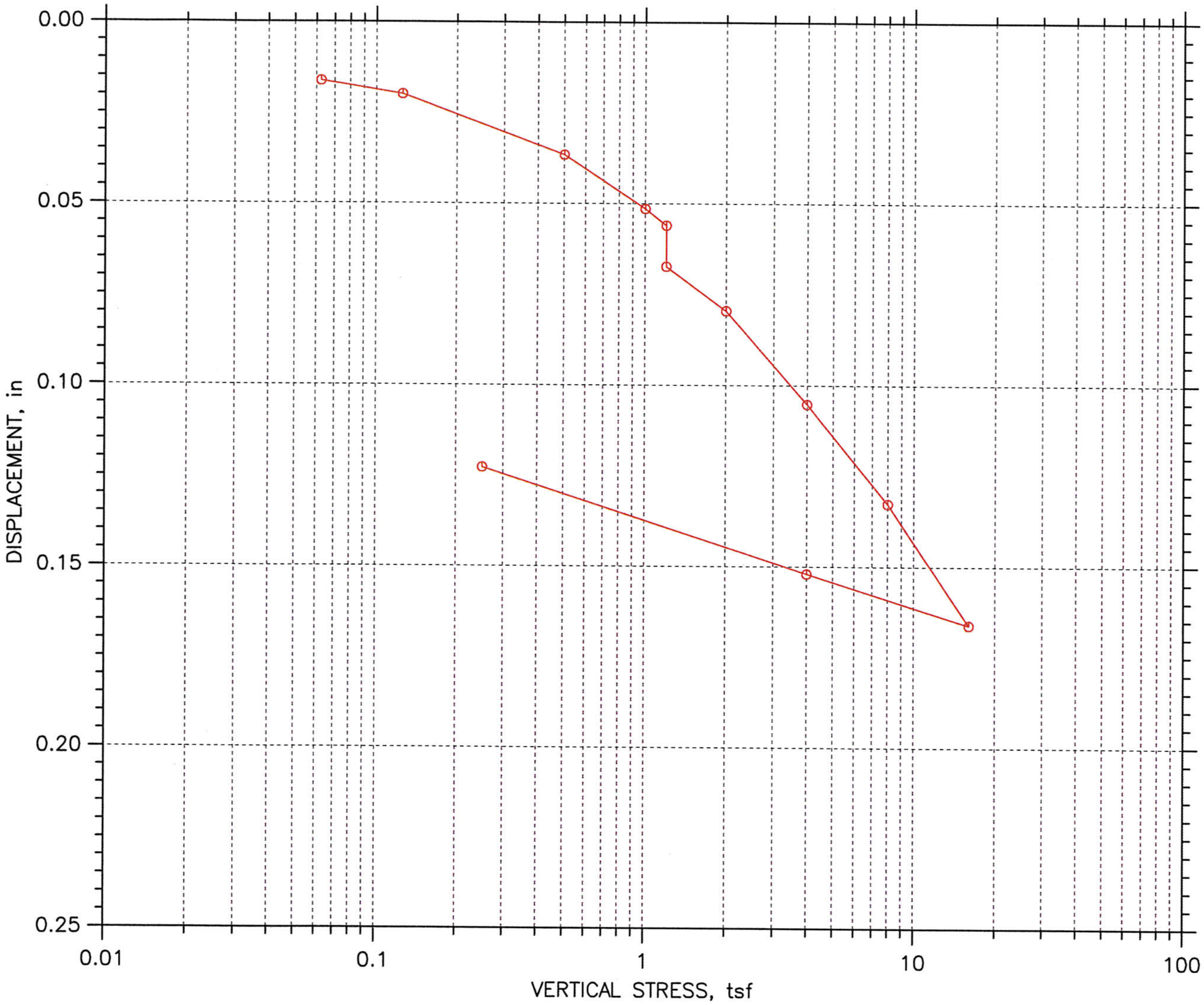


	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9-	Project No.: 11-288811
	Boring No.: RC-13-001	Tested By: jg	Checked By:
	Sample No.: 09	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-007-G3	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Sand silty		
	Remarks: Swell V inundated @ 2400 psf		

Fri, 22-NOV-2013 13:41:47

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 8.864e-312 tsf				Water Content, %	19.67	16.68
Preconsolidation Pressure: 3.612e-311 tsf				Dry Unit Weight, pcf	103.6	118.1
Compression Index: 2.75859e-313				Saturation, %	81.50	99.68
Diameter: 2.375 in		Height: 1 in		Void Ratio	0.67	0.46
LL: ---	PL: ---	PI: ---	GS: 2.77			

	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9-	Project No.: 11-288811
	Boring No.: RC-13-001	Tested By: jg	Checked By:
	Sample No.: 09	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-007-G3	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Sand silty		
	Remarks: Swell V inundated @ 2400 psf		

Fri, 22-NOV-2013 13:42:14

CONSOLIDATION TEST DATA

Project: Otay Mesa Road UC
Boring No.: RC-13-002
Sample No.: 07
Test No.: 13-008-G4

Location: 11-SD-125-0.9
Tested By: jg
Test Date: 11/18/13
Sample Type: 2"core/soil

Project No.: 11-288811
Checked By: VP 11/22
Depth: ----------
Elevation: 13-068

Soil Description: Moist: Gray: Clay silty
Remarks: Swell V @ 2800 psf

Measured Specific Gravity: 2.79
Initial Void Ratio: 0.96
Final Void Ratio: 0.78

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Initial Height: 1.00 in
Specimen Diameter: 2.38 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID		RING		
Wt. Container + Wet Soil, gm	219.9	219.9	219.4	219.4
Wt. Container + Dry Soil, gm	190.5	190.5	190.5	190.5
Wt. Container, gm	87.3	87.3	87.3	87.3
Wt. Dry Soil, gm	103.2	103.2	103.2	103.2
Water Content, %	28.49	28.49	28.00	28.00
Void Ratio	---	0.96	0.78	---
Degree of Saturation, %	---	82.57	99.87	---
Dry Unit Weight, pcf	---	88.744	97.722	---

CONSOLIDATION TEST DATA

Project: Otay Mesa Road UC
Boring No.: RC-13-002
Sample No.: 07
Test No.: 13-008-G4

Location: 11-SD-125-0.9
Tested By: jg
Test Date: 11/18/13
Sample Type: 2"core/soil

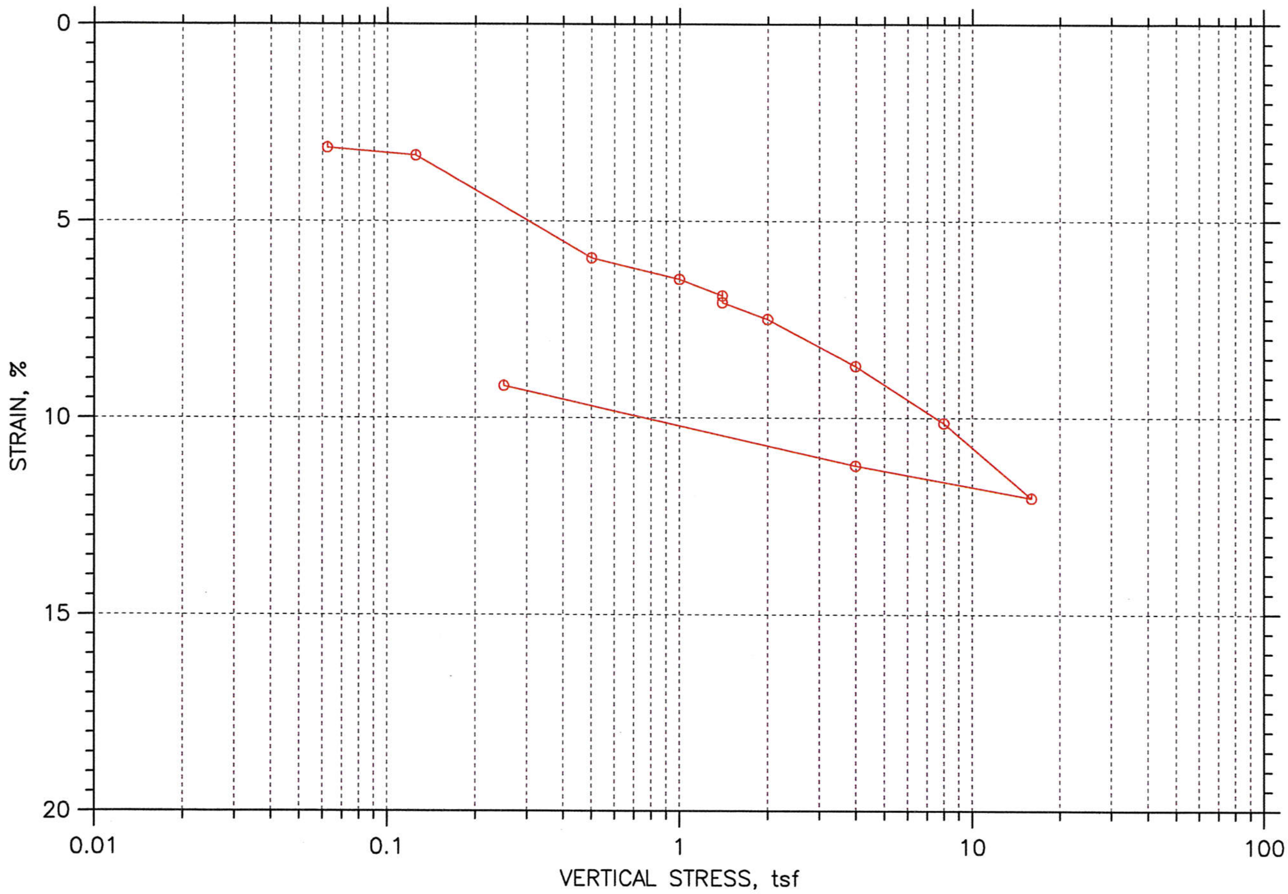
Project No.: 11-288811
Checked By:
Depth: ----------
Elevation: 13-068

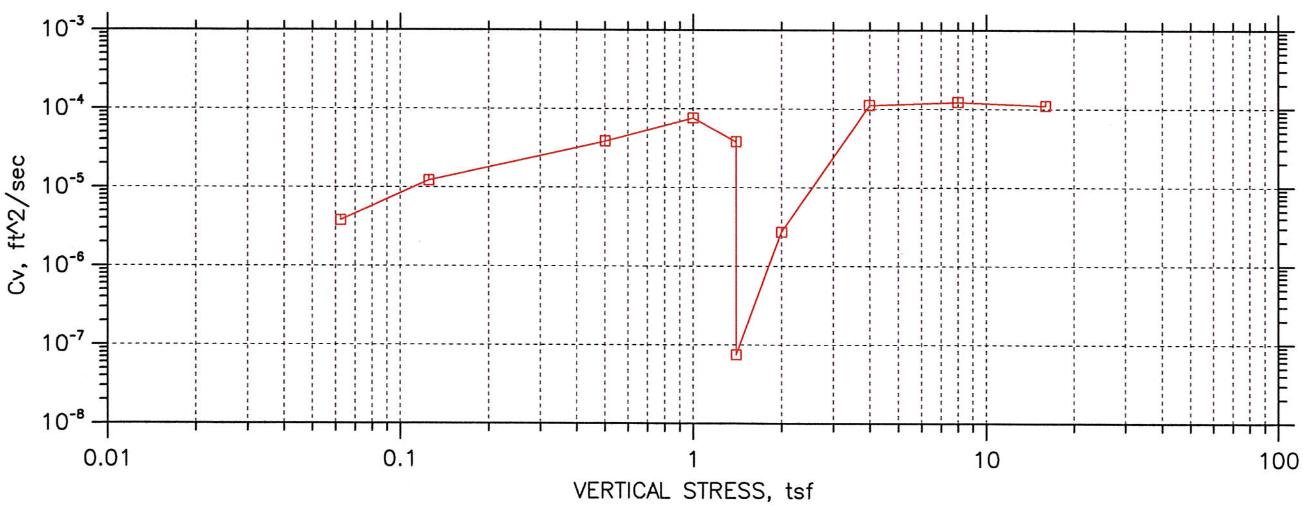
Soil Description: Moist: Gray: Clay silty
Remarks: Swell V @ 2800 psf

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.0625	0.03138	0.901	3.14	0.0	1.5	0.00e+000	3.78e-006	3.78e-006
2	0.125	0.03339	0.897	3.34	0.4	0.0	1.21e-005	0.00e+000	1.21e-005
3	0.5	0.05942	0.846	5.94	0.1	0.0	3.84e-005	0.00e+000	3.84e-005
4	1	0.06478	0.836	6.48	0.1	0.0	5.88e-005	1.08e-004	7.62e-005
5	1.4	0.06897	0.827	6.90	0.2	0.1	2.84e-005	5.77e-005	3.80e-005
6	1.4	0.07069	0.824	7.07	66.1	0.0	7.48e-008	0.00e+000	7.48e-008
7	2	0.07489	0.816	7.49	1.8	0.0	2.70e-006	0.00e+000	2.70e-006
8	4	0.08684	0.792	8.68	0.0	0.0	1.05e-004	1.18e-004	1.11e-004
9	8	0.1013	0.764	10.13	0.0	0.0	9.58e-005	1.69e-004	1.22e-004
10	16	0.1204	0.726	12.04	0.1	0.0	7.59e-005	1.99e-004	1.10e-004
11	4	0.1122	0.743	11.22	0.1	0.0	8.73e-005	0.00e+000	8.73e-005
12	0.25	0.09187	0.782	9.19	0.3	0.0	1.74e-005	0.00e+000	1.74e-005

CONSOLIDATION TEST DATA

SUMMARY REPORT



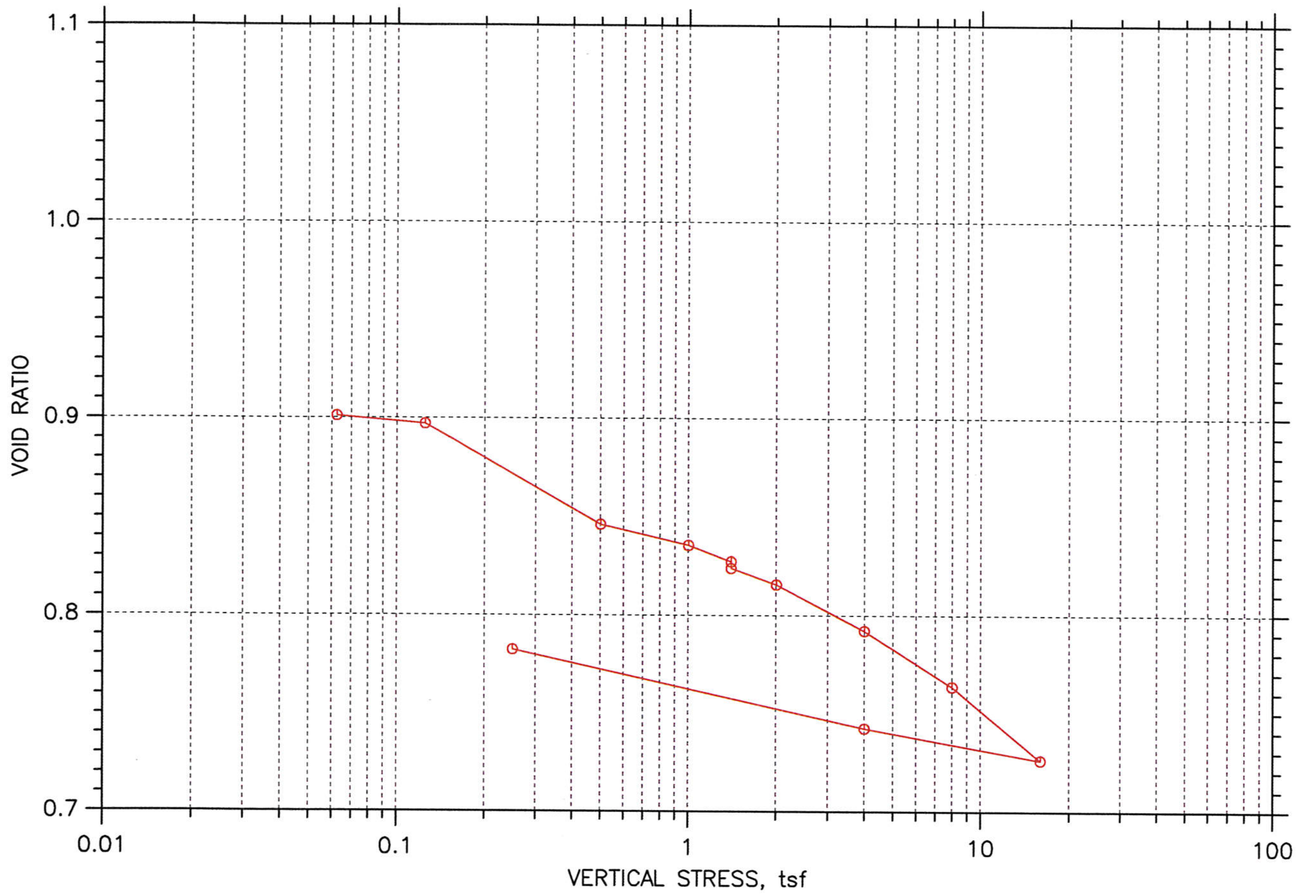


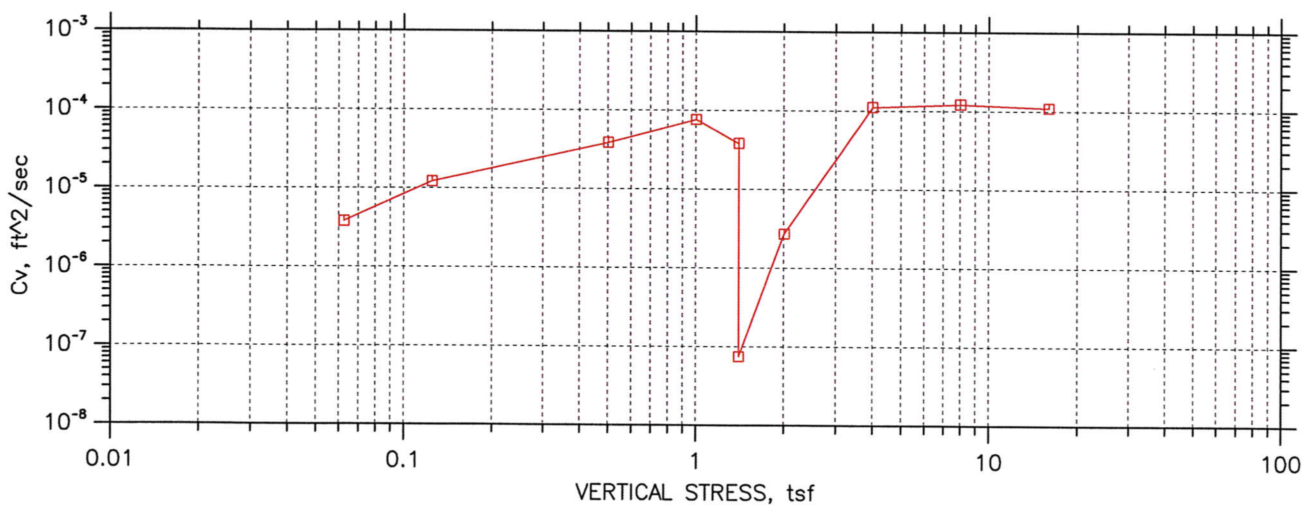
	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 07	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-008-G4	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Clay silty		
	Remarks: Swell V @ 2800 psf		

Fri, 22-NOV-2013 13:45:20

CONSOLIDATION TEST DATA

SUMMARY REPORT



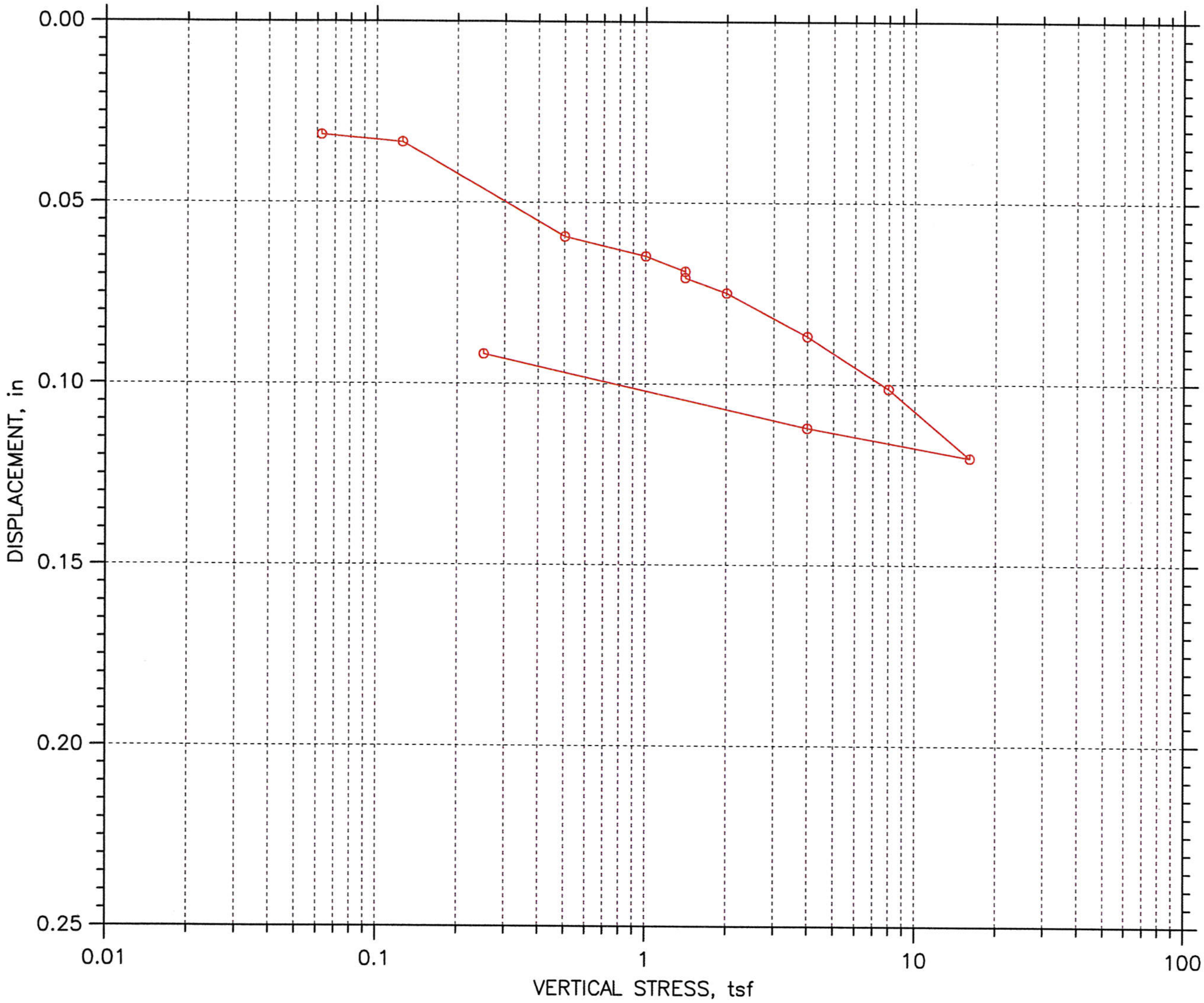


	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 07	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-008-G4	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Clay silty		
	Remarks: Swell V @ 2800 psf		

Fri, 22-NOV-2013 13:45:48

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 0 tsf				Water Content, %	28.49	28.00
Preconsolidation Pressure: 0 tsf				Dry Unit Weight, pcf	88.74	97.72
Compression Index: 3.81959e-313				Saturation, %	82.57	99.87
Diameter: 2.375 in		Height: 1 in		Void Ratio	0.96	0.78
LL: ---	PL: ---	PI: ---	GS: 2.79			

	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 07	Test Date: 11/18/13	Depth: ----------
	Test No.: 13-008-G4	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist: Gray: Clay silty		
	Remarks: Swell V @ 2800 psf		

Fri, 22-NOV-2013 13:46:18

One-Dimensional Consolidation by ASTM D 2435 - Method B

Project: Otay Mesa Road UC
Boring No.: RC-13-002
Sample No.: 21
Test No.: 13-009-G1

Location: 11-SD-125-0.9
Tested By: jg
Test Date: 11/19/13
Sample Type: 2"core/soil

Project No.: 11-288811
Checked By: W 11/22
Depth: --------
Elevation: 13-068

Soil Description: Moist; Gray; Clay silty
Remarks: Swell V inundated @ 5000 psf

Measured Specific Gravity: 2.78
Initial Void Ratio: 0.579
Final Void Ratio: 0.474

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Initial Height: 1.00 in
Specimen Diameter: 2.38 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	-	RING		
Wt. Container + Wet Soil, gm	236.60	236.60	236.40	236.40
Wt. Container + Dry Soil, gm	214.70	214.70	214.70	214.70
Wt. Container, gm	86.900	86.900	86.900	86.900
Wt. Dry Soil, gm	127.80	127.80	127.80	127.80
Water Content, %	17.14	17.14	16.98	16.98
Void Ratio	---	0.579	0.474	---
Degree of Saturation, %	---	82.30	99.61	---
Dry Unit Weight, pcf	---	109.90	117.72	---

One-Dimensional Consolidation by ASTM D 2435 - Method B

Project: Otay Mesa Road UC
Boring No.: RC-13-002
Sample No.: 21
Test No.: 13-009-G1

Location: 11-SD-125-0.9
Tested By: jg
Test Date: 11/19/13
Sample Type: 2"core/soil

Project No.: 11-288811
Checked By:
Depth: ----------
Elevation: 13-068

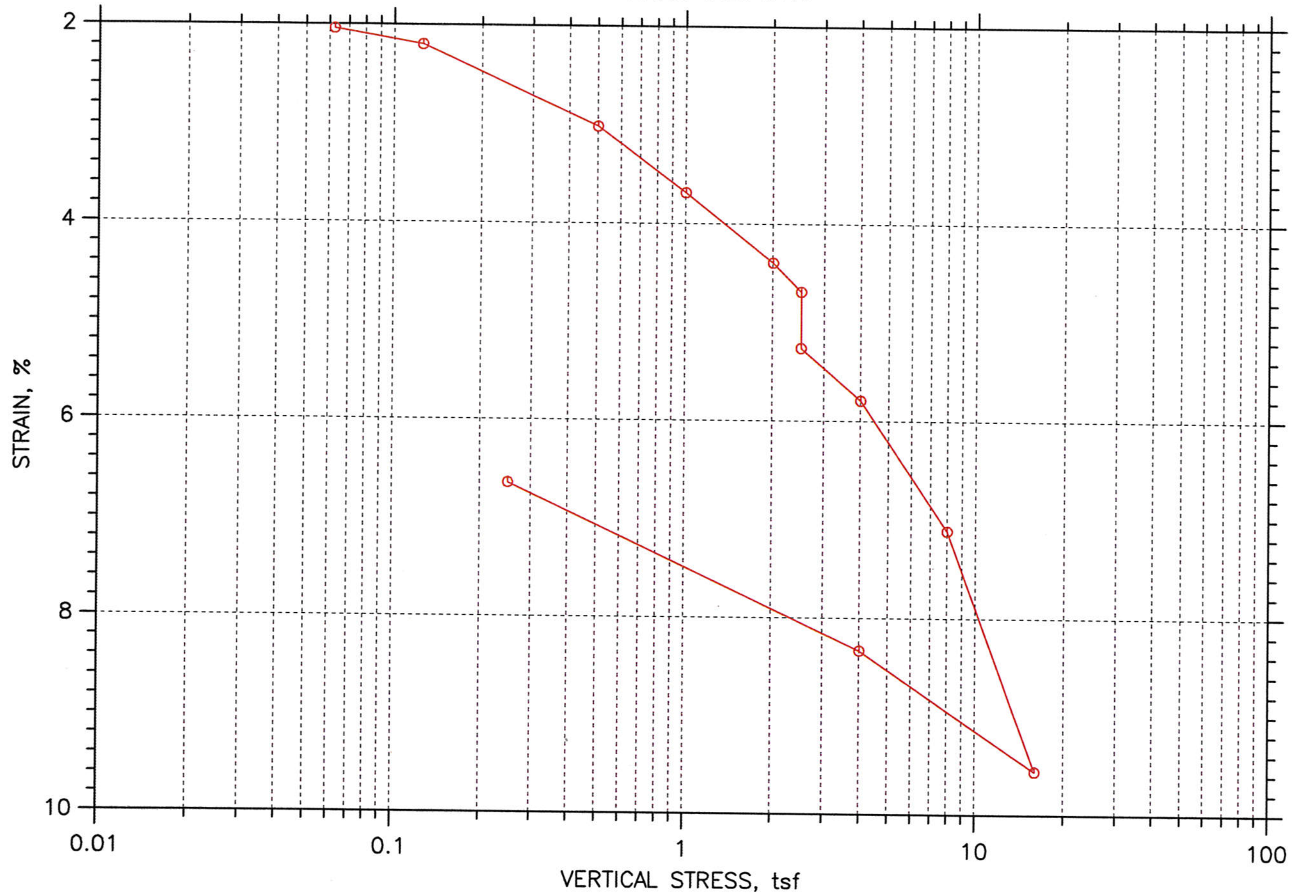
Soil Description: Moist; Gray; Clay silty
Remarks: Swell V inundated @ 5000 psf
Displacement at End of Increment

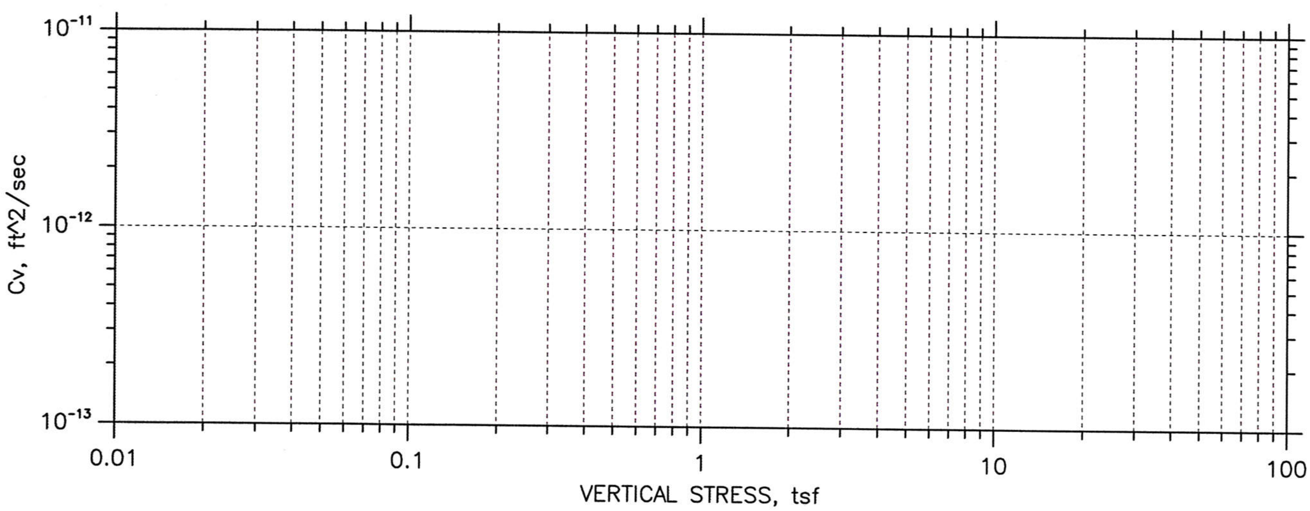
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft^2/sec	Mv 1/tsf	k ft/day
1	0.0625	0.02038	0.546	2.04	2.253	1.07e-005	3.26e-001	9.38e-003
2	0.125	0.02196	0.544	2.20	2.255	1.04e-005	2.52e-002	7.08e-004
3	0.500	0.03019	0.531	3.02	0.216	1.08e-004	2.20e-002	6.37e-003
4	1.00	0.03687	0.520	3.69	0.253	9.07e-005	1.34e-002	3.27e-003
5	2.00	0.04395	0.509	4.40	0.091	2.47e-004	7.09e-003	4.73e-003
6	2.50	0.04689	0.505	4.69	1.526	1.46e-005	5.88e-003	2.32e-004
7	2.50	0.05262	0.496	5.26	895.831	2.47e-008	1.#Je+000	1.#Je+000
8	4.00	0.05791	0.487	5.79	29.014	7.55e-007	3.53e-003	7.18e-006
9	8.00	0.07113	0.466	7.11	3.980	5.40e-006	3.30e-003	4.81e-005
10	16.0	0.09554	0.428	9.55	2.399	8.60e-006	3.05e-003	7.07e-005
11	4.00	0.08332	0.447	8.33	0.063	3.23e-004	1.02e-003	8.86e-004
12	0.250	0.06644	0.474	6.64	0.405	5.19e-005	4.50e-003	6.30e-004

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft^2/sec	Mv 1/tsf	k ft/day	Ca %
1	0.0625	0.02038	0.546	2.04	0.000	0.00e+000	3.26e-001	0.00e+000	0.00e+000
2	0.125	0.02196	0.544	2.20	0.000	0.00e+000	2.52e-002	0.00e+000	0.00e+000
3	0.500	0.03019	0.531	3.02	0.000	0.00e+000	2.20e-002	0.00e+000	0.00e+000
4	1.00	0.03687	0.520	3.69	0.049	1.08e-004	1.34e-002	3.88e-003	0.00e+000
5	2.00	0.04395	0.509	4.40	0.039	1.35e-004	7.09e-003	2.58e-003	0.00e+000
6	2.50	0.04689	0.505	4.69	0.000	0.00e+000	5.88e-003	0.00e+000	0.00e+000
7	2.50	0.05262	0.496	5.26	0.000	0.00e+000	1.#Je+000	-1.#Je+000	0.00e+000
8	4.00	0.05791	0.487	5.79	5.936	8.57e-007	3.53e-003	8.16e-006	0.00e+000
9	8.00	0.07113	0.466	7.11	0.000	0.00e+000	3.30e-003	0.00e+000	0.00e+000
10	16.0	0.09554	0.428	9.55	0.000	0.00e+000	3.05e-003	0.00e+000	0.00e+000
11	4.00	0.08332	0.447	8.33	0.000	0.00e+000	1.02e-003	0.00e+000	0.00e+000
12	0.250	0.06644	0.474	6.64	0.062	7.82e-005	4.50e-003	9.49e-004	0.00e+000

One-Dimensional Consolidation by ASTM D 2435 ⇔ Method B

SUMMARY REPORT



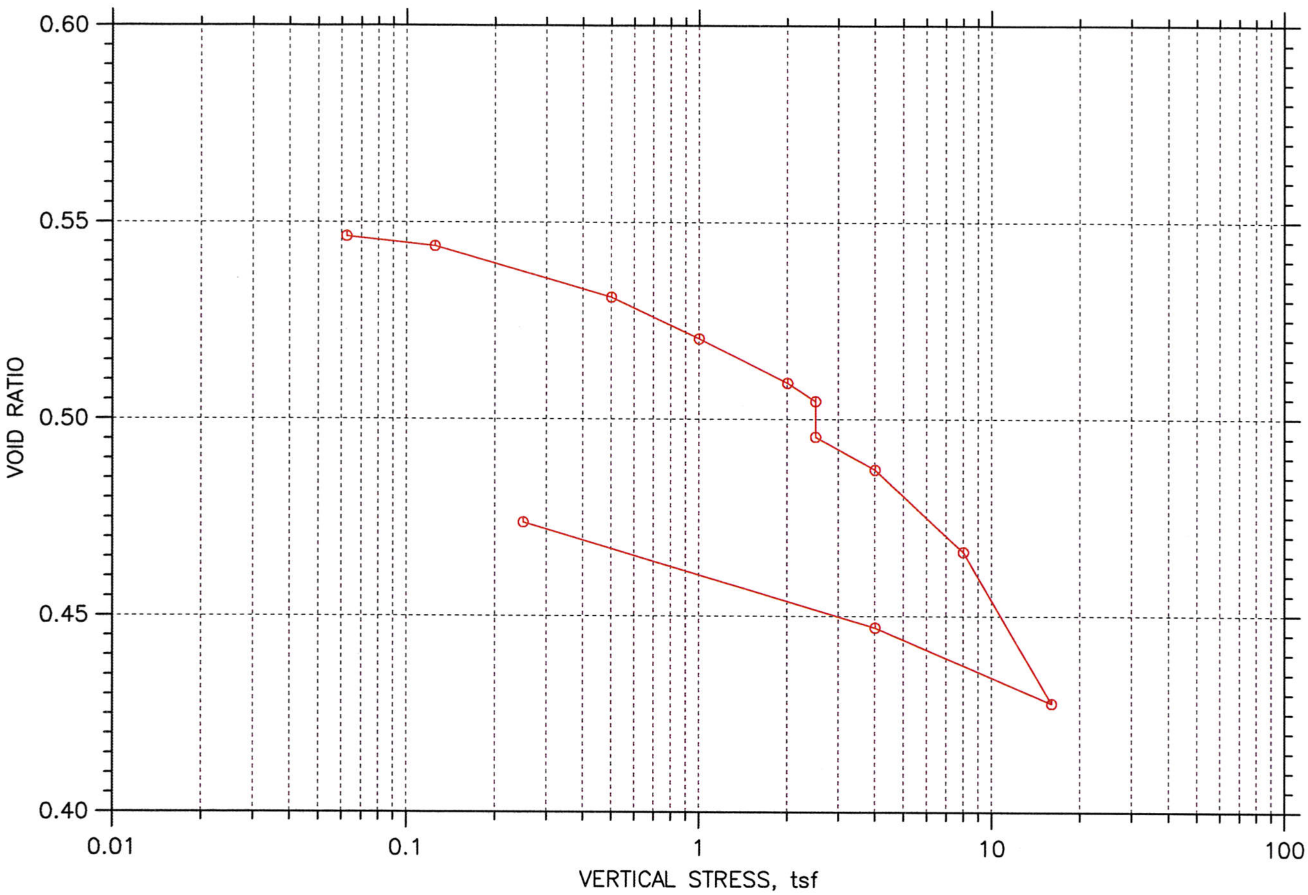


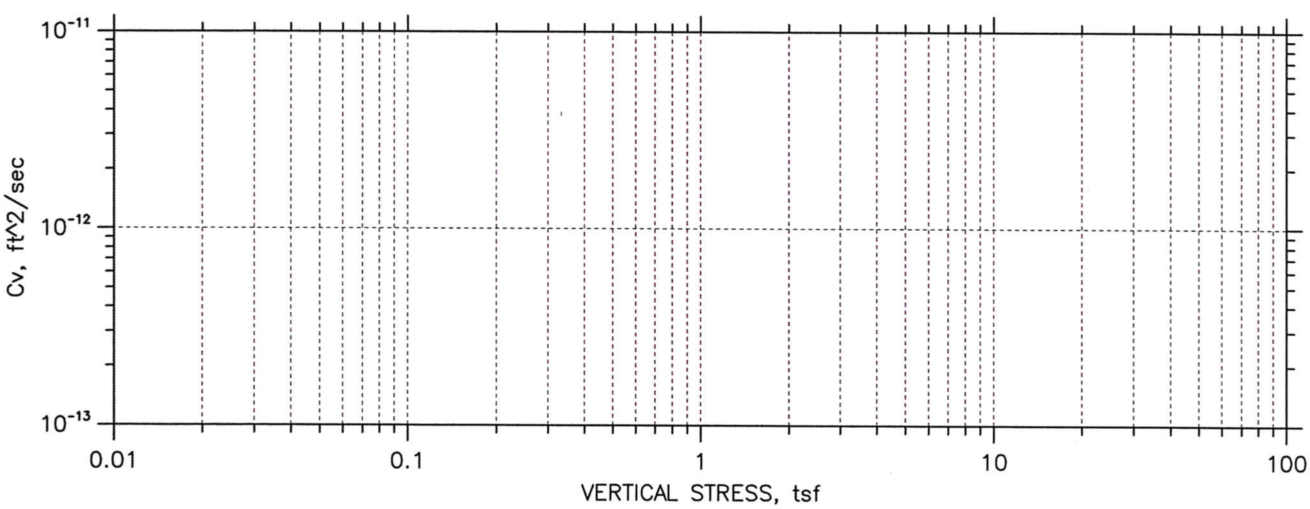
	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 21	Test Date: 11/19/13	Test No.: 13-009-G1
	Depth: ----------	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist; Gray; Clay silty		
	Remarks: Swell V inundated @ 5000 psf		
	Displacement at End of Increment		

Fri, 22-NOV-2013 14:29:47

One-Dimensional Consolidation by ASTM D 2435 ⇔ Method B

SUMMARY REPORT





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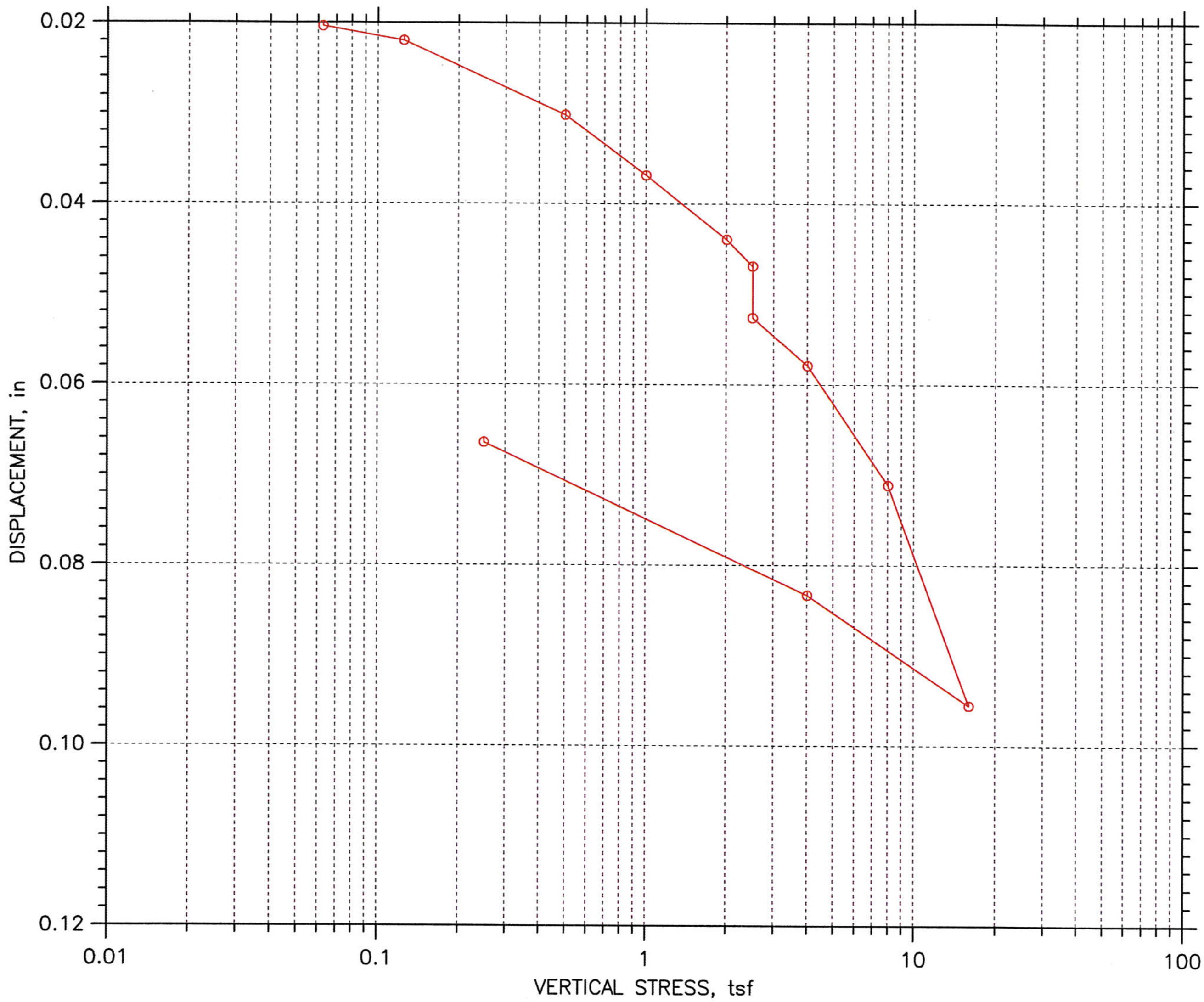
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 21	Test Date: 11/19/13	Test No.: 13-009-G1
	Depth: ----------	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist; Gray; Clay silty		
	Remarks: Swell V inundated @ 5000 psf		
	Displacement at End of Increment		

Fri, 22-NOV-2013 14:30:24

One-Dimensional Consolidation by ASTM D 2435 ⇔ Method B

SUMMARY REPORT



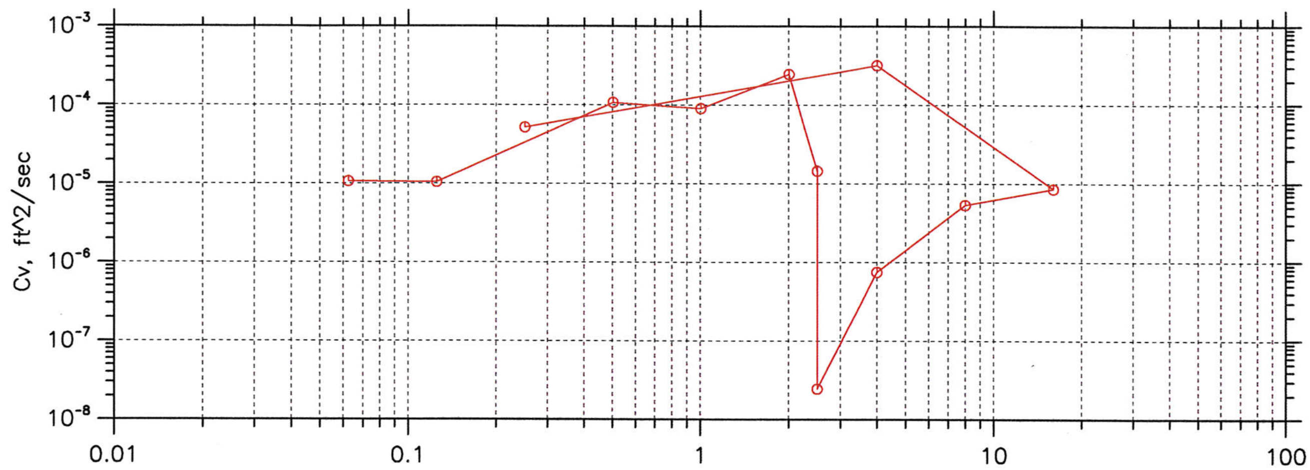
				Before Test	After Test
Overburden Pressure: 0 tsf				Water Content, %	17.14	16.98
Preconsolidation Pressure: 0 tsf				Dry Unit Weight, pcf	109.9	117.72
Compression Index: 0				Saturation, %	82.30	99.61
Diameter: 2.375 in		Height: 1 in		Void Ratio	0.58	0.47
LL: ---	PL: ---	PI: ---	GS: 2.78			

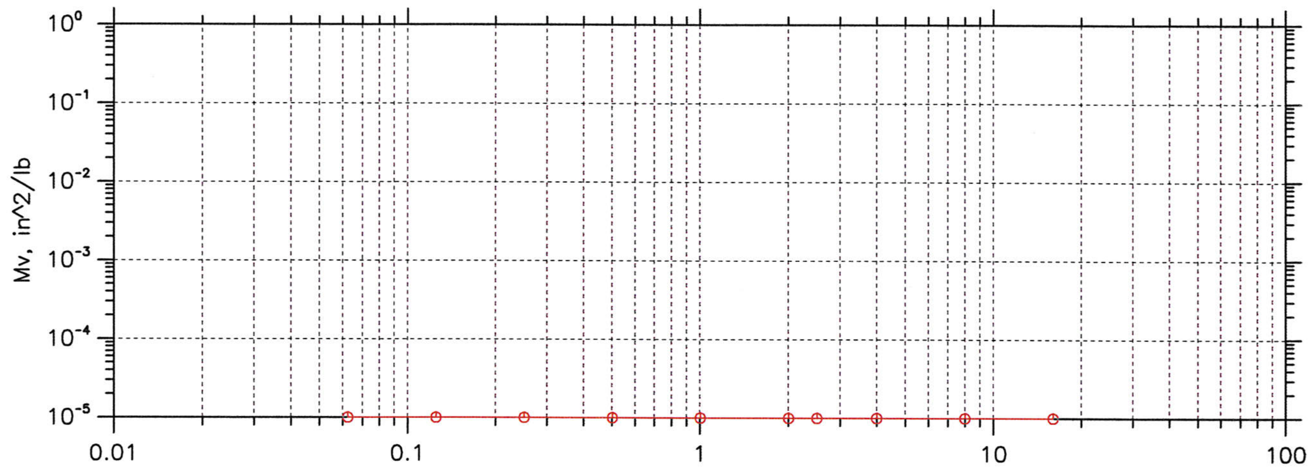
	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 21	Test Date: 11/19/13	Test No.: 13-009-G1
	Depth: ----------	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist; Gray; Clay silty		
	Remarks: Swell V inundated @ 5000 psf		
	Displacement at End of Increment		

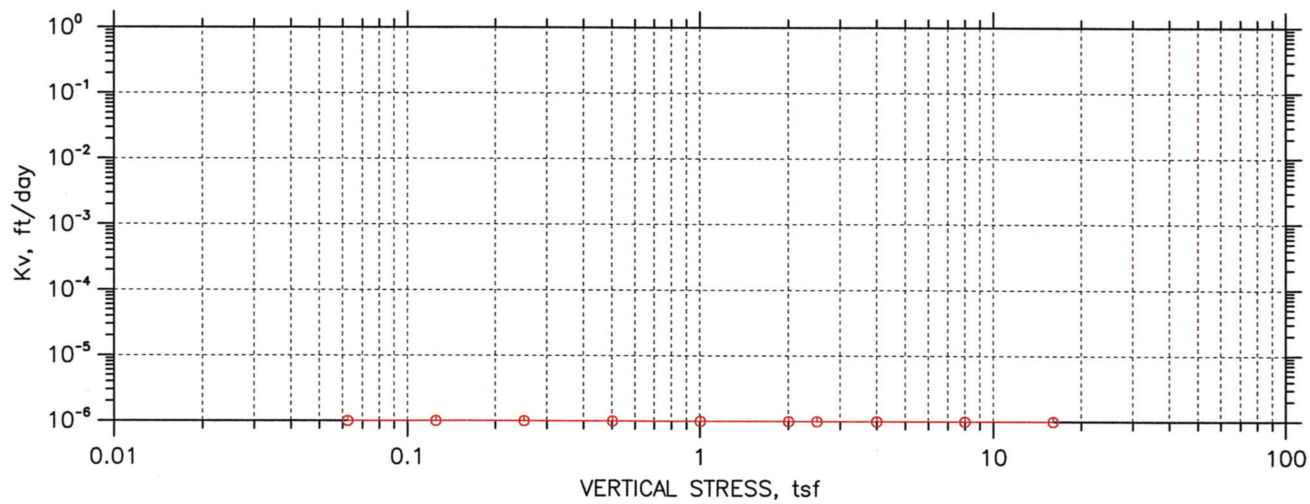
Fri, 22-NOV-2013 14:30:51

One-Dimensional Consolidation by ASTM D 2435 ⇔ Method B

ROOT of TIME COEFFICIENTS





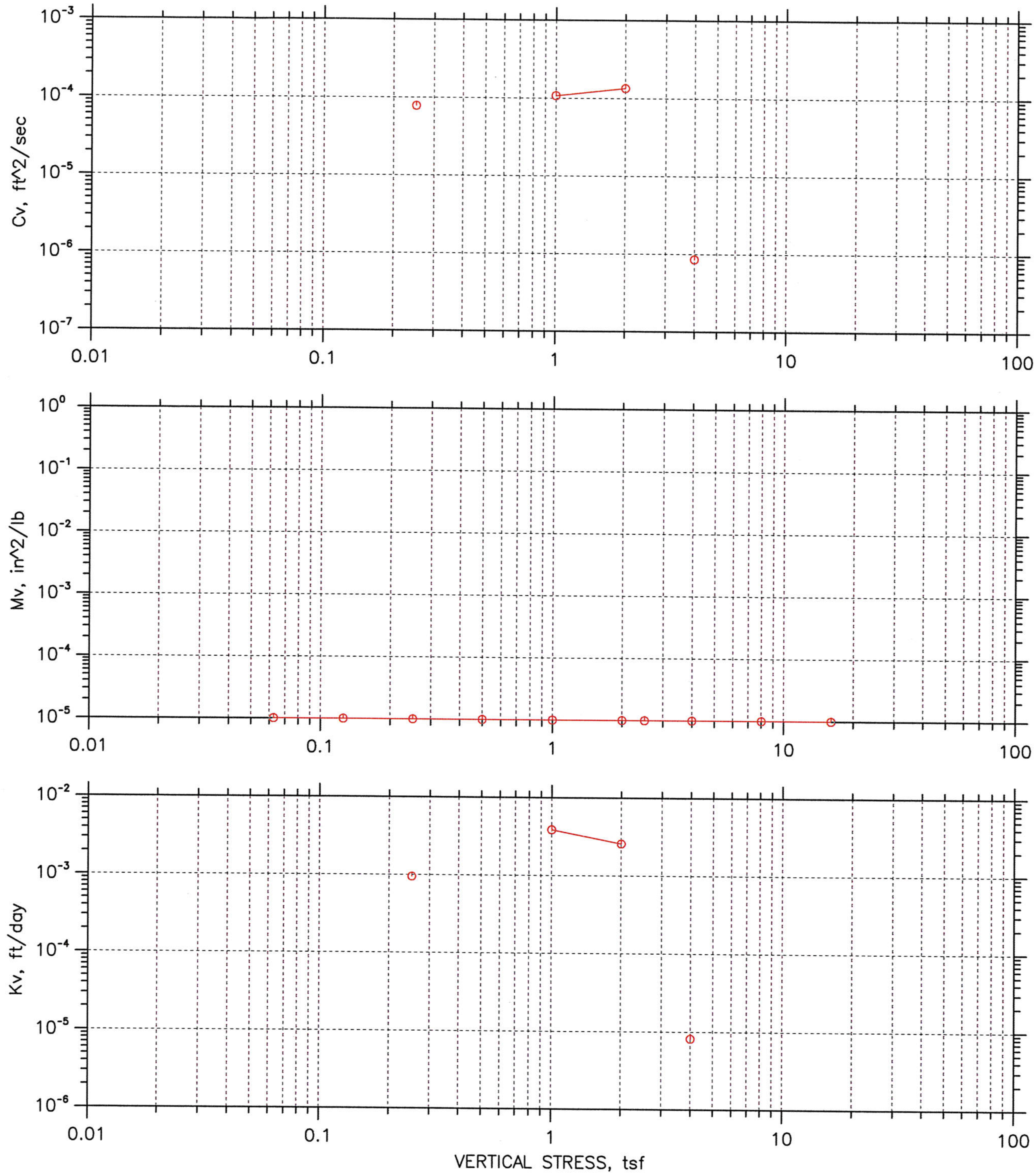


	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 21	Test Date: 11/19/13	Test No.: 13-009-G1
	Depth: ----------	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist; Gray; Clay silty		
	Remarks: Swell V inundated @ 5000 psf		
	Displacement at End of Increment		

Fri, 22-NOV-2013 14:30:51

One-Dimensional Consolidation by ASTM D 2435 ⇔ Method B

LOG of TIME COEFFICIENTS



	Project: Otay Mesa Road UC	Location: 11-SD-125-0.9	Project No.: 11-288811
	Boring No.: RC-13-002	Tested By: jg	Checked By:
	Sample No.: 21	Test Date: 11/19/13	Test No.: 13-009-G1
	Depth: ----------	Sample Type: 2"core/soil	Elevation: 13-068
	Description: Moist; Gray; Clay silty		
	Remarks: Swell V inundated @ 5000 psf		
	Displacement at End of Increment		

Fri, 22-NOV-2013 14:30:52

...Dedicated to Community Service
2554 SWEETWATER SPRINGS BOULEVARD, SPRING VALLEY, CALIFORNIA 91978-2004
TELEPHONE: 670-2222, AREA CODE 619 www.otaywater.gov

July 23, 2014

Project No.: P1438-010000
Activity: 3111

Brooke V. Emery
California Department of Transportation
District 11
4050 Taylor Street, TCIF Corridor, MS 334
San Diego, CA 92110

SUBJECT: 11-SD-905/125; PM 9.6-11.40/0.1-1.7; EA 28881; EFIS 1113000167; Construction Contract # 11-288814; Route 11/125/905 Separation

Dear Ms. Emery:

Otay Water District (District) is in receipt of your letter dated July 8, 2014 regarding water availability for the proposed construction of the Route 11/ 125/ 905 Separation to Construct northbound connectors from Route 905 and Route 11 to Route 125 and bridge undercrossing at Otay Mesa Road (Project).

The District has no objections with providing water for construction purposes for the above mentioned Project. The California Department of Transportation (Caltrans) and/or the Construction Contractor working on behalf of Caltrans will be responsible for all costs associated with obtaining temporary construction meter(s) and water usage during construction. The temporary construction meter(s) applications (**TEMPORARY WATER METERS (FOR USE ON HYDRANT)**) can be obtained from the District's web page at http://www.otaywater.gov/engineering/public services.

At the July 2, 2014 Otay Water District's Board of Director's meeting, the District approved a temporary moratorium on the installation of new recycled water facilities in its Otay Mesa service area. The full staff report is available on the District's website http://www.otaywater.gov/Otay/agenda.aspx.

As a result of this action, during the course of the temporary moratorium, the District will not be advancing recycled water projects, requiring the installation of new recycled water infrastructure, nor issuing permits for new recycled water meters for the Otay Mesa service area. Water to new development will be supplied from the District's potable water system to meet current and future developer project demand.

Please note the moratorium is limited to Otay Mesa and does not apply to the implementation of recycled water projects in east Chula Vista (the District's Central Area) where recycled water is available. The District continues to stand firm in its commitment to the use of recycled water in order to minimize overall demand for potable water and is proud to operate one of the largest recycled water distribution systems in San Diego County.

Water availability is subject to all District requirements in effect at the time of application. You are strongly encouraged to adopt water conservation measures throughout the development. In response to Governor Brown's declaration of a statewide drought, calling on all Californians to save water, the District has declared a Level 1 – Supply Watch Condition. Under a Supply Watch, customers are urged to voluntarily reduce water use by 10 percent.

In addition, the Otay Water Board of Directors will be considering the adoption of a resolution to declare a Water Shortage Response Level 2 – Supply Alert Condition at its August 6, 2014 Board Meeting. Under Supply Alert, customers are urged to reduce water use by 11 to 20 percent.

The applicant should contact all necessary agencies, including the Fire Department and sewer purveyors, for any requirements. The District should then be contacted at (619) 670-2241 regarding any other conditions that may have arisen since this letter was written for this Project.

Should you have any questions, please contact Public Services at (619) 670-2241 or via e-mail at pscounter@otaywater.gov.

Sincerely,
OTAY WATER DISTRICT

Dan Martin, P.E.
Engineering Manager

DM:jf

Enclosures: Code of Ordinances - Sections 26, 27, 31, 39
Appendix A

State of California | Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. DOUG DUNRUD
Structure Design
Office of Bridge Design-South 1
Bridge Design Branch 14
MS #9

Attention: Paul A. Peterson

Date: December 19, 2013

File: 11-SD-125-PM 0.74
11-288811
Proj. ID: 1113000167
Otay Mesa Rd UC
Br. #57-1202R

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2 MS #5
Design Branch B

Subject: Foundation Report for Otay Mesa Road UC

Pursuant to a request by the Office of Bridge Design South 1, Design Branch 14, this report presents Foundation Recommendations for the proposed Otay Mesa Road Undercrossing (UC) right bridge (Br. No. 57-1202R), and supersedes all previously generated Preliminary Foundation Reports for this structure. The following Foundation Recommendations are based on subsurface information gathered during a foundation investigation conducted by Caltrans in October 2013 for the Otay Mesa Rd. UC left and right bridges, as well as a foundation investigation conducted for a Preliminary Foundation Report for the same structures by Leighton Consulting, Inc. dated September 27, 2007. All elevations referenced in this memorandum are referenced to the 1988 North American Vertical Datum (NAVD).

Project Description

The proposed bridge site is located in southern San Diego County, approximately 5.3 miles east of Interstate 805 and approximately 1.0 mile north of the U.S/Mexico border. This structure is part of the Route 905/125/11 interchange project, which is connecting SR 125 with SR 905, and also with the proposed Route 11 freeway. Route 11 is being built to access a proposed new international border crossing located approximately 2.2 miles east of the existing Otay Mesa border crossing. The bridge is to span Otay Mesa Road, and is to be located on northbound SR 125, just north of the intersection with SR 905. The proposed Otay Mesa Rd UC is to consist of a single span, cast-in-place, reinforced concrete, box-girder structure on seat abutments.

Geology

The bridge site is located on the Otay Mesa, which is an east-west trending relic wave cut marine terrace, separating the Otay River drainage to the north, and the Tijuana River drainage to the south. Otay Mesa has generally flat to slightly rolling topography, except where it is cut by Spring Canyon, near the center of the mesa. The geologic map "Geology of National City, Imperial Beach, and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California" (Kennedy and Tan, 1977) indicates that the bridge site is underlain by the Otay

Formation, which is described as a moderately well-sorted, poorly indurated, massive sandstone and claystone. The sandstone is generally weakly cemented, but with locally strongly cemented zones. The claystone is waxy and composed almost exclusively of bentonite.

In October 2013, a subsurface investigation was conducted by Caltrans at the proposed bridge site. The investigation consisted of 2 mud rotary borings (RC-13-001 and RC-13-002) with RC-13-001 being drilled at the Abutment 1 location of the right bridge, and RC-13-002 being drilled at the Abutment 2 location of the left bridge. In July 2007 five hollow-stem auger borings were drilled at the proposed bridge site by Leighton Consulting, Incorporated. Boring B-1 was drilled at the left bridge Abutment 2 location; B-2 was drilled at the right bridge Abutment 2 location; B-3 was drilled in the middle of Otay Mesa Road, near the center of the right bridge; B-4 was drilled at the left bridge Abutment 1 location; and B-5 was drilled at the right bridge Abutment 1 location.

The subsurface investigation for the right bridge revealed the Abutment 1 location is underlain by approximately 7 feet of roadway fill material; which is underlain by about 3 feet of stiff native lean clay, which is considered residual Otay Formation. Beneath that, the horizontal lying sedimentary facies of the Otay Formation, consisting of interbedded layers of very soft to moderately hard sandstones and siltstones were encountered to the maximum depth drilled in boring RC-13-001 (83.3 ft (elev. 444.9 ft)). Boring B-2, drilled by Leighton Consulting at the Abutment 2 location, revealed that location is underlain by about one foot of silty clay, which is underlain by the sedimentary facies of the Otay Formation consisting of interbedded layers of very soft to hard sandstones and siltstones to the maximum depth drilled in that boring (80.3 ft (elev. 446.6 ft)).

Ground Water

During the October 2013 subsurface investigation a piezometer was placed in boring RC-13-002. On October 29, 2013, water was measured at 22.1 ft deep (elev. 506.6 ft) in that boring. Ground water surface elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on seasonal conditions.

Scour Potential

There is no scour potential at the site, since the structure does not span any watercourse.

Corrosion

During the October 2013 subsurface investigation three soil samples were collected for corrosion testing. Corrosion test results for the samples collected from boring RC-13-001 are shown below in Table 1. Due to chloride content being greater than 500 ppm in one of the samples tested, the site is considered to be corrosive based on current Caltrans' standards. Therefore, reinforced concrete (including piles) which are in contact with the native formational material, or fill material composed of the native formational material, require corrosion mitigation in accordance with Section 5 *Concrete Structures* of *California Amendments (to the AASHTO LRFD Bridge Design Specifications – Fourth Edition).* Additionally, where steel piles are specified, sacrificial corrosion allowance is required per Department's *Corrosion Guidelines, Section 12.1*, "Corrosion Mitigation Measures for Steel Piles", available at http://www.dot.ca.gov/hq/esc/ttsb/corrosion/pdf/2012-11-19-Corrosion-Guidelines.pdf

Table 1 – Corrosion Test Summary

Location	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
Boring RC-13-001 (Elev. 501.3 – 500.3 ft)	608	8.45	249	240
Boring RC-13-001 (Elev. 486.3 – 485.3 ft)	424	8.29	115	124
Boring RC-13-001 (Elev. 443.3 – 442.3 ft)	660	8.25	534	220

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 2000 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm.

Fault and Seismic Data

The structure site is potentially subject to ground motions from nearby earthquake sources during the design life of the new structure. For the deterministic procedure, the controlling fault for the site is the Rose Canyon (Silver Strand section – Downtown Graben fault, Fault ID: 410, strike-slip, dip=90°) with a maximum credible earthquake M_{max}=6.8, located approximately 10.5 miles west-southwest of the bridge site. For this site, the probabilistic response spectrum controls, with the corresponding peak ground acceleration (PGA) estimated to be 0.3g. The Office of Geotechnical Design-South 2 is in the process of providing Final Seismic Design Recommendations for the site, which will be forwarded to your office when completed.

Surface Rupture Potential

Surface rupture potential at the bridge site is not considered to be an issue, since no active fault passes near or beneath the bridge site.

Liquefaction Potential

Due to the dense nature of the underlying sedimentary formational material, the potential for soil liquefaction due to strong ground shaking at the proposed bridge site is considered negligible.

Foundation Recommendations

The following recommendations are for the proposed Otay Mesa Rd UC right bridge (Br. No. 57-1202R) as shown on the General Plan dated November 22, 2013. At Abutments 1 and 2 support locations, driven Class 200 "modified" Alternative (Alt) "W" piles are recommended for support. The modification to the Alt "W" piles consists of driving the piles closed-ended with either a flat plate, prefabricated flat plate, or prefabricated conical point welded to the base of the pile. Tables 2 and 3, below, show the foundation design information provided by the structure designer.

Table 2: General Foundation Information Provided by Structure Designer (Br. #57-1202R)

Support Location	Pile Type	Finished Grade Elevation	Bottom of Footing Elevation	Pile Cut-off Elevation	Pile Cap Size (ft)		Permissible Settlement Under Service Load	Number of Piles per Support
					B	L		
Abutment 1	Class 200 Mod. Alt. "W"	540.0 ft	532 ft	532.5 ft	13 ft	64 ft	1.0 in	35
Abutment 2	Class 200 Mod. Alt. "W"	541.0 ft	533 ft	533.5 ft	13 ft	60 ft	1.0 in	35

Table 3: Foundation Design Loads Provided by Structure Designer (Br. #57-1202R)

Support Location	Service 1 Limit State			Strength Limit State (Controlling Group)				Extreme Event Limit State (Controlling Group)			
	Total Loads		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Max Per Pile	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abutment 1	4351 kips	184 kips	4016 kips	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Abutment 2	4292 kips	183 kips	3956 kips	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The specified pile tip elevations for Abutments 1 and 2 are shown below in Table 4.

Table 4: Foundation Design Recommendations for Abutments 1 and 2 (Br. #57-1202R)

Location	Pile Type	Cut-Off Elevation	LRFD Service-I Limit State Load per Support		LRFD Service-I Limit State Total Load per Pile (Compression)	Nominal Resistance	Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
			Total	Permanent					
Abutment 1	Class 200 Mod. Alt. "W"	532.5 ft	4360 kips	4020 kips	190 kips	380 kips	501.0 ft (a)	501.0 ft	380 kips
Abutment 2	Class 200 Mod. Alt. "W"	533.5 ft	4300 kips	3960 kips	190 kips	380 kips	512.0 ft (a)	512.0 ft	380 kips

Note: 1) Design tip elevation is controlled by: (a) Compression

The Pile Data Table for Abutments 1 and 2 is presented in Table 5, below. The ultimate geotechnical pile capacity for the "modified" Alt. "W" piles will meet or exceed the required nominal resistance in compression.

Table 5: Pile Data Table (Br. #57-1202R)

Location	Pile Type	Nominal Resistance		Design Tip Elevation	Specified Tip Elevation	Nominal Driving Resistance
		Compression	Tension			
Abutment 1	Class 200 Mod. Alt. "W"	380 kips	0	501.0 ft (a)	501.0 ft	380 kips
Abutment 2	Class 200 Mod. Alt. "W"	380 kips	0	512.0 ft (a)	512.0 ft	380 kips

Notes: 1) Design tip elevation is controlled by: (a) Compression

Abutments 1 and 2 Left and Right Side Wing Walls

The Abutments 1 and 2 left and right side wing wall footings may be supported on spread footings founded on fill material compacted to 95% relative compaction. The recommended Factored Gross Nominal Bearing Resistances and bottom of footing elevations are listed below in Tables 6 and 7.

Table 6:
Abutment 1 Left and Right Side Type 1 Ret. Wall LRFD Spread Footing Recommendations (Br. #57-1202R)

Wall Location	Wall Segment*	Design Height of Wall "H" (ft)	Bottom of Footing Elevation (ft)	Loading Type	Effective Footing Width (B') (ft)	Gross Uniform Bearing Stress (q_o) (ksf)	Net Bearing Stress (q'_o) (ksf)	Permissible Net Contact Stress (q_{pn}) (ksf)	Factored Gross Nominal Bearing Resistance (q_R) (ksf)
Abutment 1 Left & Right	Segment 1	10	545.7 ft	Service	6.0	N/A	1.6	8.4	N/A
				Strength	3.0	3.3	N/A	N/A	4.1
				Extreme I	2.9	3.4	N/A	N/A	8.8
Abutment 1 Left & Right	Segment 2	14	541.3 ft.	Service	7.5	N/A	2.1	7.0	N/A
				Strength	4.3	3.8	N/A	N/A	4.6
				Extreme I	3.2	5.3	N/A	N/A	9.3
Abutment 1 Left & Right	Segment 3	18	537.3 ft	Service	9.8	N/A	2.3	5.0	N/A
				Strength	6.4	3.7	N/A	N/A	4.5
				Extreme I	4.1	6.1	N/A	N/A	10.5

*Wall segment 1 is farthest from the abutment, and Wall segment 3 is nearest the abutment.

Table 7:
Abutment 2 Left and Right Side Type 1 Ret. Wall LRFD Spread Footing Recommendations (Br. #57-1202R)

Wall Location	Wall Segment*	Design Height of Wall "H" (ft)	Bottom of Footing Elevation (ft)	Loading Type	Effective Footing Width (B') (ft)	Gross Uniform Bearing Stress (q_o) (ksf)	Net Bearing Stress (q'_o) (ksf)	Permissible Net Contact Stress (q_{pn}) (ksf)	Factored Gross Nominal Bearing Resistance (q_R) (ksf)
Abutment 2 Left & Right	Segment 1	22	537.1 ft	Service	12.1	N/A	2.5	5.0	N/A
				Strength	8.2	4.1	N/A	N/A	4.5
				Extreme I	5.0	6.9	N/A	N/A	10.7
Abutment 2 Left & Right	Segment 2	18	541.3 ft.	Service	9.8	N/A	2.3	5.8	N/A
				Strength	6.4	3.7	N/A	N/A	4.5
				Extreme I	4.1	6.1	N/A	N/A	10.5
Abutment 2 Left & Right	Segment 3	14	545.3 ft	Service	7.5	N/A	2.1	7.6	N/A
				Strength	4.3	3.8	N/A	N/A	4.8
				Extreme I	3.2	5.3	N/A	N/A	9.6

*Wall segment 1 is nearest the abutment, and Wall segment 3 is farthest from the abutment.

The recommended Factored Gross Nominal Bearing Resistances provided in Tables 6 and 7, above, are based upon the following design criteria:

1) All retaining walls will be Standard Type 1 retaining walls as shown in the "Standard Plans (2010)" on Revised Standard Plan RSP sheet B3-1A for Loading Case 1.

2) All spread footings shall be constructed at or below the recommended bottom of footing elevations as shown in Tables 6 and 7, above.

3) At locations where newly-placed fill is to be placed beneath the proposed wing wall footings, the newly-placed fill is to be compacted to 95% relative compaction as defined in section 19-5.03B of the Standard Specifications.

4) All proposed wing wall spread footings that will be constructed on the embankment slope are to be positioned such that they have a minimum horizontal footing embedment of 4 feet, measured from the top of footing to the face of the finished slope. The finished slope is not to exceed a 2:1 (vertical to horizontal) ratio.

If any of the above vertical embedment depths are reduced, the loading case changed, or wall heights increased, the Office of Geotechnical Design-South 2, Branch B is to be contacted for reevaluation.

General Notes:

1) All support locations are to be plotted in plan view on the Log of Test Borings as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations:

Driven Piles

1) The calculated geotechnical capacity of the "modified" Alternative "W" pipe piles is based predominantly on end-bearing.

2) Pile acceptance is to be based on Standard Specifications 49-2.01A(4)(b) "Pile Driving Acceptance Criteria". Any pile that achieves 1½ times the required nominal resistance in compression, as shown on the contract plans, within 5 feet of the specified pile tip elevation, may be considered satisfactory and cut off with written approval from the engineer. 1½ times the nominal resistance in compression at Abutments 1 and 2 locations will be 570 kips.

3) At Abutments 1 and 2 locations, to ensure the pile tips penetrate below embankment fill material and within the sedimentary formational material underlying the site, drilling to assist driving will be required prior to driving each "modified" Alt "W" pile. The drilling to assist driving shall be in accordance with Standard Specification Section 49-2.01C(3) "Drilling", to the corresponding bottom of hole elevation shown in Table 8, below.

Table 8: Bottom of Drill to Assist Driving Hole Elevations

Location	Bottom of Drill to Assist Driving Hole Elevations
Abutment 1	506.0 ft.
Abutment 2	517.0 ft.

Spread Footings

1. At all proposed wing wall segments where the footings are to be supported on newly-placed fill material, all concrete for the proposed support footings shall be placed neat against the undisturbed engineered fill at the bottom of the footing excavation. Should the bottom of footing excavation be disturbed, then the disturbed soils shall be recompacted to 95% relative compaction prior to placement of concrete for the wing wall support footings.

This Foundation Report is based on specific project information regarding structure type and location that have been provided by Structure Design, Office of Bridge Design – South 1. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South 2, Design Branch B, should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Erich Neupert, (916) 227-4565, or Mark DeSalvatore, (916) 227-5391, at the Office of Geotechnical Design-South 2, Branch B.

Prepared by: Date: 12/19/13

Erich Neupert

Erich Neupert, P.G., 8137
Engineering Geologist
Office of Geotechnical Design-South 2
Design Branch B

PROFESSIONAL GEOLOGIST
ERICH NEUPERT
No. 8137
Exp. 2/28/14
STATE OF CALIFORNIA

Reviewed by: Date: 12/19/13

Mark DeSalvatore, R.C.E., 039499
Senior Materials & Research Engineer
Office of Geotechnical Design-South 2
Design Branch B

REGISTERED PROFESSIONAL ENGINEER
MARK DeSALVATORE
No. CE039499
Exp. 12/31/13
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File
Ofelia Alcantara - Specs & Estimates
Carlos Cortez – District 11 (Project Manager)
Art Padilla – District 11 (Materials Engineer)
Abbas Abghari – OGDS-2
Geotechnical Archive

DISTRICT 11

MATERIALS INFORMATION BROCHURE

MATERIALS ENGINEERING BRANCH

11-SD-11/125/905
PM Var.
11-288811
EFIS# 1113000167

CT CALIFORNIA DEPARTMENT OF TRANSPORTATION

State of California | Business, Transportation and Housing Agency

Memorandum

To : LEON EDMONDS (332)
Office Engineer
District 11

Date: December 20, 2013

File: 11-SD-11/125/905
PM Var.
EA 288811
EFIS#1113000167

From **DEPARTMENT OF TRANSPORTATION - DISTRICT 11**
Materials Engineering Branch

subject: Materials Information Brochure

Attached herewith for your consideration

MATERIALS INFORMATION

FOR PROPOSED PROJECT ON ROUTE 111

IN SAN DIEGO COUNTY

STATE ROUTE 11/125/905

For Construction of State Highway in San Diego County,
and near San Diego at Route 11/125/905 Separation

REGISTERED PROFESSIONAL ENGINEER
ARTHUR F. PADILLA
No. C 49529
Exp. 9-30-14
CIVIL
STATE OF CALIFORNIA

Arthur F. Padilla
District Materials Engineer

Attachment

AFP: js
cc: C Cortez (333)
Project File 288811.doc

MATERIALS INFORMATION

11-SD-11/125/905
PM Var.
EA 288811

NOTE: Information contained herein has been compiled in accordance with Section 2-1.3 of the Standard Specifications. Additional information is available for review at the District 11, Materials Laboratory, 7177 Opportunity Road, San Diego, California.

TABLE OF CONTENTS

MATERIALS INFORMATION

GROUND WATER

Test pits taken to depths of 3.0 ft. did not expose any groundwater. Geotechnical South (Caltrans) is monitoring standpipes that will enable them to record fluctuating groundwater levels at depths greater than test pits allow.

R-VALUES

Existing soils within the general limits of the project were primarily clay soil types with the exception of one clayey sand. R-values ranged between 5 and 15.

GRADING FACTORS

The average relative compaction of existing basement soils is 79%. Removal and recompaction of those soils to 90% as specified in section 19 of the Standard Specifications will produce a grading factor of 0.88 or shrinkage of 12.2%.

EMBANKMENT RECOMMENDATIONS

Basement soils excavated during structural section construction should be placed in the embankments. Imported Borrow with an R-value of no less than 5 should be used to make up any deficiencies when constructing embankments.

CLASS 4 AGGREGATE SUBBASE

Material for aggregate subbase may be processed from soils found within the project or obtained from commercial sources. Aggregate subbase shall be Class 4 and conform to the provisions in Section 25, "Aggregate Subbase," of the Standard Specifications, and Standard Special Provision 25-1.

Class 4 aggregate subbase shall have a minimum R-value of 60 and a Sand Equivalent of 22. The aggregate subbase shall conform to the following grading:

Sieve Sizes	Percentage Passing
6 inch	100
3 inch	90-100
No. 4	35-100
No. 30	0-60
No. 200	0-20

EARTHWORK QUANTITIES

The following earthwork quantities are from the Engineer's Estimate:

Roadway Excavation	113,000 CY
Roadway Embankment	284,000 CY
Borrow	170,500 CY
Class 2 Aggregate Base	11,000 CY
Class 4 Aggregate Subbase	5,600 CY

CORROSION ANALYSIS

Corrosion potential tests were performed on seven soil samples and analyzed with Caltrans Alternate Pipe (V-7.0) software. Based on this testing and analysis, the environment is rated as generally very corrosive to aluminum and aluminized pipes. The design values chosen for analysis are as follows:

- Soil PH = 7.5
- Soil Minimum Resistivity = 333 Ohms.cm
- Sulfates = 1500 mg/kg
- Chlorides = 1980 mg/kg
- Non-abrasive flow conditions

RECOMMENDED CULVERT ALTERNATIVES

1. Use of reinforced concrete pipe (RCP) and or reinforced concrete box (RCB), must incorporate type IP (MS) modified cement, type II modified cement with mineral admixture or Type V cement with mineral admixture as set forth in subsection 90-1.02.B of the Standard Specifications. Concrete pipe shall contain 5.0 sacks, 470 pounds of cement, with a minimum 1.0" cover to steel and a maximum water/cement ratio of 0.40.

2. Steel-Metal Pipes, 18 gage (0.052") or greater polymerized asphalt (hot-dipped) or polymeric sheet coated.

3. HOPE – Type S or C.

4. PVC – Type S or C.

Final pipe options will be made by Caltrans Hydraulics after abrasion and fill heights are addressed.

MATERIALS SOURCES

A current list of mining operations eligible to sell materials such as aggregates to the State of California in San Diego County, can be found at the following California Office of Mine Reclamation website:

http://www.conservation.ca.gov/omr/SMARA%20Mines/ab_3098_1ist/Pages/I ndex.aspx

GEOTECHNICAL DESIGN REPORT

State Route 905/State Route 125 Northbound Connectors Project

11-SD-11/905/125- PM VAR

EA 11-288811
EFIS 1113000167

February 04, 2014

Prepared By:

OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2, BRANCH-D
7177 OPPORTUNITY ROAD
SAN DIEGO, CA 92111

Memorandum

To: Mr. Michael Webster
Project Design Senior

Date: February 04, 2014

File: 11-SD-11/905/125-PM VAR
EA 11-288811
EFIS 1113000167

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design- South 2, Branch-D

Subject: Geotechnical Design Report for State Route 905/State Route 125 Northbound Connectors Project

Pursuant to your request, the Office of Geotechnical Design-South 2 (OGDS2), Branch-D has prepared this Geotechnical Design Report (GDR) for the design and construction of the proposed State Route 905/State Route 125 Northbound Connectors Project.

This GDR documents the prevailing site conditions and provides specific recommendations for project features. This report defines the geotechnical conditions as evaluated from previous field investigations and used in geotechnical analyses and design. This report provides recommendations for project design and construction. This report does not address the foundation aspects of the proposed bridge structures that are part of this project. Foundation reports for the bridge structures will be issued separately by OGDS2.

Please ensure that this GDR is included in the District Resident Engineer (RE) Pending File. OGDS2 staff will be available for further assistance. Should you have any questions or comments regarding this report, please contact the undersigned.

Zia Yazdani P.E., G.E.
Associate Materials and Research Engineer
Office of Geotechnical Design-South 2, Branch-D
(760) 639-4440

Brian Hinman P.E.
Senior Transportation Engineer (Civil)
Office of Geotechnical Design- South 2, Branch-D
(858) 705-1344

CARBON COPY (CC) LIST

Ismael Salazar	District Project Manager
Brooke Emery	Project Engineer
Art Padilla	District Materials Engineer
Shawn Wei	Office of Geotechnical Design- South 2, Branch-D Senior
Geotechnical Archives	http://10.160.173.158/

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (continued)

Section **Page**

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

This Geotechnical Design Report (GDR) has been prepared by the Office of Geotechnical Design South-2 (OGDS2) to address the geotechnical design considerations for the State Route 905 (SR-905)/State Route 125 (SR-125) northbound connectors project, on Otay Mesa, in southwest San Diego County, California hereafter referred to as the project. Figure 1 is the project location map. Figure 2 is an aerial photograph of the project site. The project will construct the westbound SR-905 to the northbound SR-125, the westbound State Route 11 (SR-11) to the northbound SR-125, and the eastbound SR-905 to the northbound SR-125 connectors.

The purpose of this GDR is to document subsurface geotechnical conditions, provide engineering evaluation of site conditions, and provide recommendations relevant to the design and construction of the project features. This report establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions. The geotechnical information, evaluation, recommendations, and advisories contained in this GDR supersede any information that may have been previously conveyed through correspondences or documents concerning the project features addressed herein.

This GDR is based on site reconnaissance; research of archived resources; data from previous subsurface exploration performed by OGDS2 and Leighton Consulting, Incorporated; and engineering analyses. A list of documents utilized to prepare this GDR is contained in Section 3.0. The project layout plans, profile plans, and cross sections referenced during the preparation of this GDR were provided by Caltrans District 11 Design. Project layout plans utilized are included as Figure 3A through Figure 3F. A draft GDR was prepared for this project by Leighton Consulting, Incorporated dated February 6, 2008 and is included as Appendix II. This GDR was prepared in accordance with the guidelines set forth in the *Caltrans: Guidelines for Preparing Geotechnical Design Report (GDR), Version 1.3, December 2006.* All units referenced in this document are United States (U.S) Customary units, unless otherwise noted. All elevations referenced in this report are in feet and referenced to the NAVD88 vertical datum. Stations are referenced to the "N", "EN", and "WN" Lines.

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENT

2.1 Existing Facilities

Existing facilities in the vicinity of the project alignment include SR-905 and SR-125. SR-905 is aligned from west to east then turns southbound towards Airway Road. SR-905 terminates at the existing Otay Mesa Point of Entry (POE). Southbound SR-125 approaches the proposed SR-11/SR-905 junction from the north but terminates at a point to the north of Otay Mesa Road.

2.1.1 Existing Roadway

No roadways currently exist along the alignments of the proposed connectors. The proposed project features will be located on a swath of vacant State right-of-way surrounded and crossed by local streets, including: Otay Mesa Road, which is located to the north of the project and runs west to east; Harvest Road, which is located to the east of the project and runs south to north; and Airway Road which is located to the south of the project and runs west to east.

2.1.2 Existing Cut, Fill and Natural Slopes

The topography at the site is relatively flat. There are no natural or cut slopes along the alignment of the proposed freeway.

There are two (2) existing soil stockpiles within the project footprint. The first stockpile is located to the west of Harvest Road and south of Otay Mesa Road. This stockpile is approximately twenty-feet (20ft) in height with a slope ratio of approximately two-horizontal to one-vertical (2H:1V). The slope of this stockpile is stable. This stockpile was developed during construction of SR-905 and contains excess materials that were obtained from roadway excavations and grading at the nearby Dillard property. This stockpile is shown on Figure 4 as the area designated "Grading for Future SR-125 Connector". Based on information provided by Caltrans Construction the stockpile at this location has been compacted and documentation regarding the proper placement and compaction of the fill is available. The fill materials are comprised of medium dense to dense clayey sands and moist, stiff sandy clays.

The second stockpile is located north of Otay Mesa Road. This stockpile consists of uncompacted, non-engineered fill comprised predominantly of expansive clayey materials that were obtained from excavations made during the construction of SR-125 to the north of the project. This stockpile is shown as undocumented fill on Figure 7A.

There are four (4) other existing stockpiles in the project vicinity shown on Figure 4. These stockpiles are designated as Location 1 (a.k.a. Sanyo Stockpile), Location 2, Location 3, and Location 4. The stockpiles at Locations 2 and 3 are expected to be used as potential borrow sources for the construction of SR-11, which is anticipated to begin prior to the construction of the project. The Sanyo Stockpile and the stockpile at Location 4 are expected to be left in place as finished embankment to be part of SR-11 and associated bridge connectors. These four stockpiles have limited relevance to the project. Information pertaining to these four stockpiles is presented in the GDR for SR-11, dated May 13, 2013 prepared by OGDS2 and referenced in Section 3.0 of this GDR.

2.1.3 Existing Development

Land adjacent to the project is both undeveloped fallow farm land and densely developed industrial parks. Development abuts the proposed State right-of-way.

2.1.4 Existing Utilities

Utilities present within the limit of the project include underground water, sewer, storm drain, gas, electrical, and telecommunication lines. Additionally there are existing overhead electrical lines along Otay Mesa Road, Airway Road and the Harvest Road utility corridor just east of SR-905.

2.2 Proposed Improvements

The proposed improvements will consist of three (3) connector ramps including:

1. The westbound SR-905 to the northbound SR-125 connector.
2. The westbound SR-11 to the northbound SR-125 connector.
3. The eastbound SR-905 to the northbound SR-125 connector.

The proposed connector ramp alignments are shown on Figure 2. The proposed connector ramps will be constructed primarily on embankment fill.

The westbound SR-905 to the northbound SR-125 connector will originate from SR-905 at approximate Station 30+52 and terminate at approximate Station 70+00 on the "N" line. Earthwork to attain profile grade will involve cuts of approximately fifteen-feet (15ft) in maximum height and fills of approximately thirty-two-feet (32ft) in maximum height.

The westbound SR-11 to the northbound SR-125 connector will originate at approximate Station 68+00 and terminate at approximate Station 92+50 on the "WN" line. Earthwork to attain profile grade will involve a maximum cut of approximately fourteen-feet (14ft) and a maximum fill height of approximately forty-four-feet (44ft).

The eastbound SR-905 to the northbound SR-125 connector is a loop ramp that will originate at approximate Station 63+40 and terminate at approximate Station 86+21 on the "EN" line. Earthwork to attain profile grade will involve a maximum cut of approximately twelve-feet (12ft) and a maximum fill height of approximately thirty-eight-feet (38ft).

2.2.1 Proposed Roadways

The proposed ramps will vary in width with a maximum width of fifty-nine-feet (59ft) without shoulders. Shoulder widths will vary from five to ten-feet (5-10ft). The typical pavement structural section will be comprised of a layer of Jointed Plane Concrete Pavement over Type-A Hot Mix Aggregate over Class II Aggregate Base.

2.2.2 Proposed Slopes

In order to provide the embankment width necessary to construct the connector ramps, additional embankment fill is proposed. Embankment fill will range from approximately thirty to forty-five-feet (30-45ft) in height. Fill slopes will range in inclination from two-horizontal to one-vertical (2H:1V) to four-horizontal to one-vertical (4H:1V) or flatter. Cut slopes are also proposed. The cut slopes will be inclined at four-horizontal to one-vertical (4H:1V) and will not exceed fourteen-feet (14ft) in height.

2.2.3 Proposed Bridges

A bridge structure is proposed at the SR-125 and Otay Mesa Road Undercrossing.

Information on the site conditions, analyses, advisories, and recommendations relevant to this bridge structure are provided in a separate Foundation Report.

2.2.4 Proposed Retaining Walls

Retaining walls are not proposed as part of this project

2.2.5 Proposed Drainage Facilities

Fifteen (15) drainage systems are proposed. The drainage facilities will range in diameter from eighteen to seventy-two-inches (18-72in). These drainage systems will be placed at the approximate original ground surface, below grade, or in embankment. Detention basins are also proposed for the project. No box culverts are proposed for this project. The plans depicting the locations of the proposed drainage facilities that were used to prepare this GDR are included as Figure 5A through Figure 5C.

2.2.6 Proposed Soundwalls/Sound Berms

Soundwalls and sound berms are not proposed as part of this project.

2.2.7 Proposed Overhead Signs

Two (2) overhead sign structures are also proposed for this project. These overhead sign structures will be Standard Plan Design structures supported on Cast-In-Drill Hole (CIDH) foundations. The approximate locations of the proposed overhead signs are depicted on Figure 3B and Figure 3F.

3.0 PERTINENT REPORTS AND INVESTIGATIONS

Pertinent reports and investigations utilized in the preparation of this GDR include:

- *Leighton Consulting Inc. (February 2008), Draft Geotechnical Design Report, SR-125/SR-905 Connector, San Diego County, California, Project Number 600158-905*
- *Caltrans (September 2005), Geotechnical Design Report, 11-SD-905-KP9.2/18.0, 11-091821*
- *Caltrans (June 2001), Geotechnical Design Report, 11-SD-905-KP 18.5/19.3*
- *Caltrans (May 2013), Geotechnical Design Report, 11-SD-11/905-PM 0.0/1.6, PM R9.9/10.7*

4.0 PHYSICAL SETTING

The following section describes the physical setting of the project including: the climate; topography and drainage; man-made and natural features of engineering and construction significance; regional geology and seismicity; and soil survey mapping.

4.1 Climate

San Diego has a Mediterranean to semi-arid climate that is characterized by warm, dry summers and mild winters with some rain. San Diego has mild, mostly dry weather with approximately two hundred (200) days above seventy-degrees Fahrenheit (70°F). The extended summer and dry period lasts from May to October. Temperatures are mild to warm in the summer. The typical high and low temperatures during the summer range from seventy to seventy-eight-degrees Fahrenheit (70-78°F) and fifty-five to sixty-six-degrees Fahrenheit (55-66°F), respectively. Temperatures exceed ninety-degrees Fahrenheit (90°F) approximately four (4) days a year. Winter is the rainy period and lasts from November to April. Temperatures are mild with periods of moderate to heavy precipitation. The typical high and low temperatures during the winter range from sixty-six to seventy-degrees Fahrenheit (66-70°F) and fifty to fifty-six-degrees Fahrenheit (50-56°F), respectively. On average there are approximately ten-inches (10in) of rainfall in San Diego annually. However, precipitation may range from three to thirty-inches (3-30in) during any given year.

4.2 Topography & Drainage

The project site topography may be described as a mostly planar inland mesa with broad, subdued undulations. The approximate elevation at the project site is six hundred-feet (600ft) above mean sea level (MSL).

The broad undulations on the mesa gather storm runoff and convey concentrated flows in a general southerly direction. Urban runoff from streets and industrial parks is gathered and conveyed by a system of gutters and storm drains. This runoff conveyed through engineered systems is directed to small arroyos that trend southward into Mexico. All concentrated runoff originating on the mesa ultimately discharge into the Tijuana River Valley that runs west to the Pacific Ocean.

4.3 Man-made and Natural Features of Engineering and Construction Significance

The project site is overlain by a thin mantle of topsoil which is known to be moderately and highly expansive. These materials typically swell with an increase in moisture content and shrink with a decrease in moisture content. Pavements and other improvements constructed directly on these materials are subject to distress due to ground movements caused by variation in moisture content.

Corrosive materials are likely to be encountered at the project site. Special design considerations may be needed to mitigate the effects of corrosion at the site.

The stockpile designated "Grading for Future SR 125 Connector" consisting of compacted fill material is located to the west of Harvest Road and south of Otay Mesa Road. These materials were obtained from excavations during construction of SR-905 and from excess material generated during grading operations at the nearby Dillard property northeast of the project site. This embankment will remain in place and will be part of the SR-125 alignment.

A stockpile of undocumented fill north of Otay Mesa Road was encountered by Leighton Consulting Group, Inc. during their field investigation. The presence of this stockpile was confirmed by the recent field mapping conducted by OGDS2 and is depicted on Figure 7A. The undocumented fill varies in thickness from five to ten-feet (5-10ft) and is comprised predominantly of uncompacted, non-engineered clayey sand, silty and sandy clay with construction debris. These materials are highly compressible in their present condition and will need to be removed during the grading operations.

4.4 Regional Geology and Seismicity

The project site lies within the coastal plain of the Peninsular Range Geomorphic Province of California. The Peninsular Ranges are a group of mountain ranges that extend nine hundred-miles (900mi) from the Transverse Ranges and the Los Angeles Basin in Southern California to the southern tip of Mexico's Baja California. The southern segment of the Peninsular Ranges in Southern California is referred to as the San Diego Embayment. The San Diego Embayment consists of thick sequences of marine and non-marine sediments. The sedimentary rocks within the San Diego Embayment form an eastward thinning wedge of continental margin deposits that extend from Oceanside to the US-Mexico border.

The closest regional active faults to the project site is the Coronado Banks Fault and the Newport Inglewood Rose Canyon Fault System that run on a north-northwest trend and located approximately eight-miles (8mi) to the west. Data pertaining to the regional active faults are included in Table 1.

4.5 Soil Survey Mapping

The Soil Survey of San Diego Area, California prepared by United States Department of Agriculture (USDA), Soil Conservation Service (SCS) and Forest Service and published in 1973 was utilized to determine the surficial soils and their general properties. The soil units mapped along the project alignment are Salinas clay (ScA) and Diablo clay (DaC and DaD). The Salinas clay consists of a surface layer of clay and a substratum of clay to clay loam with zero to two-percent (0-2%) slopes. The Diablo clay consists of well-drained, moderately deep to deep clays derived from soft calcareous sandstone and shale. These soils have slopes of two to nine-percent (2-9%). Both of these material types were encountered in previous subsurface investigations.

According to the USDA-SCS publication the Salinas clay has low permeability, very slow runoff and a slight erosion hazard. The Diablo clay has low permeability, slow to medium runoff and a slight to moderate erosion hazard. Figure 6 presents the Soil Survey Map for the site.

5.0 EXPLORATION

No recent subsurface exploration work was performed for this project by OGDS2. Data developed by OGDS2 during previous investigations for SR-11 and the bridge structures as well recent geologic mapping performed by OGDS2 were utilized in developing geotechnical engineering recommendations for this project. Soil boring data developed previously by Leighton Consulting, Inc. and presented in the referenced draft GDR were also utilized.

5.1 Drilling and Sampling

No recent drilling and sampling was performed by OGDS2 for this GDR.

5.2 Geologic Mapping

The project geologic map and an expansive soil location map are presented in Figure 7A and Figure 7B, respectively. The project geologic map depicts geo-materials that will likely be encountered during construction. The project geologic map is based upon geologic mapping completed by Kennedy and Tan in 1977 and presented in the *California Divisions of Mines and Geology (CDMG) publication titled "Geology of National City, Imperial Beach and Otay Mesa Quadrangles, San Diego* Metropolitan Area, California, Map Sheet 29." Project level geologic mapping was conducted to ascertain the presence and extent of geo-materials not represented in the referenced CDMG publication. The project geologic mapping was conducted during the month of November, 2013.

5.3 Geophysical Studies

No geophysical studies were conducted for the preparation of this GDR.

5.4 Instrumentation

No piezometers or any other monitoring devices were installed during the field investigation.

5.5 Exploration Notes

No recent exploratory work was performed at the project site.

6.0 GEOTECHNICAL TESTING

No recent geotechnical testing was performed for this project. Archived data was reviewed for projects in the area to determine the geotechnical engineering properties of the project site soils.

7.0 GEOTECHNICAL CONDITIONS

The following section describes the geotechnical conditions that will affect the project.

7.1 Site Geology

The project site is located on Otay Mesa, which is situated near the inland edge of a sediment filled basin. Volcanic basement rock is exposed at the surface just a few miles east of the site. The surface of Otay Mesa represents an erosional remnant of Tertiary sedimentary beds cut by Quaternary sea advances. These beds are believed to be comprised of both marine and terrestrial sediments.

7.1.1 Lithology

The following materials are found in the project area. Figure 7A is the project geologic map.

Topsoil: A layer of topsoil exists at the ground surface along undeveloped portions of the project. Topsoil is comprised of dark brown, dry to moist, medium to very stiff, sandy clay and clayey sand with scattered gravel. The topsoil layer averages five-feet (5ft) of thickness. The topsoil is not depicted on the project geologic map.

Documented Fill (Qaf): Documented fill (a.k.a. artificial fill) in the project area appears to be derived from material excavated from nearby cuts in the sandstone and siltstone. In general, the documented fill materials are comprised of medium dense to dense silty sand and clayey sand with scattered gravel and occasional cobbles.

Undocumented Fill (Qafu): A significant volume of undocumented fill exists north of Otay Mesa Road and is believed to have originated from grading operations during construction of existing SR-125. These fills are comprised of uncompacted clayey sand, silty and sandy clay, and silt. Construction debris consisting of wood planks, PVC fragments, and concrete clasts were encountered in the undocumented fill encountered in an exploratory test pit excavated by Leighton Consulting Inc. The thickness of the undocumented fill ranges from five to ten-feet (5-10ft).

Quaternary Alluvium (Qal): The Quaternary Alluvium (Qal) are recent, water-born, clastic deposits. The alluvium clast range in size from clay to cobble.

Tertiary Otay Formation (To): The Tertiary Otay Formation (a.k.a. Otay Formation) is comprised of brown to gray, silty sandstone, siltstone and claystone. These materials were generally found to be moderately to intensely weathered; moderately soft to soft; and moderately to intensely fractured. The Otay Formation is known to contain beds, lenses, and laminae of pure and impure bentonite. The bentonite and bentonitic mudstones are highly expansive.

Other materials depicted on Figure 7A include: Alluvium and Otay Formation Undifferentiated (Qal/To UDF), Alluvium and Fill Undifferentiated (Qal/Qaf UDF), and Otay Formation and Fill Undifferentiated (To/Qaf UDF).

7.1.2 Structure

The Otay Formation is generally flat lying and laterally continuous for large distances. The stratum appears to have a mild dip of approximately five-degrees (5°) towards the southwest in the general vicinity of the project site, which essentially mirrors the topographic descent in this direction.

7.1.3 Natural Slope Stability

There are no natural slopes present along the alignment of this project.

7.2 Subsurface Conditions

The following sections describe the relevant geotechnical conditions that impact project design and excavations.

7.2.1 Soil and Rock

Topsoil, documented fill, and undocumented fill soils overlie the sedimentary rock strata (Otay Formation) at the project site.

The topsoil is typically comprised of stiff sandy clay and medium dense clayey sand with high plasticity. The topsoil is known to be moderately and highly expansive. These materials typically swell with an increase in moisture content and shrink with a decrease in moisture content. Pavements and other improvements constructed directly on these materials are subject to distress due to ground movements caused by variation in moisture content.

The documented fill is comprised of medium dense to very dense silty and clayey sand. The documented fill are compacted to Caltrans Standards (engineered). These materials are considered suitable for the support of the proposed freeway improvements.

The undocumented fill is comprised of uncompacted sandy and silty clay, clayey sand and silt with construction debris and trash. In their present condition, these undocumented fills are considered unsuitable for support of the proposed freeway improvements.

The Otay Formation underlies the entire project area and will be exposed in some areas during grading and excavations. The Otay Formation is comprised of weakly indurated sandstone with interbedded layers of siltstone and claystone. The Otay Formation is considered to be competent to support embankment loads. However, the Otay Formation is known to contain beds, lenses, and laminae of pure and impure highly-expansive bentonite and bentonitic mudstones considered unsuitable for support of the proposed freeway improvements.

7.2.2 Groundwater

The regional ground water table was not encountered in previous investigations at the site. Groundwater is located at significant depth relative to the proposed construction.

Perched ground water was encountered at depths of six to thirteen-feet (6-13ft) in previous investigations conducted by OGDS2. The Leighton Consulting, Inc. Draft GDR, prepared in 2008, refers to the presence of perched ground water in some exploratory borings at depths ranging from fifteen to thirty five-feet (15-35ft) below original ground surface. The sedimentary formation varies in strength and permeability. Groundwater is perched atop stronger, less permeable layers and zones. Virtually all perched groundwater in the project area is local storage within the sedimentary formation or overlying material.

7.2.3 Corrosion

No corrosion tests were performed during this investigation. These tests were deemed unnecessary in view of the considerable amount of data that had been developed during previous investigations conducted by OGDS2 for SR-905 and by Leighton Consulting, Inc. for the draft GDR. In general, the tests indicated that the soils in the vicinity of the project site are high in chloride and sulfate concentrations and thus moderately to highly corrosive.

7.3 Surface Water

Urban storm water and landscape irrigation runoff from nearby businesses is the primary source of surface water in this area. Storm water runoff drains as sheet flow during rainy periods in a southerly to southwesterly direction. No perennial streams or large bodies of water exist within the project limits.

7.3.1 Scour

Since no perennial streams or large bodies of water exist within the project limits, the potential for scour is nonexistent.

7.3.2 Erosion

The existing onsite materials are erodible.

7.4 Project Site Seismicity

This section provides a seismic evaluation of the project site to be used for evaluation of project features. Due to the proximity of active fault zones, project features may be subjected to seismic shaking.

7.4.1 Ground Motion

The project is located roughly eight-miles (8mi) east of the northwesterly trending Newport Inglewood Rose Canyon Fault Zone and the Coronado Banks Fault. Numerous other active fault zones including the Elsinore, San Jacinto, and San Andreas lay to the north and east. The Agua Blanca Fault and San Miguel Fault Zone lie in Mexico to the south. Ground motion caused by nearby and distant seismic events should be anticipated during the life of the facilities.

7.4.2 Ground Rupture

No active fault traces cross the project alignment. The project does not lie within any Alquist-Priolo special study zone. Ground surface rupture caused by active faulting is considered unlikely within the project limits.

8.0 GEOTECHNICAL ANALYSIS AND DESIGN

The following section describes the geotechnical analyses, parameters, and design criteria that should be utilized by project designers in the continued developed of the project.

8.1 Dynamic Analysis

This section describes the seismic parameters selected and dynamic analysis developed for the project.

8.1.1 Parameter Selection

The proximity of the Newport Inglewood-Rose Canyon Fault Zone to the project could result in significant impact to the project features as the result of a seismic event. The Newport Inglewood-Rose Canyon Fault displaces Holocene sediments and is therefore considered active by current standards.

The Caltrans Acceleration Response Spectra (ARS) Online Tool Version 1.0.4 (Caltrans ARS Online Tool) was used to determine pertinent seismic data. The Caltrans ARS Online Tool is a web based tool that calculates both deterministic and probabilistic ARS for any location in California based on the criteria set forth in *Caltrans, Seismic Design Criteria (SDC) Version 1.6, November 2010, Appendix B.*

The Otay Formation is the predominant material type at the project site. The borings developed for the project had SPT results in the Otay Formation that averaged greater than fifty (>50). According to the *SDC Figure B.12*, Soil Profile Type C has a SPT value greater than fifty (N>50). Therefore, the Otay Formation within the project limits has a Soil Profile Type C.

The latitude and longitude input into the Caltrans ARS Online Tool were 32.5635 and -116.9358, respectively. The shear wave velocity used in the Caltrans ARS online tool was five hundred and sixty-meters per second (560m/s), which corresponds to a Soil Profile Type C. The closest regional active fault as indicated by the Caltrans ARS Online Tool is the Newport Inglewood Rose Canyon Fault. Data pertaining to the regional active faults are provided in Table 1.

Based on results produced by the Caltrans ARS Online Tool, the anticipated Peak Ground Acceleration (PGA) for the project site is two-tenths-gravity (0.2g). The PGA corresponds to the Spectral Acceleration at a period of zero-seconds (0sec). The attenuation period for the fault is estimated to be five-seconds (5sec) with a probability of exceedence of five-percent (5%) in fifty-years (50yrs) or a reoccurrence interval of nine hundred seventy five-years (975yrs). The results produced by the Caltrans ARS Online Tool and the Caltrans Online Tool QA/QC Checklist are include in Appendix I.

The review of the seismic data provided an effective seismic horizontal coefficient, K_h, for use in pseudo-static (seismic) slope stability analyses. The K_h used is defined by the Caltrans Guidelines for Foundation Investigation and Reports (Version 1.2) as one-third (1/3) the peak ground acceleration of the project site. Therefore the horizontal acceleration used for the pseudo-static evaluation of the proposed project features is seven-one hundredths-gravity (0.07g).

8.1.2 Liquefaction Analysis

Liquefaction involves the sudden loss of shear strength of a saturated, cohesionless soil subjected to cyclic loading produced by an earthquake. The cyclic loading and loss of shear strength cause the soil to temporarily exhibit the strength characteristic of a fluid mass. Typically, liquefaction occurs in areas where groundwater is less than fifty-feet (50ft) from the surface and where the soils are predominantly comprised of poorly consolidated poorly graded fine sands, silty sands, and non-plastic silts.

The project primarily resides on dense sedimentary formation with minor portions of embankment fill residing atop relatively thin deposits of alluvium and colluvium. There is no potential for soil liquefaction to adversely impact project features.

8.2 Cuts and Excavations

Existing and proposed slopes are described in Section 2.1.2 and Section 2.2.2, respectively. This section presents the analyses used to determine the stability, rippability, and grading factors of materials in proposed cuts or excavations.

8.2.1 Stability

Proposed cut slopes, and conceptual temporary cut slopes were evaluated for stability based on the observed performance of slopes in the project area and by using the computer program GSTABL7 with STEDwin v.2. The graphic results of computer based slope stability analyses are provided in Appendix I.

The permanent cut slope configuration analyzed was inclined at two-horizontal to one-vertical (2H:1V) with a maximum height of thirty-feet (30ft). This proposed cut slope configuration was found to satisfy Caltrans static and pseudo-static stability criteria. The maximum cut slope height for this project is not expected to exceed fourteen-feet (14ft). The proposed 2H:1V cut slopes for this project should be adequately stable in the long term.

Expansive soils should not remain on the cut slope surfaces. Expansive materials should be removed horizontally a minimum distance of ten-feet (10ft) and replaced with materials with an Expansive Index of fifty (50) or less.

Temporary cut slopes/excavations may be defined as cut slopes/excavations that exist for a limited duration to facilitate construction of project features. The exact configurations of temporary excavations are proposed by the Contractor and subject to the approval of the Engineer. Conceptual temporary cut slopes/excavations were evaluated as part of this study to provide project development staff with useful criteria for the development of final design plans, construction staging plans, and final right-of-way requirements and to provide guidance and limitations on slope inclination to the Contractor and Engineer. Under no circumstances should the inclination of temporary cut slopes/excavations be allowed to exceed one-horizontal to one-vertical (1H:1V) in fill and three quarter-horizontal to one-vertical (0.75H:1V) in sedimentary formation.

8.2.2 Rippability

The siltstone and claystone sedimentary formation is weak and poorly to moderately-indurated. Generally the materials within the project area are considered rippable by conventional heavy duty grading equipment and are drillable by conventional drill equipment.

8.2.3 Grading Factors

Earthwork factors relate the in-place volume of material to be excavated to the in-place volume of material after placement as fill. The factors are defined as in place volume of compacted fill divided by in place volume of material to be excavated.

$$G_f = V_{fill}/V_{exc}$$

An estimated grading factor of one and two-one hundredths (1.02) may be used for the material generated from cuts within the sedimentary formation. An estimated grading factor of ninety-three-one hundredths (0.93) may be used for material obtained from stockpiles at the project site.

8.2.4 Pavement and Embankment Subgrade Preparation

In pavement and embankment areas where expansive, near surface, topsoil are present, remedial measures should be implemented as described in Section 8.3 of this report.

In areas where expansive soils are not known to be present and the near-surface topsoil is soft or loose, the upper twenty-four-inches (24in) of the near surface soils should be over-excavated. The next lower twelve-inches (12in) should be scarified and recompacted to ninety-percent (90%) relative compaction. The over-excavated material should then be reused as backfill and compacted to ninety-percent (90%) relative compaction. This recommendation does not apply to cuts made in the Otay Formation to attain pavement grade.

In areas where undocumented fill soils are known to be present the fill materials should be removed down to their full depth to competent subgrade prior to placement of embankment fill.

In areas where cuts to attain pavement grade result in exposure of bentonite and/or bentonitic mudstones of the Otay Formation, it is recommended that the bentonite and/or bentonitic mudstones be removed to a depth of five-feet (5ft) below existing grade and replaced with Class V Aggregate Sub-base material.

8.3 Embankments

In order to provide the embankment width necessary to construct the connector ramps, additional embankment fill is proposed. Embankment fill will vary in height from approximately thirty to forty-five-feet (30-45ft).

Moderately and highly expansive materials are located within the project area. Areas underlain by the moderately and highly expansive soils are shown on Figure 7B. The expansive materials underlying proposed project features should be removed and replaced by Class V Aggregate Sub-base comprised of non-expansive to low-expansive fill materials.

The recommended depth of expansive soil removal may vary based on field observations by OGDS2 staff during grading operations, but is not anticipated to exceed five-feet (5ft) below the bottom of the pavement structural section or the bottom of the embankment fill.

Class V Aggregate Sub-base materials may be acquired from excavation cuts, existing stockpiles, and/or imported. Class V Aggregate Sub-base materials should possess a Resistance-value (R-value) greater than ten (>10) and a Plasticity Index (PI) of less than twelve (<12). Alternatively, a Sand Equivalent (SE) of fifteen or greater (≥15) may be used to qualify the material in lieu of the R-value and PI.

Embankment fill will mostly be supported by the Otay Formation. The Otay Formation is a dense to very dense formation and will be subjected to minimal compression under embankment loads. Embankment heights of thirty-feet or less (≤30ft) will cause a maximum settlement of less than one-half inch (0.5in) in the underlying formation. In cases where the embankment fill will be up to forty-five-feet (45ft) high, a maximum settlement in the underlying formation of approximately one-inch (1in) may be anticipated. These settlements are anticipated to occur rapidly upon application of the embankment loads. Accordingly, these settlements should not impact the integrity of the pavement sections.

The embankment fill slope configuration analyzed was inclined at two-horizontal to one-vertical (2H:1V) with a maximum height of fifty-feet (50ft). This proposed embankment configuration was found to satisfy Caltrans static and pseudo-static stability criteria. The maximum embankment height for this project is not expected to exceed forty-four-feet (44ft). The proposed 2H:1V embankments for this project should be adequately stable in the long term. Embankment fill slopes should be no steeper than two-horizontal to one-vertical (2H:1V). The graphical results of the stability analyses are shown in Appendix I.

Expansive materials should not be placed closer than a horizontal distance of ten-feet (10ft) from the embankment slope face.

8.4 Earth Retaining Systems

No earth retaining systems are proposed for this project.

8.5 Culvert Foundations

The majority of culverts will be founded on stable soil.

In areas where the culverts will be founded within a depth of five-feet (5ft) below existing grade, foundation treatment is recommended. In areas underlain by expansive materials and/or soft or loose topsoil the depth of removal should be a minimum of five-feet (5ft) below existing grade. In areas underlain by undocumented fill materials the excavation should extend to the full depth of undocumented fill. The pipe bedding grade may be restored by placement of Class V Aggregate Sub-base material compacted to ninety-percent (90%) relative compaction.

Drainage systems will also be supported on dense Otay Formation. Culvert settlements are expected to be negligible on the dense Otay Formation, even in areas where the pipes will cross embankments. Where bentonite and/or bentonitic mudstone is encountered in culvert excavations it is recommended that it be removed to a depth of five-feet (5ft) below the existing grade and replaced with Class V Aggregate Sub-base material.

8.6 Sound Wall Foundations

No sound walls are proposed for this project.

8.7 Overhead Sign Foundations

Subsurface materials at the overhead sign locations consist of documented fill derived from the sandstones, siltstones, and claystones of the Otay Formation. These materials were compacted in accordance with Caltrans standards. Project design staff informed OGDS2 that Standard Plan CIDH pile foundations are proposed to be used to support the overhead signs. The documented fill is suitable for the installation of CIDH pile foundations. Adverse drilling, caving, or groundwater conditions are not anticipated to be encountered during CIDH pile installation.

9.0 MATERIAL SOURCES

No off site material source has been identified for this project. Material generated from on site excavations will consist primarily of sand, silt and expansive clays derived from topsoil, documented fill, undocumented fill, and sedimentary formation. The materials generated on site, including the expansive clays, are anticipated to be suitable for use as embankment fill but not for use as structural fill. The non-cohesive portions of these materials are suitable for use as low-expansive fill and Class V Aggregate base material. Undocumented fill soils may be reused as fill provided trash and debris are removed from these materials. Expansive materials may be buried and/or mixed with non-to low-expansive materials and buried deeper than eight-feet (8ft) in embankment fill provided it is compacted per Caltrans Specifications.

10.0 MATERIAL DISPOSAL

Examples of material unsuitable for embankment subgrade or fill include organic mud, stockpiled trash, and debris. Materials generated during construction that are found to be unsuitable for use as subgrade, embankment fill or topsoil should be placed in a suitable location within the project limits or properly disposed off site.

11.0 RECOMMENDATIONS

The following is a summary of the geotechnical engineering recommendations for this project.

1. Along sections of the connector alignments where expansive soils are present, the subgrade should be over-excavated to a minimum depth of five-feet (5ft). The expansive materials should be replaced with Class V Aggregate Sub-base materials which may be obtained from on-site excavation/cuts or imported. Class V Aggregate Sub-base materials is defined as material possessing a Resistance-value (R-value) greater than ten (>10) and a Plasticity Index (PI) of less than twelve (<12). Alternatively, a Sand Equivalent (SE) of fifteen or greater (≥15) may be used to qualify the material in lieu of the R-value and PI.

2. In areas where expansive soils are not known to be present and the near-surface topsoil is soft or loose, the upper twenty-four-inches (24in) of the near surface soils should be over-excavated. The next lower twelve-inches (12in) should be scarified and recompacted to ninety-percent (90%) relative compaction. The over-excavated material should then be reused as backfill and compacted to ninety-percent (90%) relative compaction. This recommendation does not apply to cuts made in the Otay Formation to attain pavement grade.

3. In areas where cuts to attain pavement grade result in exposure of bentonite and/or bentonitic mudstones of the Otay Formation, it is recommended that bentonite and/or bentonitic mudstones be removed to a depth of five-feet (5ft) below the existing grade and replaced with Class V Aggregate Sub-base material.

4. Undocumented fill that underlies the proposed roadway and embankments have the potential to adversely impact the freeway facility. Therefore, undocumented fills should be removed to competent subgrade prior to placement of structural or embankment fill.

5. Permanent cut slopes should be no steeper than two-horizontal to one-vertical (2H:1V). Expansive materials should be removed horizontally a distance of ten-feet (10ft) from the slope face and replaced with materials with an Expansive Index of fifty (50) or less.

6. Permanent fill slopes should be no steeper than two-horizontal to one-vertical (2H:1V). Expansive materials may be buried and/or mixed with non- to low-expansive materials and buried deeper than eight-feet (8ft) in embankment fill provided it is compacted per Caltrans Specifications. Expansive materials should not be placed closer than a horizontal distance of ten-feet (10ft) from the embankment slope face.

7. Slope erosion control measures should be implemented as quickly as practical after grading. The Caltrans District 11 Landscape Architect should be consulted for appropriate erosion control recommendations.

8. In cases where embankment heights will be thirty-feet or less (≤30ft), a maximum settlement of less than one-half inch (0.5in) in the underlying formation may be anticipated. In cases where the embankment fill will be up to forty-five-feet (45ft) high, a maximum settlement in the underlying formation of approximately one-inch (1in) may be anticipated. These settlements are anticipated to occur rapidly upon application of the embankment loads.

9. The site soils are considered corrosive. Appropriate Caltrans functional units should provide design recommendations to mitigate the corrosion potential of onsite soils on proposed freeway improvements.

10. As it pertains to culvert foundations, in areas underlain by expansive materials and/or soft or loose topsoil the depth of removal should be a minimum of five-feet (5ft) below existing grade. In areas underlain by undocumented fill materials the excavation should extend to the full depth of undocumented fill. Where bentonite and/or bentonitic mudstone is encountered in culvert excavations it is recommended that it be removed to a depth of five-feet (5ft) below the existing grade. The pipe bedding grade may be restored by placement of Class V Aggregate Sub-base material compacted to ninety-percent (90%) relative compaction.

11. Overhead sign structures are proposed to be supported on Standard Plan CIDH pile foundations extending into compacted fill materials derived from the Otay Formation. The site is suitable for the use of CIDH pile foundations. Difficult drilling, caving, and ground water conditions during pile installation are not anticipated.

12.0 DESIGN ADVISORIES

1. Expansive material is likely to be encountered at pavement subgrade elevations at locations depicted in Figure 7B. These materials should be removed down to a depth of approximately five-feet (5ft) and replaced with low expansion potential material compacted to ninety-percent (90%) relative compaction.

2. On site materials are considered corrosive. Therefore, the design of structures should account for the corrosive nature of the soil.

13.0 CONSTRUCTION CONSIDERATIONS

1. Under no circumstances should the inclination of temporary excavations be allowed to exceed one-horizontal to one-vertical (1H:1V) in fill and three quarter-horizontal to one-vertical (0.75H:1V) in sedimentary formation.

2. Perched groundwater will likely be encountered in some deeper excavations. A dewatering strategy that incorporates narrow trenches to remove locally stored groundwater prior to final excavation should be considered.

3. Roadway excavations may result in surplus quantities of expansive materials. These materials may be used in the deeper portions of embankment fill as described in previous sections of this report. It may be necessary to export any excess expansive materials off site.

4. Vegetation, trash, and/or construction debris may be encountered during construction. These materials should be removed and appropriately disposed.

5. There are several features of this project that will involve the removal of expansive soils in pavement and embankment areas, cut slopes, temporary excavations, and embankment fill

operations. Close construction monitoring and testing by personnel experienced in the removal of expansive soils will be required during construction.

14.0 ACTUAL VS. REPORTED SITE CONDITIONS

The characterizations of geotechnical conditions along the project alignment and presented in this report are based on the review of the design information provided, proposed project features, as-built plans, geologic maps, geologic literature, archival reports, exploration by OGDS2, and laboratory testing. The evaluations and recommendations contained in this report are based on the information discovered and data gathered. If conditions are encountered during the project that appear to differ from the conditions conveyed in this report, or if construction difficulties related to soil conditions are encountered, a representative of OGDS2, Branch-D should be consulted to assist with the assessment of the prevailing geotechnical conditions and to assist in formulating appropriate strategies to facilitate project completion.

Should project design features vary significantly from those described in this report an updated GDR should be prepared by OGDS2, Branch-D to address the geotechnical considerations related to those features.

15.0 REFERENCES

USDA, Soil Conservation Service and Forest Service, (1973), *Soil Survey, San Diego Area, California.*

S.S Tan and M.P. Kennedy, (1996), Geologic *Map of Northwestern Part of San Diego County.*

S.S. Tan and M.P. Kennedy, (1996), *Geologic Map of Northwestern Part of San Diego County, Plate 2 Geologic Map of the Encinitas and Rancho Santa Fe 7.5' Quadrangles, San Diego County, California.*

S.S. Tan and M.P. Kennedy, (1996), *Geologic Map of Northwestern Part of San Diego County, Plate 1 Geologic Map of the Oceanside, San Luis Rey, and San Marcos 7.5' Quadrangles, San Diego County, California.*

GSTABLE7 with STEDwin v.2.

Caltrans, Division of Engineering Services, Geotechnical Services, (2009), *Geotechnical Services Design Manual v.1.0, Section 1: Seismic Design Recommendation.*

Caltrans, Division of Engineering Services, Geotechnical Services, (2009), *Geotechnical Services Design Manual v.1.0, Appendix B.*

FIGURES

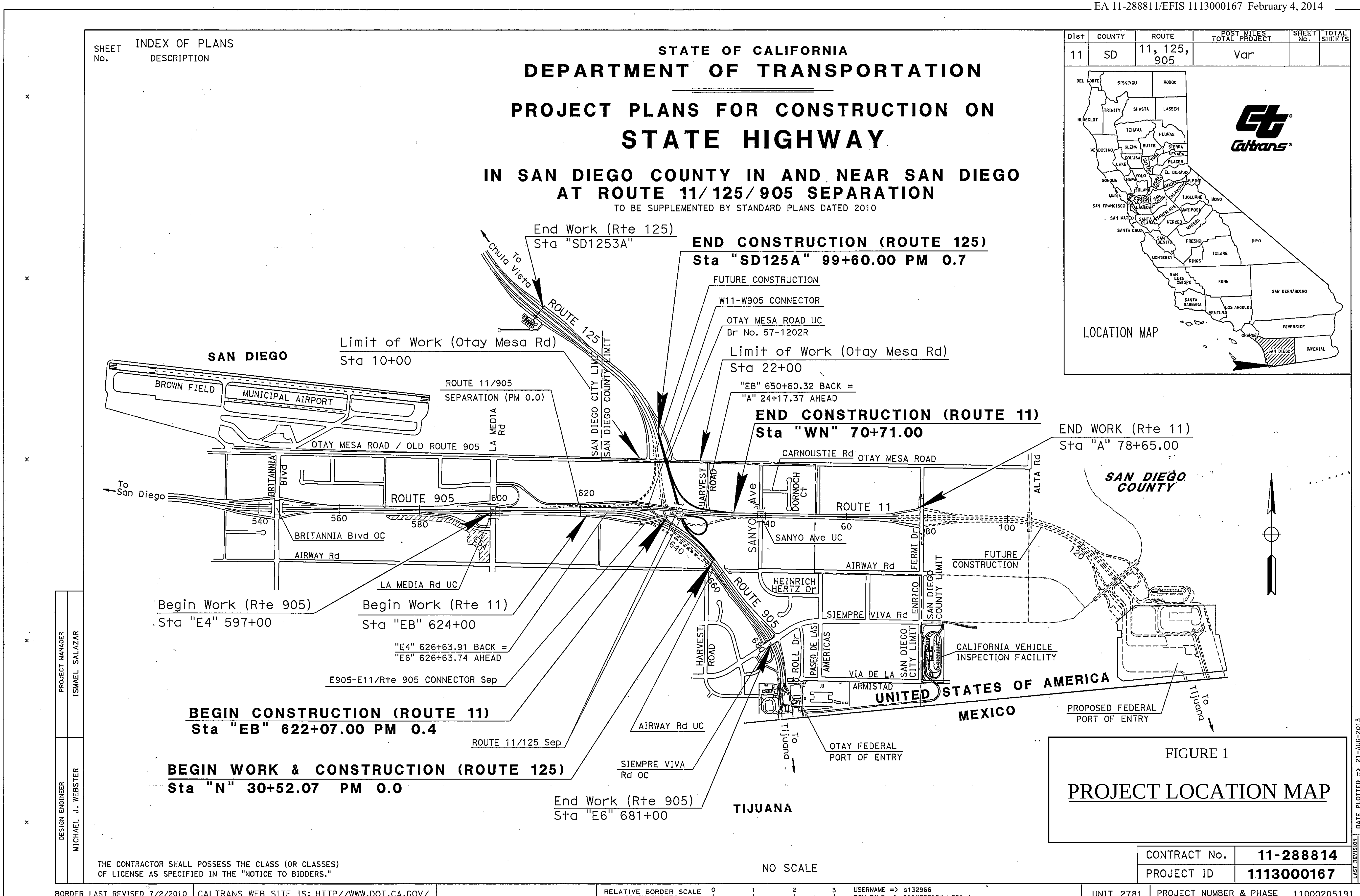


FIGURE 1

PROJECT LOCATION MAP

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167
February 4, 2014

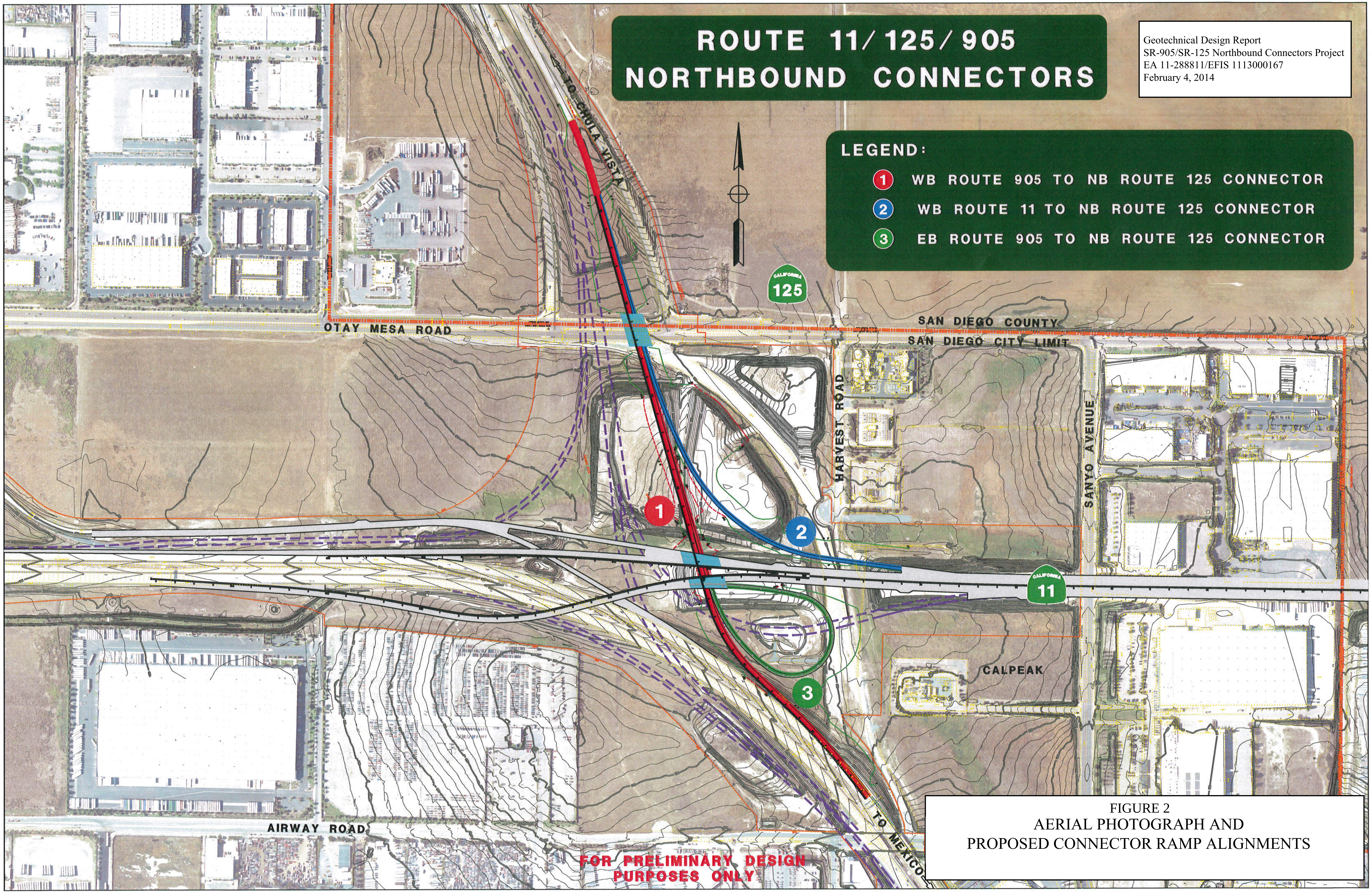


FIGURE 2
AERIAL PHOTOGRAPH AND
PROPOSED CONNECTOR RAMP ALIGNMENTS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

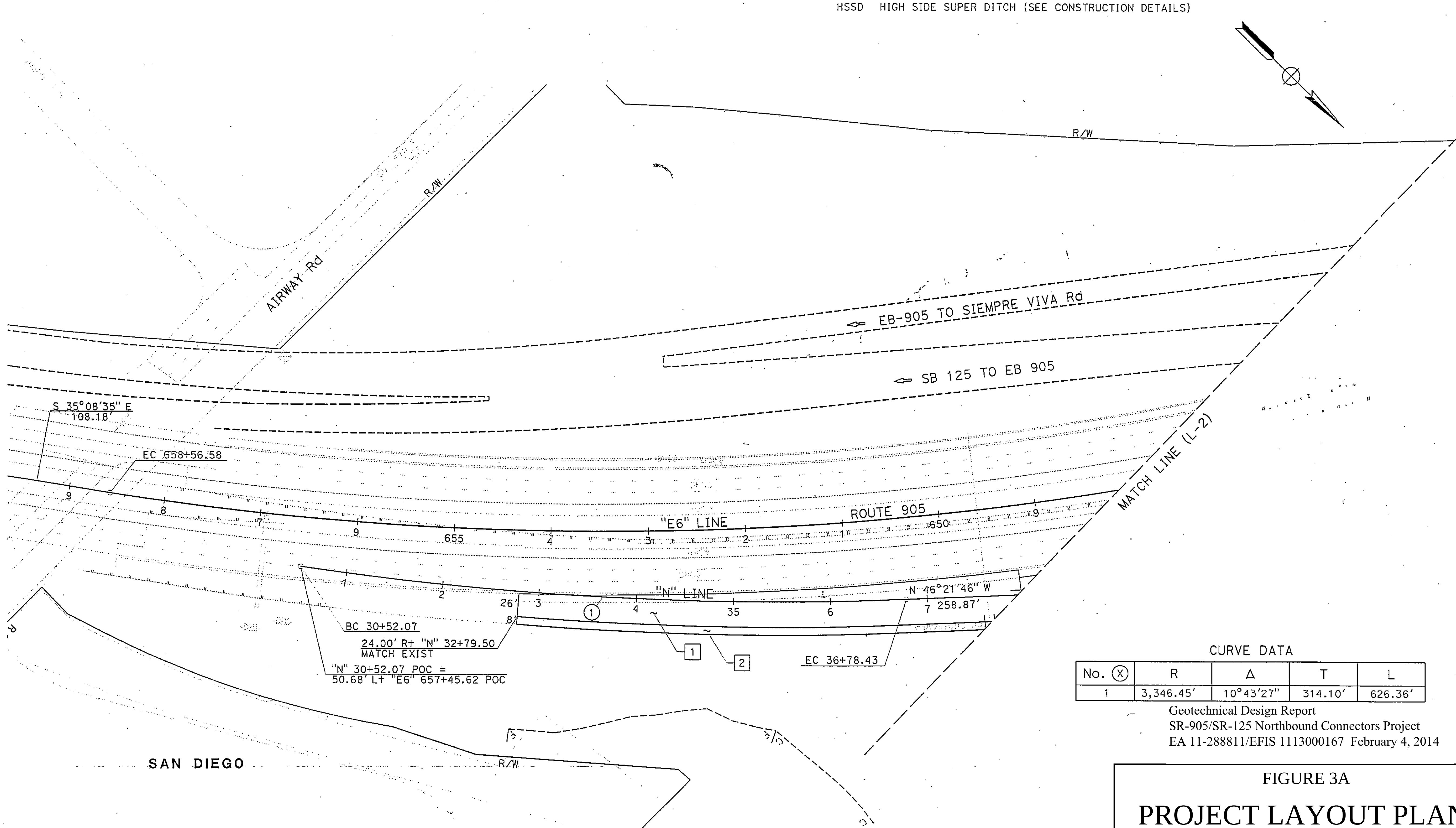
REGISTERED PROFESSIONAL ENGINEER BROOKE V. EMERY No. 77620 Exp. 06-30-15 CIVIL STATE OF CALIFORNIA

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. SEE CONSTRUCTION DETAILS FOR DETAILS NOT SHOWN.

LEGEND:

- AREA FOR CONTRACTOR USE
- MINOR CONCRETE (TEXTURED PAVING) (SEE CONSTRUCTION DETAIL)
- FUTURE CONSTRUCTION
- (#) CURVE DATA
- [X] STRUCTURAL SECTION (SEE TYPICAL CROSS SECTIONS)
- (#) METAL BEAM GUARD RAIL (SEE SUMMARY OF QUANTITIES)
- S/C SAW CUT LINE
- HSSD HIGH SIDE SUPER DITCH (SEE CONSTRUCTION DETAILS)



CURVE DATA

No.	R	Δ	T	L
1	3,346.45'	10°43'27"	314.10'	626.36'

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 3A

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans DESIGN

FUNCTIONAL SUPERVISOR MICHAEL J. WEBSTER | CALCULATED-DESIGNED BY OLIVER ASIS | CHECKED BY BROOKE EMERY | REVISED BY | DATE REVISED

LAST REVISION 09-24-13 | DATE PLOTTED => 28-OCT-2013 | TIME PLOTTED => 23:28

BORDER LAST REVISED 7/2/2010 | USERNAME => s132966 | DGN FILE => | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 2781 | PROJECT NUMBER & PHASE 1113000167

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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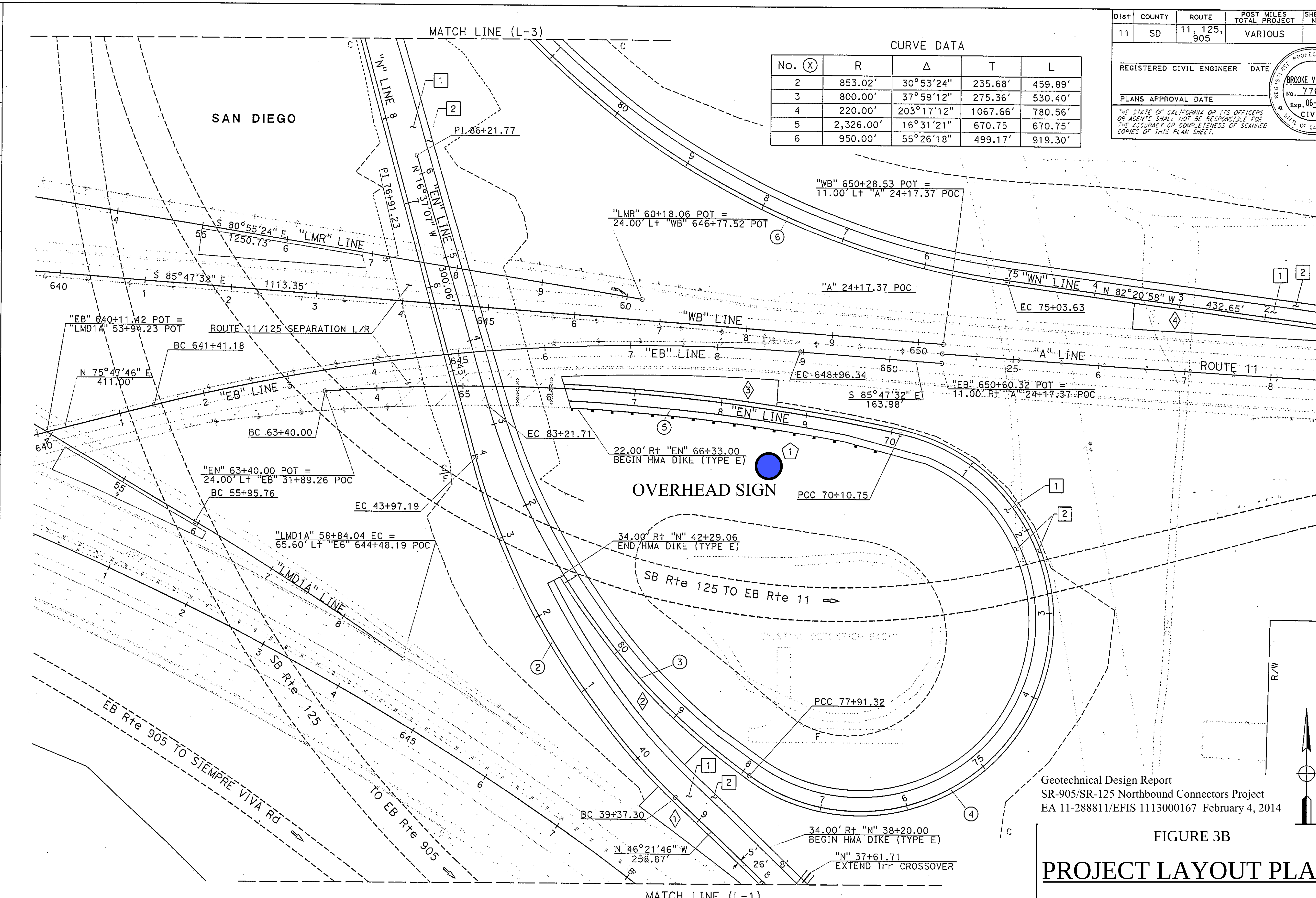
REGISTERED PROFESSIONAL ENGINEER BROOKE V. EMERY No. 77620 Exp. 06-30-15 CIVIL STATE OF CALIFORNIA

CURVE DATA

No. (X)	R	Δ	T	L
2	853.02'	30°53'24"	235.68'	459.89'
3	800.00'	37°59'12"	275.36'	530.40'
4	220.00'	203°17'12"	1067.66'	780.56'
5	2,326.00'	16°31'21"	670.75	670.75'
6	950.00'	55°26'18"	499.17'	919.30'



Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 3B

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
DESIGN

FUNCTIONAL SUPERVISOR: MICHAEL J. WEBSTER
CALCULATED-DESIGNED BY / CHECKED BY: OLIVER ASIS / BROOKE EMERY
REVISED BY / DATE REVISED

LAST REVISION 10-23-13 | DATE PLOTTED => 28-OCT-2013 | TIME PLOTTED => 23:28

BORDER LAST REVISED 7/2/2010 | USERNAME => s132966 | DGN FILE => | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 2781 | PROJECT NUMBER & PHASE 1113000167

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER BROOKE V. EMERY No. 77620 Exp. 06-30-15 CIVIL STATE OF CALIFORNIA

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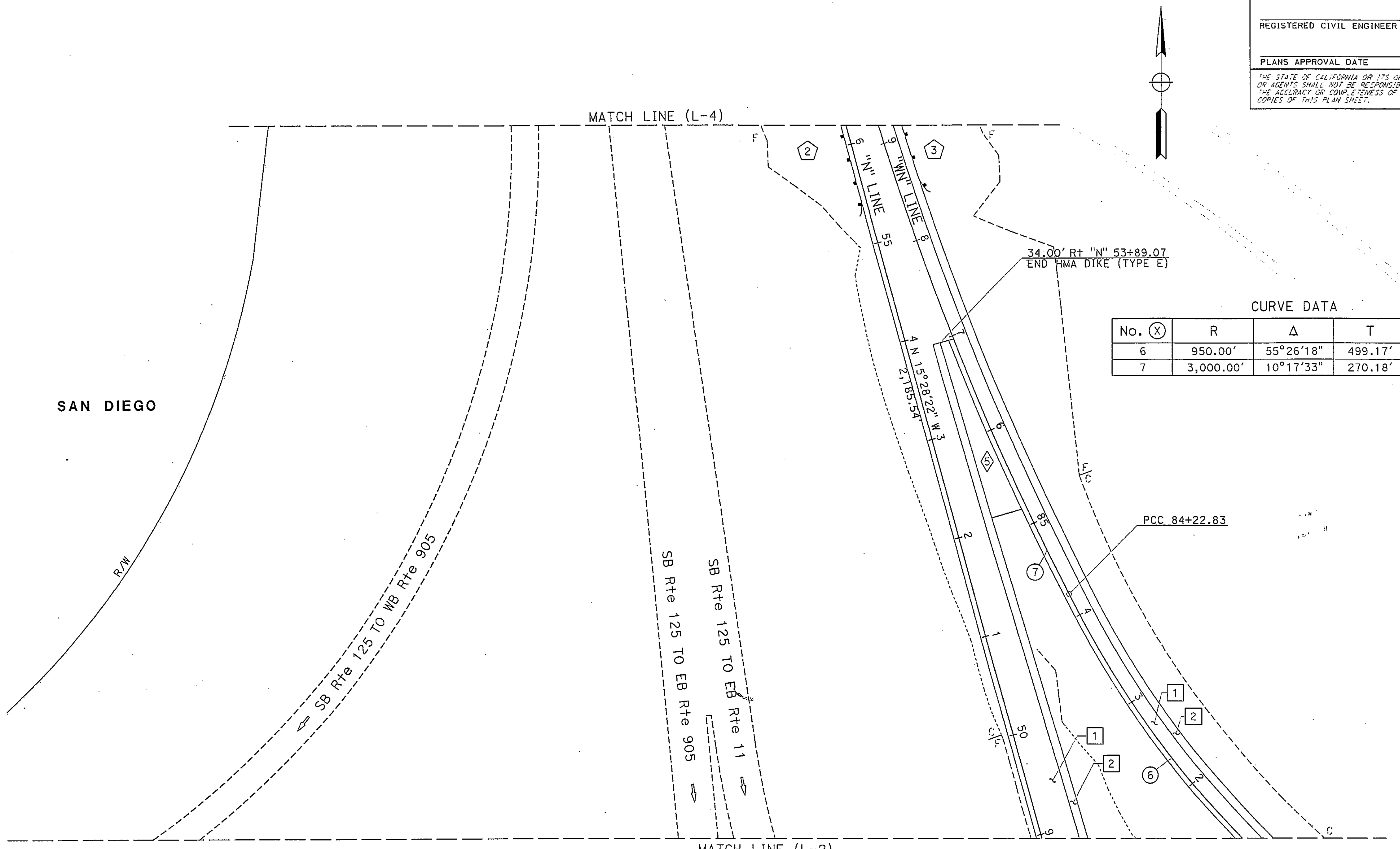

CURVE DATA

No. (X)	R	Δ	T	L
6	950.00'	55°26'18"	499.17'	919.30'
7	3,000.00'	10°17'33"	270.18'	538.92'

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 3C

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN

FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	REVISED BY
MICHAEL J. WEBSTER	CHECKED BY	DATE REVISED

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

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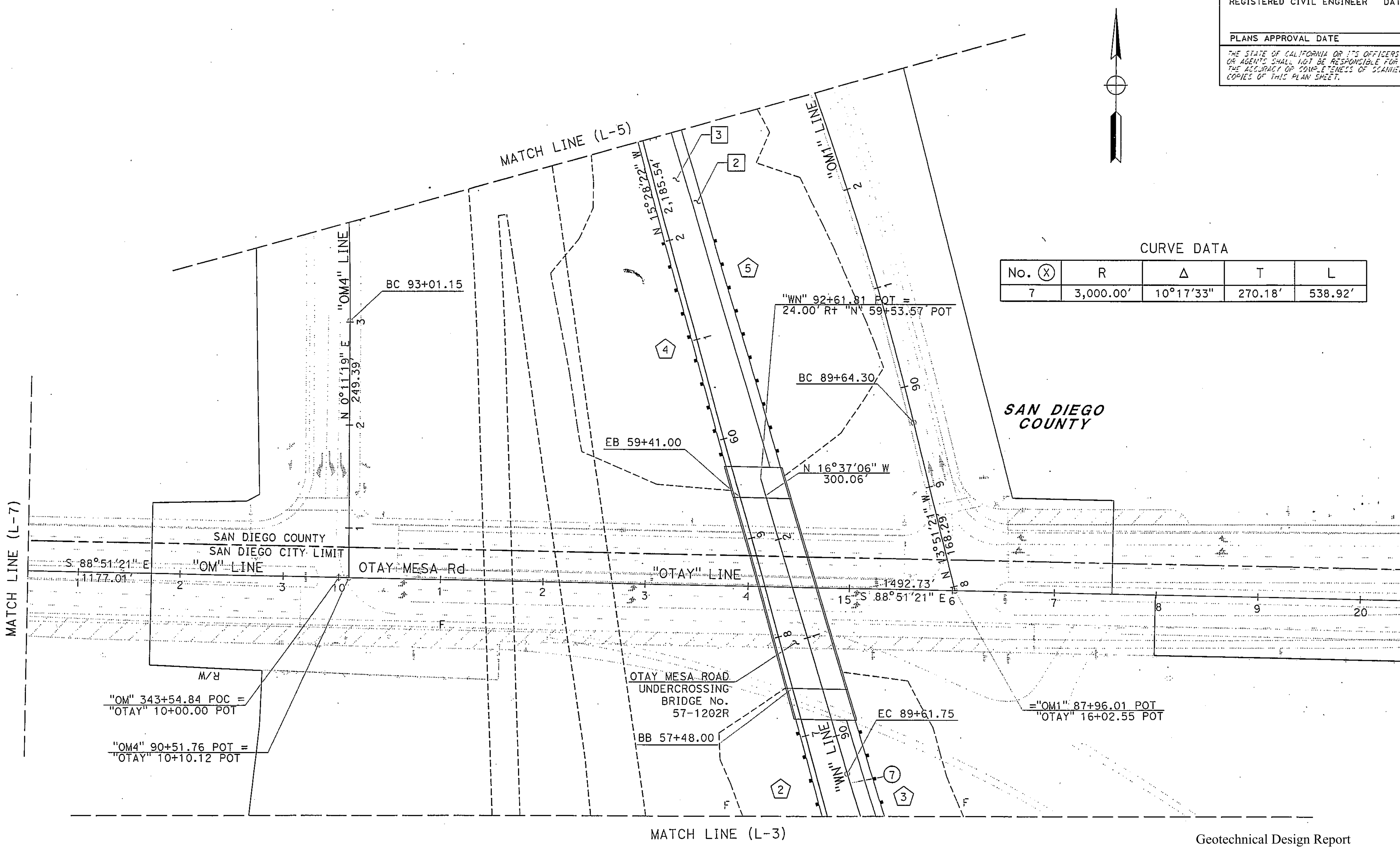

CURVE DATA

No. Ⓧ	R	Δ	T	L
7	3,000.00'	10°17'33"	270.18'	538.92'

REVISED BY | DATE REVISED | CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR | MICHAEL J. WEBSTER

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DESIGN

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EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 3D

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

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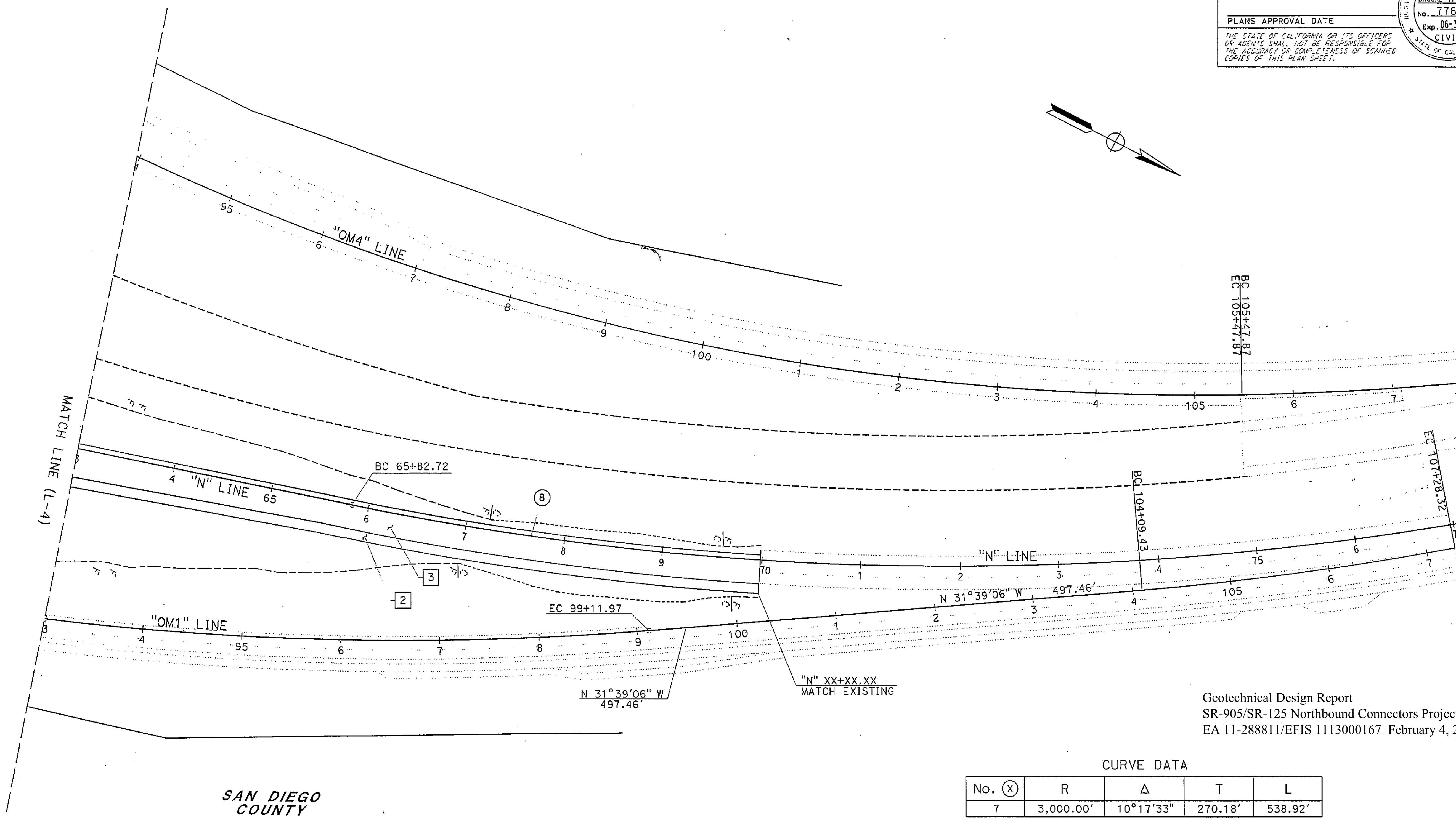

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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CURVE DATA

No. (X)	R	Δ	T	L
7	3,000.00'	10°17'33"	270.18'	538.92'

FIGURE 3E

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN

FUNCTIONAL SUPERVISOR MICHAEL J. WEBSTER

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION 10-23-13

DATE PLOTTED => 28-OCT-2013

TIME PLOTTED => 23:28

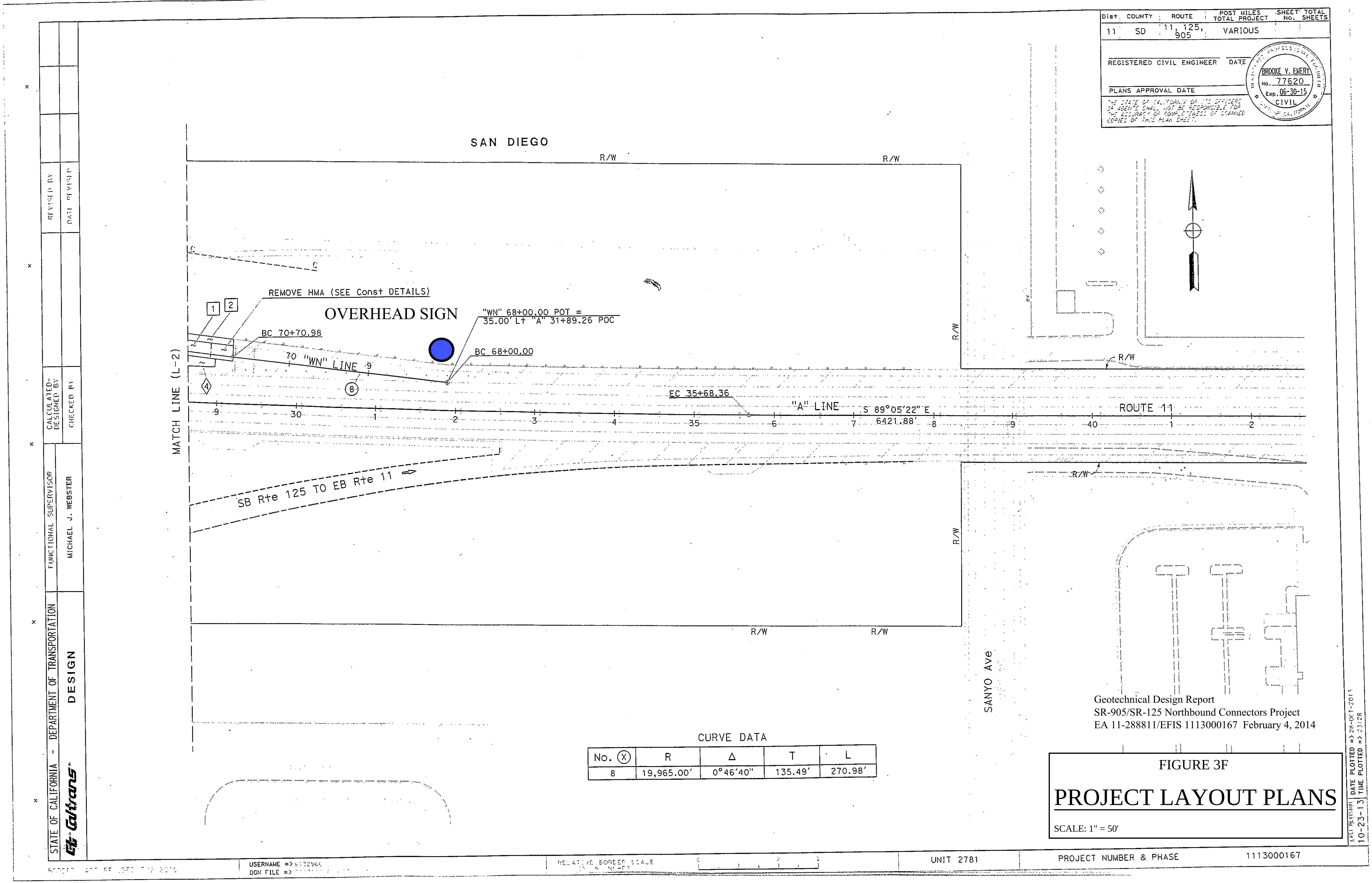

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FIGURE 3F

PROJECT LAYOUT PLANS

SCALE: 1" = 50'

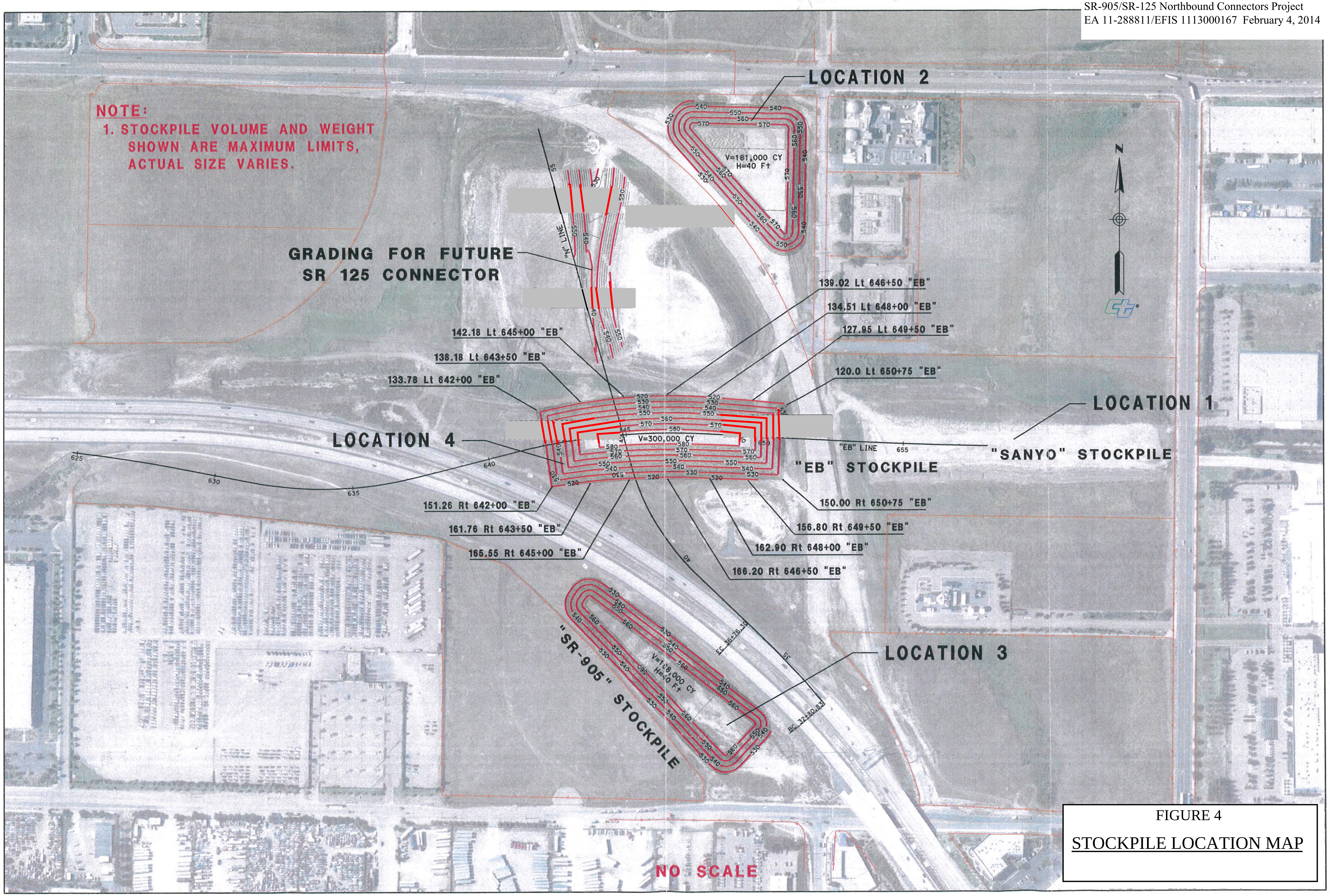

FIGURE 4

STOCKPILE LOCATION MAP

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER MATTHEW T. MCCARTHY No. C77228 Exp. 6-30-15 CIVIL STATE OF CALIFORNIA

CH2M HILL
402 W. BROADWAY,
SUITE 1450
SAN DIEGO, CA 92101

NOTES:

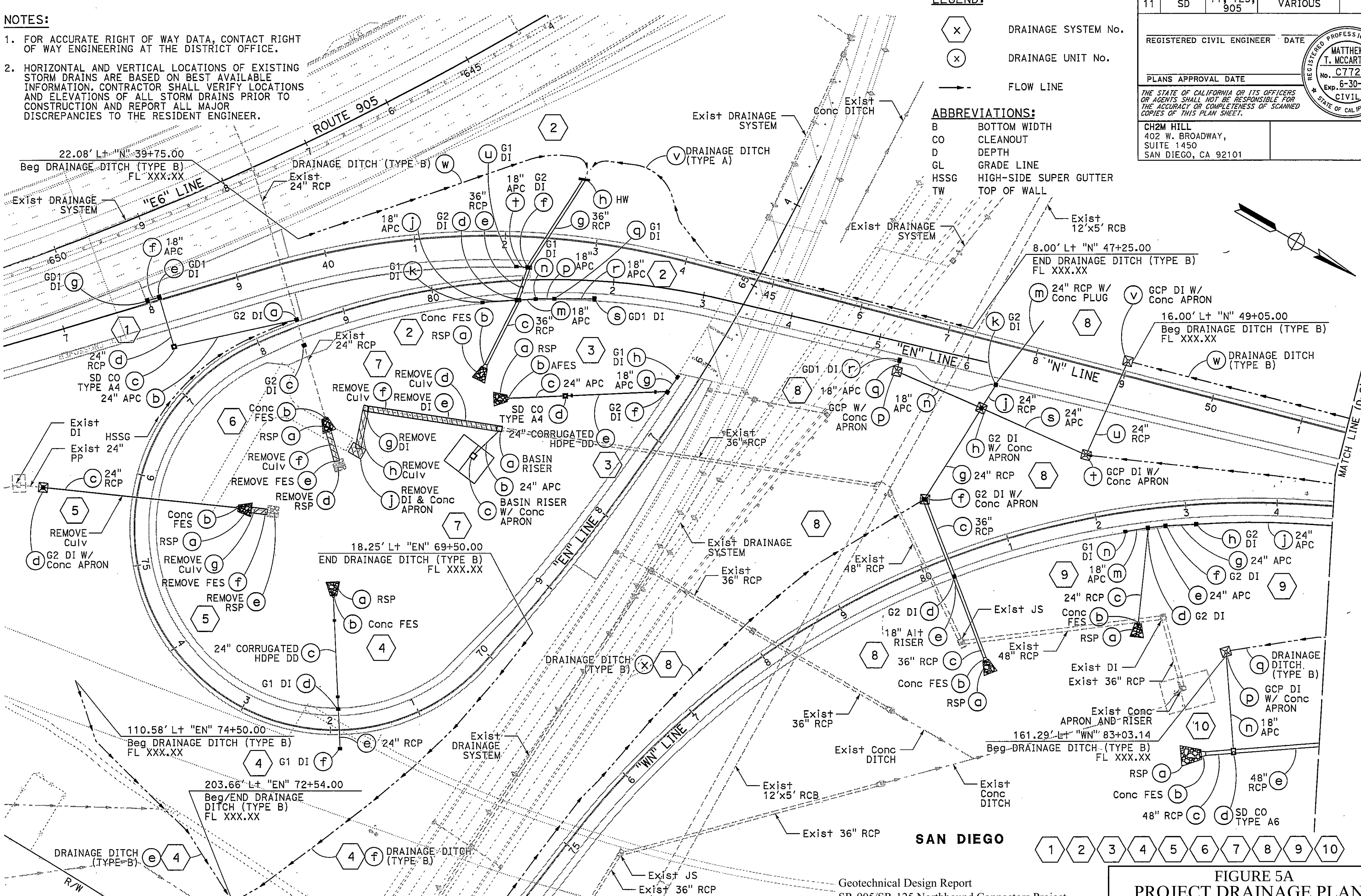
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING STORM DRAINS ARE BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR SHALL VERIFY LOCATIONS AND ELEVATIONS OF ALL STORM DRAINS PRIOR TO CONSTRUCTION AND REPORT ALL MAJOR DISCREPANCIES TO THE RESIDENT ENGINEER.

LEGEND:

- (x) hexagon — DRAINAGE SYSTEM No.
- (x) circle — DRAINAGE UNIT No.
- — FLOW LINE

ABBREVIATIONS:

B	BOTTOM WIDTH
CO	CLEANOUT
D	DEPTH
GL	GRADE LINE
HSSG	HIGH-SIDE SUPER GUTTER
TW	TOP OF WALL



1 2 3 4 5 6 7 8 9 10

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EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 5A
PROJECT DRAINAGE PLANS

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HANY HAROUN
CALCULATED-DESIGNED BY: BENJAMIN ESPIRITU
CHECKED BY: MATTHEW T. MCCARTHY
REVISED BY / DATE REVISED

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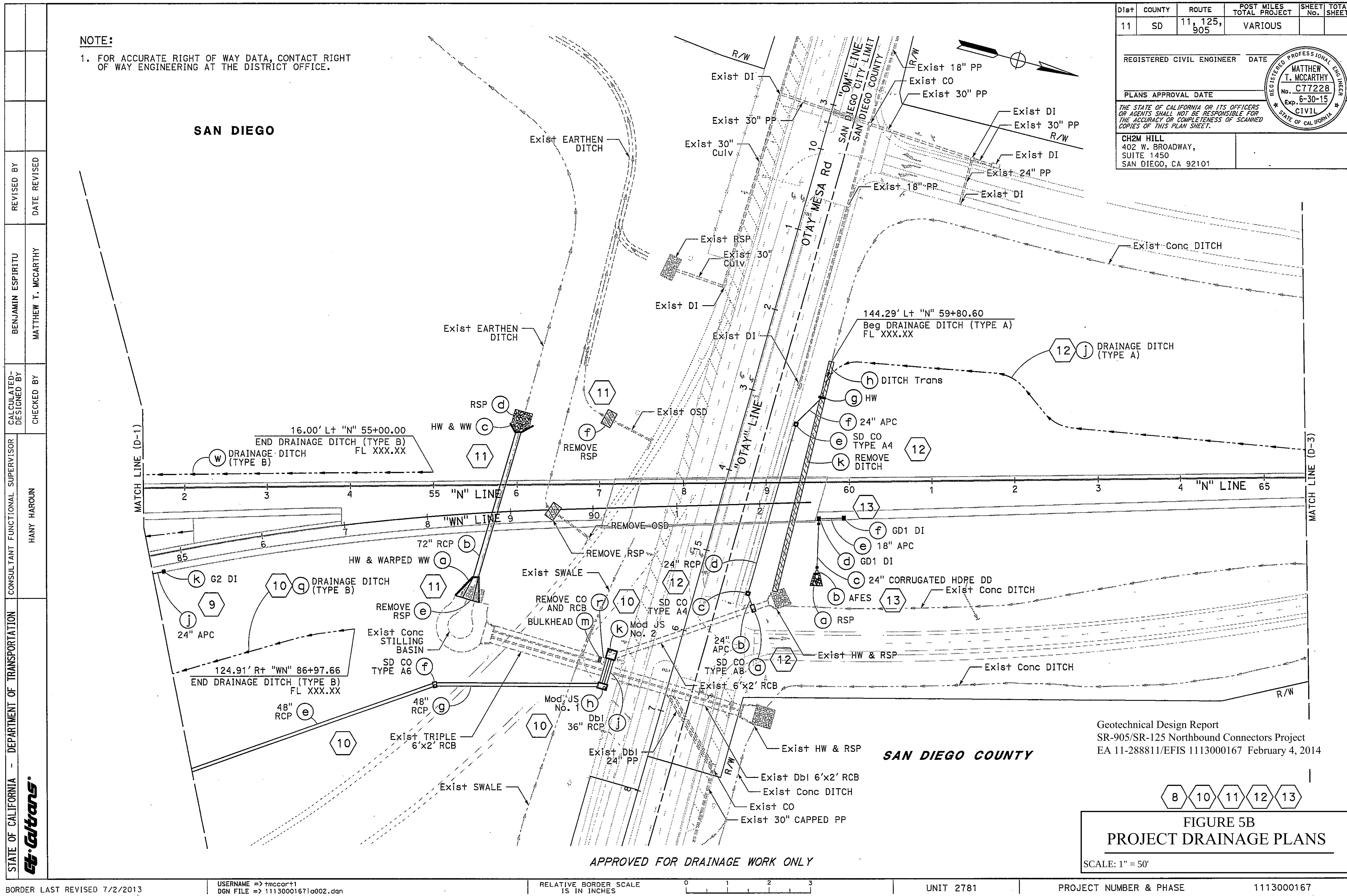

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

FIGURE 5B
PROJECT DRAINAGE PLANS

SCALE: 1" = 50'

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	11, 125, 905	VARIOUS		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER MATTHEW T. MCCARTHY No. C77228 Exp. 6-30-15 CIVIL STATE OF CALIFORNIA

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CH2M HILL
402 W. BROADWAY,
SUITE 1450
SAN DIEGO, CA 92101

NOTE:

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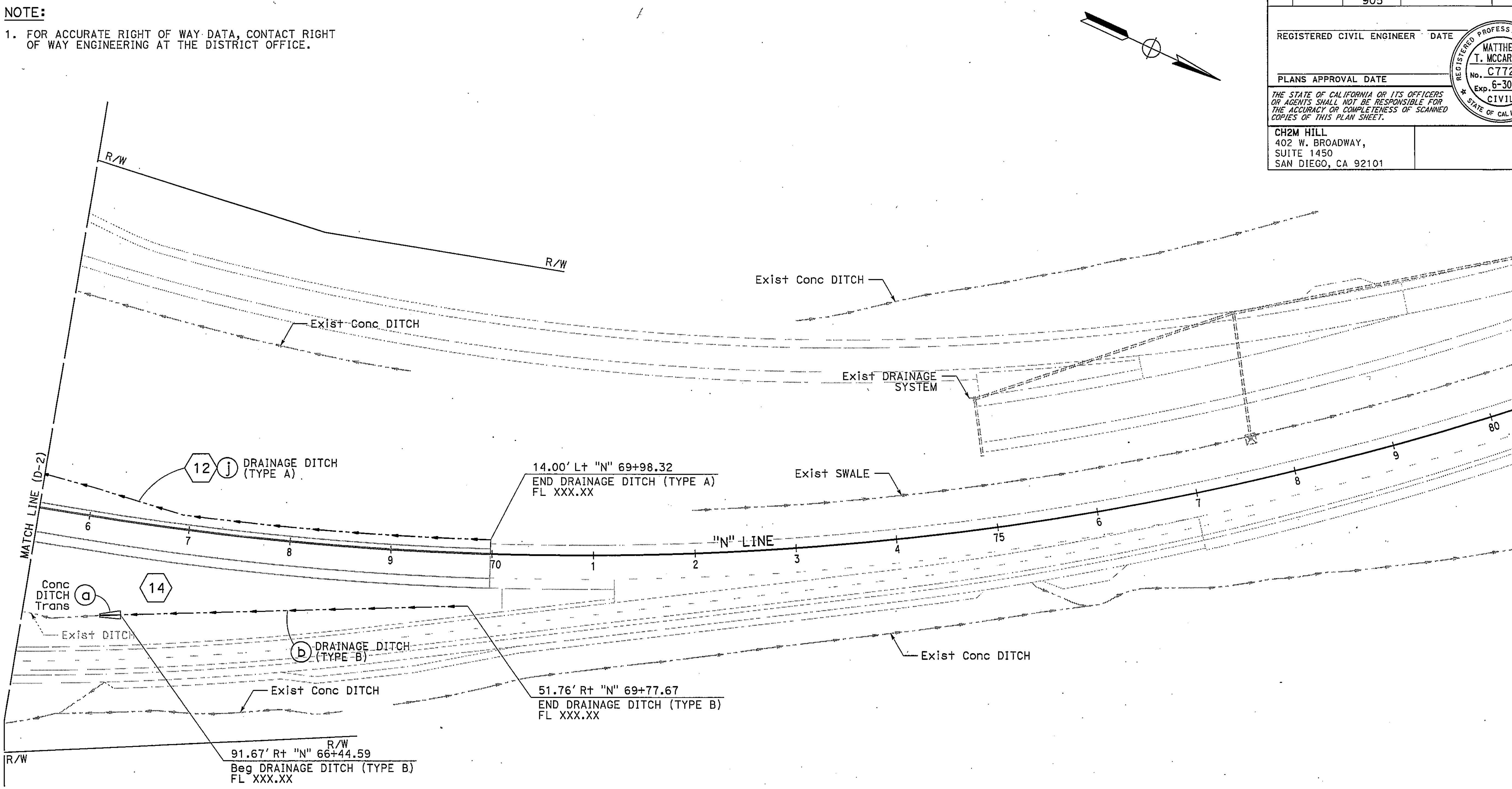

SAN DIEGO COUNTY

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

12 14

FIGURE 5C
PROJECT DRAINAGE PLANS

SCALE: 1" = 50'

APPROVED FOR DRAINAGE WORK ONLY

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HANY HAROUN

CALCULATED-DESIGNED BY: BENJAMIN ESPIRITU | CHECKED BY: MATTHEW T. MCCARTHY

REVISED BY | DATE REVISED

LAST REVISION 11-22-13 | DATE PLOTTED => 21-NOV-2013 | TIME PLOTTED => 19:23

BORDER LAST REVISED 7/2/2013 | USERNAME => tmccart1 DGN FILE => 1113000167ia003.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 2781 | PROJECT NUMBER & PHASE 1113000167

Soil Map—San Diego County Area, California
(SR-11 NRCS Soil Series Map)

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SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167 February 4, 2014

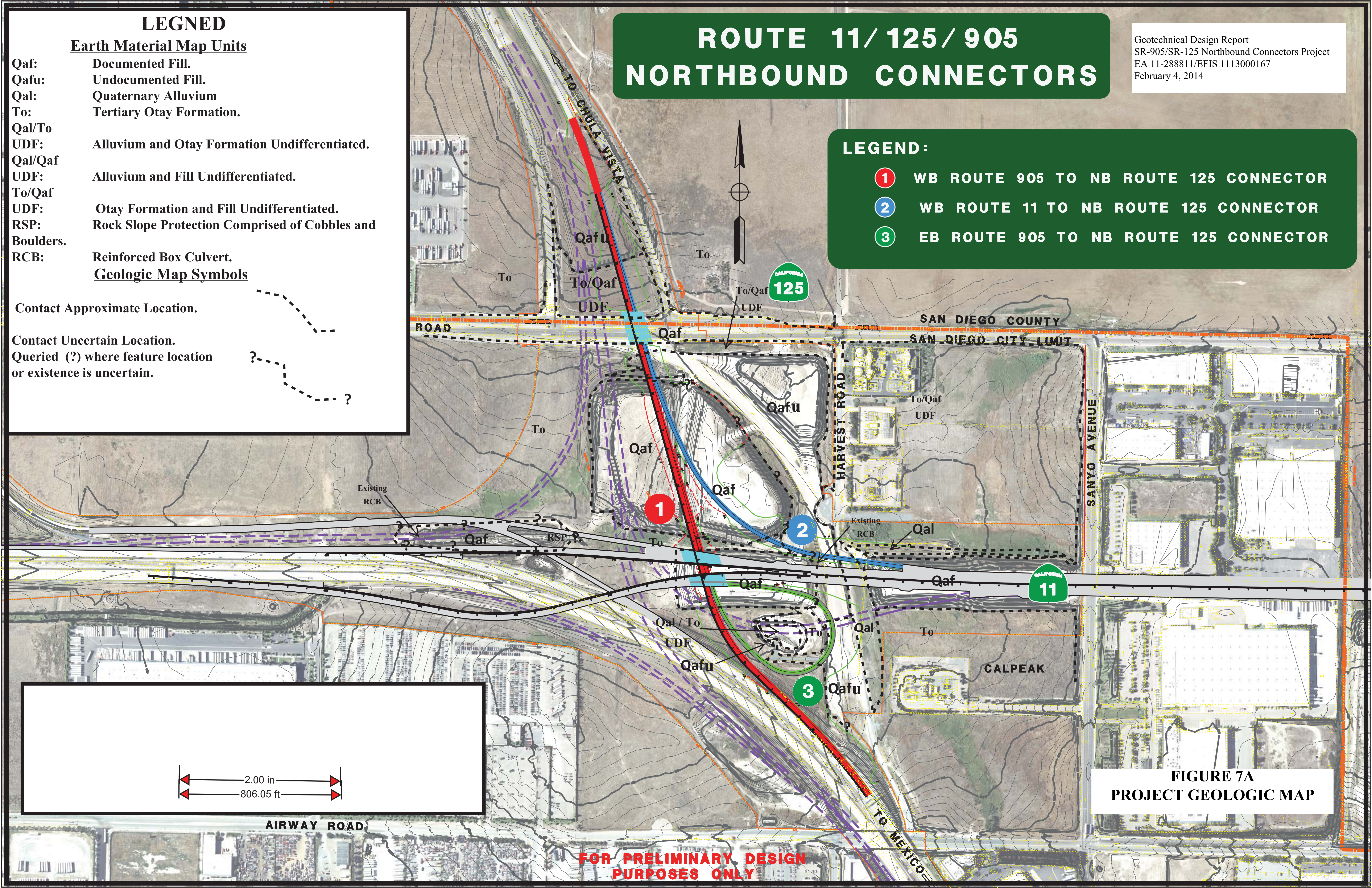
FIGURE 6
SOIL SURVEY MAP

Map Scale 1:11,700 if printed on B size (11" x 17") sheet.

N

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1,000, 2,000, 3,000


LEGNED
Earth Material Map Units
Qaf: Documented Fill.
Qafu: Undocumented Fill.
Qal: Quaternary Alluvium
To: Tertiary Otay Formation.
Qal/To UDF: Alluvium and Otay Formation Undifferentiated.
Qal/Qaf UDF: Alluvium and Fill Undifferentiated.
To/Qaf UDF: Otay Formation and Fill Undifferentiated.
RSP: Rock Slope Protection Comprised of Cobbles and Boulders.
RCB: Reinforced Box Culvert.
Geologic Map Symbols
Contact Approximate Location.
Contact Uncertain Location. Queried (?) where feature location or existence is uncertain.
ROUTE 11/125/905
NORTHBOUND CONNECTORS
Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167
February 4, 2014
LEGEND:
1 WB ROUTE 905 TO NB ROUTE 125 CONNECTOR
2 WB ROUTE 11 TO NB ROUTE 125 CONNECTOR
3 EB ROUTE 905 TO NB ROUTE 125 CONNECTOR
TO CHULA VISTA
125
11
ROAD
SAN DIEGO COUNTY
SAN DIEGO CITY LIMIT
HARVEST ROAD
SANYO AVENUE
CALPEAK
AIRWAY ROAD
TO MEXICO
Existing RCB
RSP
Qaf
Qafu
Qal
To
To/Qaf UDF
Qal / To UDF
2.00 in
806.05 ft
FIGURE 7A
PROJECT GEOLOGIC MAP
FOR PRELIMINARY DESIGN PURPOSES ONLY

Geotechnical Design Report
SR-905/SR-125 Northbound Connectors Project
EA 11-288811/EFIS 1113000167
February 4, 2014

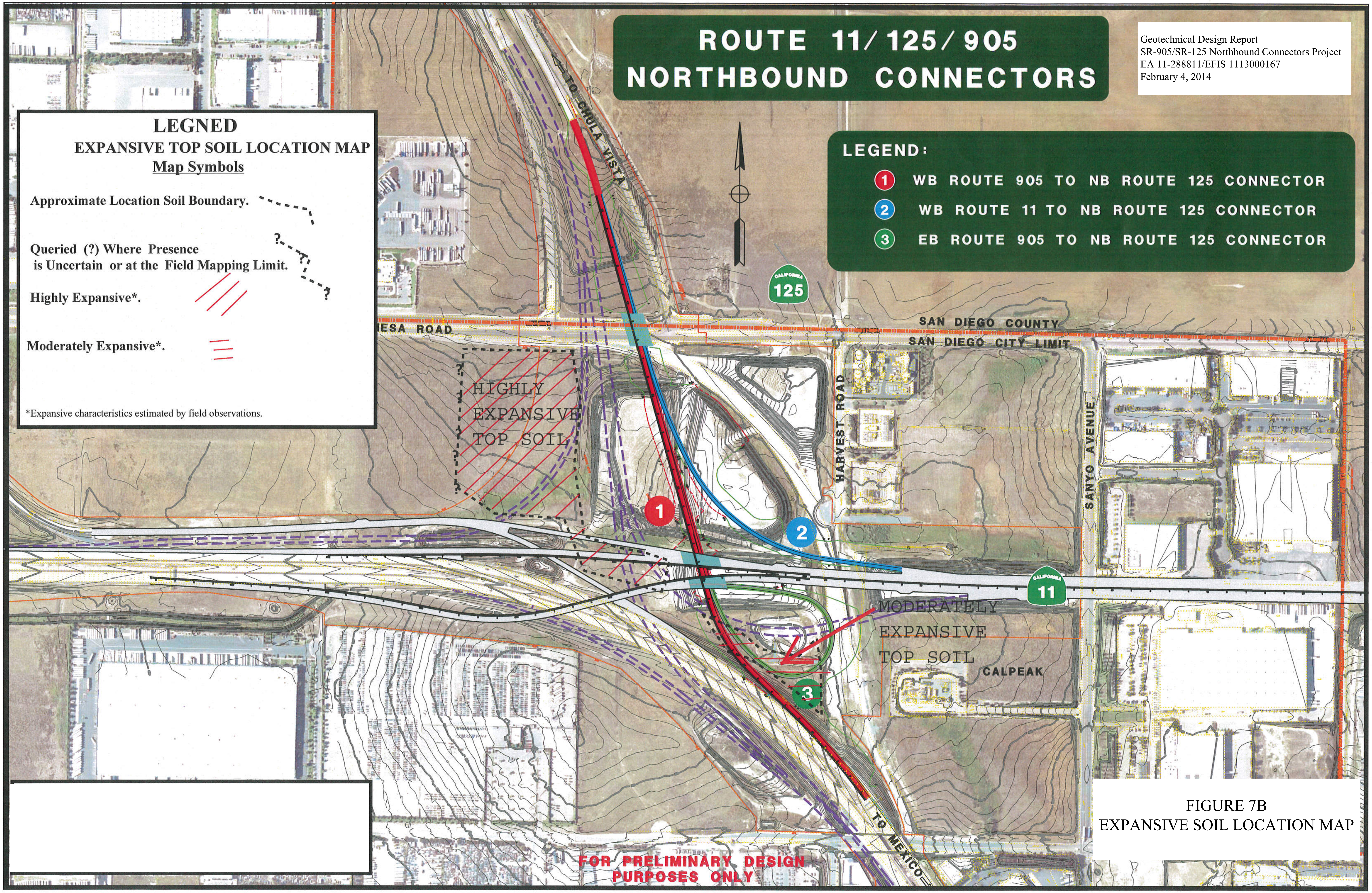


FIGURE 7B
EXPANSIVE SOIL LOCATION MAP

TABLES

TABLE 1: REGIONAL ACTIVE FAULT(S)

Fault Name (Initials)	FID	M_{MAX}	Fault Type	Fault Dip	Dip Direction	Z_{BOT}	Z_{TOR}	R_{RUP}	R_{JB}	R_X	F_{NM}	F_{RV}
Newport Inglewood-Rose Canyon fz (Silver Strand section)	224	7.5	RLSS	90º	Vertical	8.1mi (13.0km)	0.0	11.2mi (18.1km)	11.2mi (18.1km)	11.2mi (18.1km)	0	0

Notes: FID = The fault ID number. Fault Identification Number (FID), used to identify a fault trace on the Caltrans Deterministic PGA Map.
M_{MAX} = Maximum Moment Magnitude: Defined as the largest earthquake a fault is capable of generating.
Fault Type = Right Lateral Strike Slip (RLSS).
Fault Dip = The angle between the fault plane and the horizontal plane.
Dip Direction = The direction the fault dips.
Z_{BOT} = The depth to the bottom of the rupture plane.
Z_{TOR} = The depth to the top of the rupture plane.
R_{RUP} = The closest distance to the fault rupture plane.
R_{JB} = The shortest horizontal distance to the surface projection of the rupture area (a.k.a. Joyner-Boone Distance).
R_X = The horizontal distance to the fault trace or surface projection of the top of the rupture plane.
F_{NM} = The faults identified as a normal fault.
F_{RV} = The faults identified as a reverse fault.

TABLE 2: SOIL STRENGTH PARAMETERS

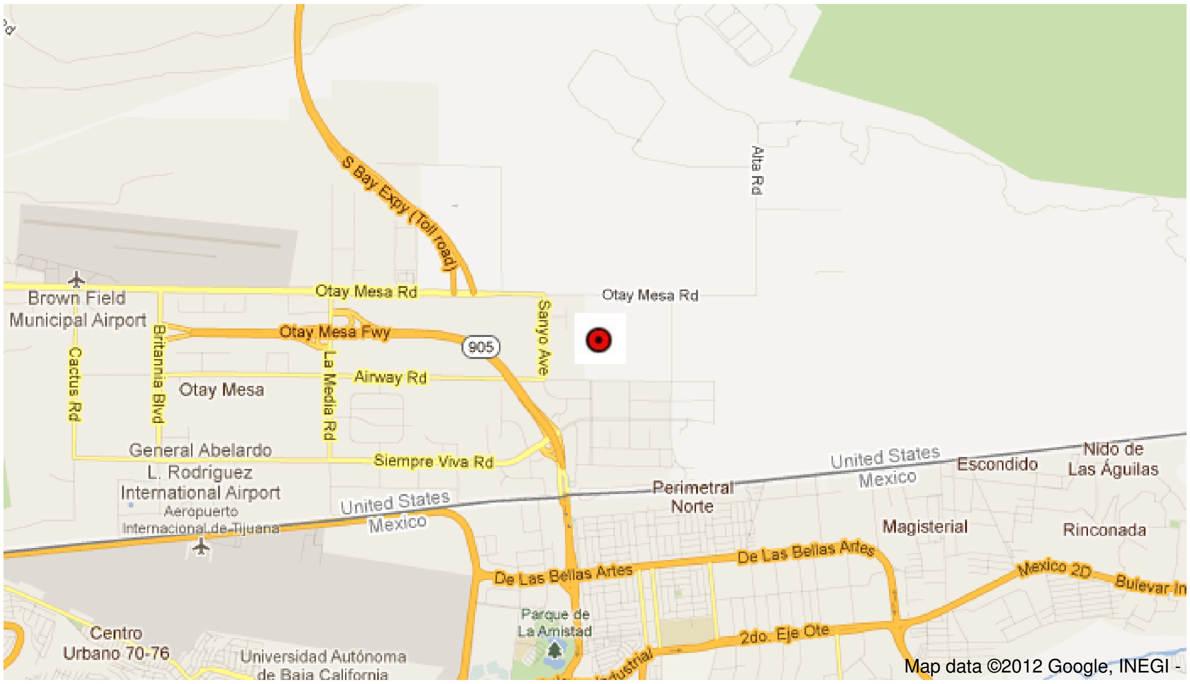
Geologic Unit	Cohesion (psf)	Angle of Internal Friction (degrees)	In-Situ Dry Density (pcf)
Artificial Fill	200	26	120
Otay Formation	500	34	120

APPENDICES

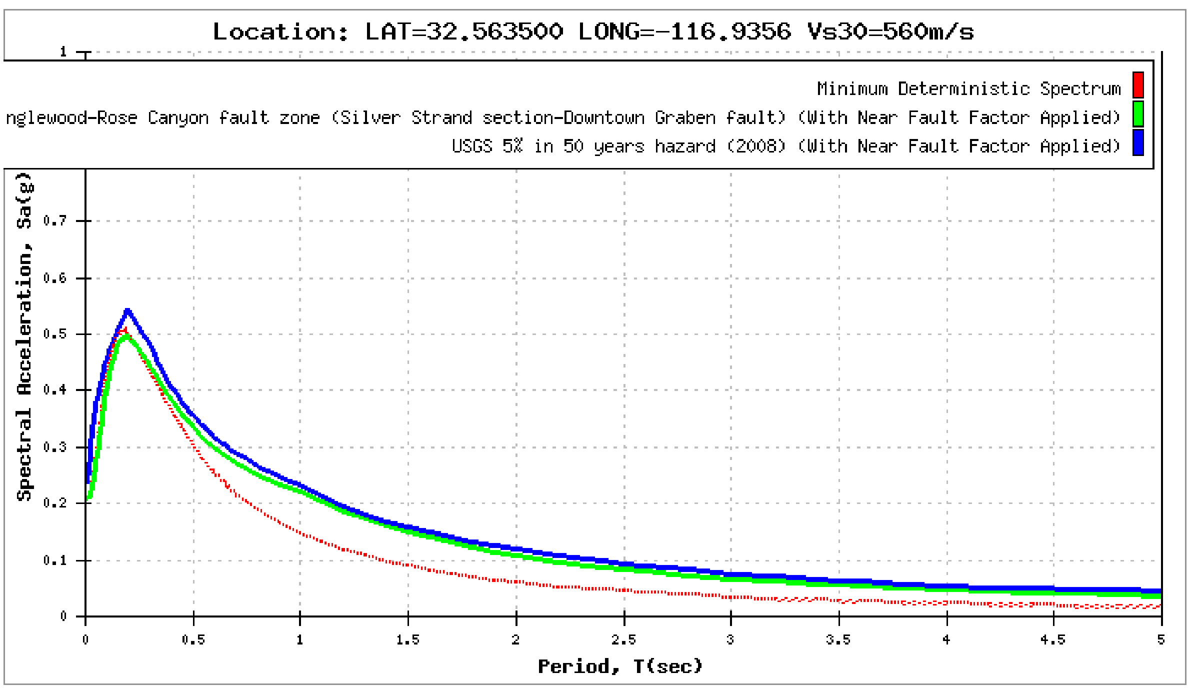
APPENDIX I

ANALYSES AND CALCULATIONS

SELECT SITE LOCATION



CALCULATED SPECTRA



SITE DATA

Shear Wave Velocity, V_{S30}:	560 m/s
Latitude:	32.563500
Longitude:	-116.935600
Depth to Vs = 1.0 km/s:	74 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Newport Inglewood-Rose Canyon fault zone (Silver Strand section-Downtown Graben fault)

Fault ID:	423
Maximum Magnitude (MMax):	7.5
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	18.14 km
Rjb:	18.14 km
Rx:	18.14 km
Fnorm:	0
Frev:	0

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.209	1.000	1.000	0.209
0.02	0.213	1.000	1.000	0.213
0.022	0.215	1.000	1.000	0.215
0.025	0.220	1.000	1.000	0.220
0.029	0.225	1.000	1.000	0.225
0.03	0.227	1.000	1.000	0.227
0.032	0.231	1.000	1.000	0.231
0.035	0.237	1.000	1.000	0.237
0.036	0.240	1.000	1.000	0.240
0.04	0.249	1.000	1.000	0.249
0.042	0.253	1.000	1.000	0.253
0.044	0.258	1.000	1.000	0.258
0.045	0.260	1.000	1.000	0.260
0.046	0.263	1.000	1.000	0.263
0.048	0.267	1.000	1.000	0.267
0.05	0.272	1.000	1.000	0.272
0.055	0.287	1.000	1.000	0.287
0.06	0.302	1.000	1.000	0.302
0.065	0.316	1.000	1.000	0.316
0.067	0.322	1.000	1.000	0.322
0.07	0.330	1.000	1.000	0.330

0.075	0.344	1.000	1.000	0.344
0.08	0.358	1.000	1.000	0.358
0.085	0.371	1.000	1.000	0.371
0.09	0.384	1.000	1.000	0.384
0.095	0.396	1.000	1.000	0.396
0.1	0.408	1.000	1.000	0.408
0.11	0.427	1.000	1.000	0.427
0.12	0.444	1.000	1.000	0.444
0.13	0.459	1.000	1.000	0.459
0.133	0.463	1.000	1.000	0.463
0.14	0.471	1.000	1.000	0.471
0.15	0.482	1.000	1.000	0.482
0.16	0.486	1.000	1.000	0.486
0.17	0.490	1.000	1.000	0.490
0.18	0.492	1.000	1.000	0.492
0.19	0.493	1.000	1.000	0.493
0.2	0.494	1.000	1.000	0.494
0.22	0.485	1.000	1.000	0.485
0.24	0.476	1.000	1.000	0.476
0.25	0.470	1.000	1.000	0.470
0.26	0.465	1.000	1.000	0.465
0.28	0.454	1.000	1.000	0.454
0.29	0.448	1.000	1.000	0.448
0.3	0.443	1.000	1.000	0.443
0.32	0.430	1.000	1.000	0.430
0.34	0.418	1.000	1.000	0.418
0.35	0.412	1.000	1.000	0.412
0.36	0.406	1.000	1.000	0.406
0.38	0.394	1.000	1.000	0.394
0.4	0.383	1.000	1.000	0.383
0.42	0.372	1.000	1.000	0.372
0.44	0.362	1.000	1.000	0.362
0.45	0.357	1.000	1.000	0.357
0.46	0.353	1.000	1.000	0.353
0.48	0.344	1.000	1.000	0.344
0.5	0.335	1.000	1.000	0.335
0.55	0.312	1.000	1.014	0.316
0.6	0.291	1.000	1.027	0.299
0.65	0.274	1.000	1.041	0.285
0.667	0.268	1.000	1.046	0.281
0.7	0.258	1.000	1.055	0.273
0.75	0.245	1.000	1.069	0.261
0.8	0.232	1.000	1.082	0.252
0.85	0.221	1.000	1.096	0.243
0.9	0.211	1.000	1.110	0.235
0.95	0.202	1.000	1.123	0.227
1	0.194	1.000	1.137	0.220
1.1	0.178	1.000	1.137	0.202
1.2	0.164	1.000	1.137	0.187

1.3	0.152	1.000	1.137	0.173
1.4	0.141	1.000	1.137	0.161
1.5	0.132	1.000	1.137	0.150
1.6	0.123	1.000	1.137	0.140
1.7	0.115	1.000	1.137	0.131
1.8	0.108	1.000	1.137	0.123
1.9	0.101	1.000	1.137	0.115
2	0.096	1.000	1.137	0.109
2.2	0.085	1.000	1.137	0.097
2.4	0.077	1.000	1.137	0.088
2.5	0.073	1.000	1.137	0.083
2.6	0.070	1.000	1.137	0.080
2.8	0.064	1.000	1.137	0.073
3	0.059	1.000	1.137	0.067
3.2	0.055	1.000	1.137	0.062
3.4	0.051	1.000	1.137	0.058
3.5	0.049	1.000	1.137	0.056
3.6	0.048	1.000	1.137	0.054
3.8	0.045	1.000	1.137	0.051
4	0.042	1.000	1.137	0.048
4.2	0.040	1.000	1.137	0.045
4.4	0.038	1.000	1.137	0.043
4.6	0.036	1.000	1.137	0.041
4.8	0.034	1.000	1.137	0.039
5	0.033	1.000	1.137	0.037

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	**SA (Base Spectrum)**	**Basin Factor**	**Near Fault Factor (Applied)**	**SA (Final Spectrum)**
0.01	0.237	1.000	1.000	0.237
0.02	0.288	1.000	1.000	0.288
0.022	0.296	1.000	1.000	0.296
0.025	0.307	1.000	1.000	0.307
0.029	0.321	1.000	1.000	0.321
0.03	0.324	1.000	1.000	0.324
0.032	0.330	1.000	1.000	0.330
0.035	0.338	1.000	1.000	0.338
0.036	0.341	1.000	1.000	0.341
0.04	0.351	1.000	1.000	0.351
0.042	0.356	1.000	1.000	0.356
0.044	0.361	1.000	1.000	0.361
0.045	0.363	1.000	1.000	0.363
0.046	0.366	1.000	1.000	0.366
0.048	0.370	1.000	1.000	0.370

0.05	0.375	1.000	1.000	0.375
0.055	0.385	1.000	1.000	0.385
0.06	0.395	1.000	1.000	0.395
0.065	0.404	1.000	1.000	0.404
0.067	0.407	1.000	1.000	0.407
0.07	0.412	1.000	1.000	0.412
0.075	0.420	1.000	1.000	0.420
0.08	0.428	1.000	1.000	0.428
0.085	0.436	1.000	1.000	0.436
0.09	0.443	1.000	1.000	0.443
0.095	0.450	1.000	1.000	0.450
0.1	0.456	1.000	1.000	0.456
0.11	0.468	1.000	1.000	0.468
0.12	0.478	1.000	1.000	0.478
0.13	0.488	1.000	1.000	0.488
0.133	0.491	1.000	1.000	0.491
0.14	0.498	1.000	1.000	0.498
0.15	0.507	1.000	1.000	0.507
0.16	0.515	1.000	1.000	0.515
0.17	0.523	1.000	1.000	0.523
0.18	0.531	1.000	1.000	0.531
0.19	0.538	1.000	1.000	0.538
0.2	0.546	1.000	1.000	0.546
0.22	0.530	1.000	1.000	0.530
0.24	0.516	1.000	1.000	0.516
0.25	0.510	1.000	1.000	0.510
0.26	0.504	1.000	1.000	0.504
0.28	0.492	1.000	1.000	0.492
0.29	0.487	1.000	1.000	0.487
0.3	0.482	1.000	1.000	0.482
0.32	0.464	1.000	1.000	0.464
0.34	0.447	1.000	1.000	0.447
0.35	0.440	1.000	1.000	0.440
0.36	0.432	1.000	1.000	0.432
0.38	0.418	1.000	1.000	0.418
0.4	0.406	1.000	1.000	0.406
0.42	0.394	1.000	1.000	0.394
0.44	0.383	1.000	1.000	0.383
0.45	0.378	1.000	1.000	0.378
0.46	0.373	1.000	1.000	0.373
0.48	0.364	1.000	1.000	0.364
0.5	0.355	1.000	1.000	0.355
0.55	0.330	1.000	1.014	0.334
0.6	0.309	1.000	1.027	0.317
0.65	0.290	1.000	1.041	0.302
0.667	0.285	1.000	1.046	0.298
0.7	0.275	1.000	1.055	0.290
0.75	0.260	1.000	1.069	0.278
0.8	0.247	1.000	1.082	0.267

0.85	0.234	1.000	1.096	0.257
0.9	0.223	1.000	1.110	0.248
0.95	0.213	1.000	1.123	0.240
1	0.204	1.000	1.137	0.232
1.1	0.187	1.000	1.137	0.212
1.2	0.172	1.000	1.137	0.195
1.3	0.159	1.000	1.137	0.181
1.4	0.148	1.000	1.137	0.169
1.5	0.139	1.000	1.137	0.158
1.6	0.131	1.000	1.137	0.149
1.7	0.123	1.000	1.137	0.140
1.8	0.117	1.000	1.137	0.133
1.9	0.111	1.000	1.137	0.126
2	0.106	1.000	1.137	0.120
2.2	0.095	1.000	1.137	0.108
2.4	0.086	1.000	1.137	0.098
2.5	0.082	1.000	1.137	0.094
2.6	0.079	1.000	1.137	0.090
2.8	0.072	1.000	1.137	0.082
3	0.067	1.000	1.137	0.076
3.2	0.062	1.000	1.137	0.071
3.4	0.058	1.000	1.137	0.066
3.5	0.056	1.000	1.137	0.064
3.6	0.054	1.000	1.137	0.062
3.8	0.051	1.000	1.137	0.058
4	0.048	1.000	1.137	0.054
4.2	0.046	1.000	1.137	0.052
4.4	0.044	1.000	1.137	0.050
4.6	0.042	1.000	1.137	0.048
4.8	0.041	1.000	1.137	0.047
5	0.040	1.000	1.137	0.045

MINIMUM DETERMINISTIC SPECTRUM

Period	**SA**
0.01	0.210
0.02	0.214
0.022	0.217
0.025	0.221
0.029	0.227
0.03	0.228
0.032	0.233
0.035	0.240
0.036	0.243
0.04	0.252
0.042	0.257
0.044	0.262
0.045	0.265

0.046	0.267
0.048	0.272
0.05	0.277
0.055	0.294
0.06	0.310
0.065	0.326
0.067	0.332
0.07	0.342
0.075	0.357
0.08	0.371
0.085	0.386
0.09	0.399
0.095	0.413
0.1	0.425
0.11	0.444
0.12	0.461
0.13	0.476
0.133	0.480
0.14	0.488
0.15	0.499
0.16	0.502
0.17	0.503
0.18	0.504
0.19	0.505
0.2	0.504
0.22	0.490
0.24	0.477
0.25	0.470
0.26	0.463
0.28	0.449
0.29	0.442
0.3	0.436
0.32	0.421
0.34	0.407
0.35	0.400
0.36	0.394
0.38	0.381
0.4	0.369
0.42	0.355
0.44	0.341
0.45	0.335
0.46	0.329
0.48	0.317
0.5	0.306
0.55	0.278
0.6	0.254
0.65	0.233
0.667	0.227
0.7	0.216

0.75	0.201
0.8	0.187
0.85	0.175
0.9	0.165
0.95	0.155
1	0.147
1.1	0.131
1.2	0.118
1.3	0.107
1.4	0.097
1.5	0.089
1.6	0.081
1.7	0.075
1.8	0.069
1.9	0.064
2	0.060
2.2	0.052
2.4	0.046
2.5	0.044
2.6	0.042
2.8	0.038
3	0.034
3.2	0.031
3.4	0.029
3.5	0.028
3.6	0.027
3.8	0.025
4	0.023
4.2	0.022
4.4	0.020
4.6	0.019
4.8	0.018
5	0.017

Envelope Data

Period	**SA**
0.01	0.237
0.02	0.288
0.022	0.296
0.025	0.307
0.029	0.321
0.03	0.324
0.032	0.330
0.035	0.338
0.036	0.341
0.04	0.351
0.042	0.356
0.044	0.361
0.045	0.363

0.046	0.366
0.048	0.370
0.05	0.375
0.055	0.385
0.06	0.395
0.065	0.404
0.067	0.407
0.07	0.412
0.075	0.420
0.08	0.428
0.085	0.436
0.09	0.443
0.095	0.450
0.1	0.456
0.11	0.468
0.12	0.478
0.13	0.488
0.133	0.491
0.14	0.498
0.15	0.507
0.16	0.515
0.17	0.523
0.18	0.531
0.19	0.538
0.2	0.546
0.22	0.530
0.24	0.516
0.25	0.510
0.26	0.504
0.28	0.492
0.29	0.487
0.3	0.482
0.32	0.464
0.34	0.447
0.35	0.440
0.36	0.432
0.38	0.418
0.4	0.406
0.42	0.394
0.44	0.383
0.45	0.378
0.46	0.373
0.48	0.364
0.5	0.355
0.55	0.334
0.6	0.317
0.65	0.302
0.667	0.298
0.7	0.290

0.75	0.278
0.8	0.267
0.85	0.257
0.9	0.248
0.95	0.240
1	0.232
1.1	0.212
1.2	0.195
1.3	0.181
1.4	0.169
1.5	0.158
1.6	0.149
1.7	0.140
1.8	0.133
1.9	0.126
2	0.120
2.2	0.108
2.4	0.098
2.5	0.094
2.6	0.090
2.8	0.082
3	0.076
3.2	0.071
3.4	0.066
3.5	0.064
3.6	0.062
3.8	0.058
4	0.054
4.2	0.052
4.4	0.050
4.6	0.048
4.8	0.047
5	0.045

Analysis of CY-CB Attenuation Prediction Equation vs ARS Online Results

Comparison of ARS Curves
(unlock sheet with "shmi")

Model Inputs

Fault

Magnitude	7.5	(5 to 8.5)
F_{RV}	0	(input 1 = Rev)
F_{NM}	0	(input 1 = Normal)
Dip (degree)	90	(0 to 90)
Z_{TOR} (km)	0	

Distance

R_{RUP} (km)	18.1	
R_{JB} (km)	18.1	
R_x (km)	18.1	
Hanging Wall?	☐ Yes?	
Near-Field Factor?	☑ Yes?	

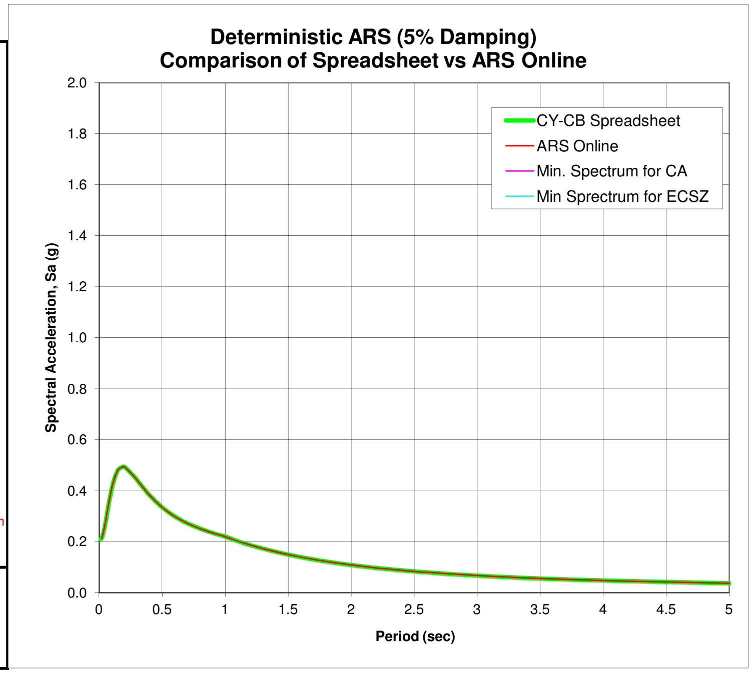
Site

V_{S30} (m/sec)	560	(270 to 1500 m/s)
$Z_{1.0}$ (m)	74	(0 - No Basin)
$Z_{2.5}$ (km)	2	(0 - No Basin)
No. Cal. Basin?	☐ Yes ?	(Check only for sites located within a Basin)
So. Cal. Basin?	☐ Yes ?	

Analysis

ARS Online vs CY-CB Spreadsheet Results

MAX. % Diff. = 1%



CY-CB Spreadsheet Results

T (sec)	CB-CY S(a)
0.010	0.20942
0.020	0.21274
0.022	0.21547
0.025	0.21962
0.029	0.22504
0.030	0.22660
0.032	0.23085
0.035	0.23735
0.036	0.23963
0.040	0.24852
0.042	0.25322
0.044	0.25788
0.045	0.26030
0.046	0.26269
0.048	0.26745
0.050	0.27228
0.055	0.28703
0.060	0.30189
0.065	0.31629
0.067	0.32207
0.070	0.33043
0.075	0.34426
0.080	0.35772
0.085	0.37099
0.090	0.38364
0.095	0.39595
0.100	0.40777
0.110	0.42701
0.120	0.44408
0.130	0.45877
0.133	0.46252
0.140	0.47091
0.150	0.48152
0.160	0.48633
0.170	0.48956
0.180	0.49200

Place ARS Online Deterministic Data Here "Paste"

T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.209	1	1	0.209	0%
0.02	0.213	1	1	0.213	0%
0.022	0.215	1	1	0.215	0%
0.025	0.22	1	1	0.22	0%
0.029	0.225	1	1	0.225	0%
0.03	0.227	1	1	0.227	0%
0.032	0.231	1	1	0.231	0%
0.035	0.237	1	1	0.237	0%
0.036	0.24	1	1	0.24	0%
0.04	0.248	1	1	0.248	0%
0.042	0.253	1	1	0.253	0%
0.044	0.258	1	1	0.258	0%
0.045	0.26	1	1	0.26	0%
0.046	0.263	1	1	0.263	0%
0.048	0.267	1	1	0.267	0%
0.05	0.272	1	1	0.272	0%
0.055	0.287	1	1	0.287	0%
0.06	0.302	1	1	0.302	0%
0.065	0.316	1	1	0.316	0%
0.067	0.322	1	1	0.322	0%
0.07	0.33	1	1	0.33	0%
0.075	0.344	1	1	0.344	0%
0.08	0.358	1	1	0.358	0%
0.085	0.371	1	1	0.371	0%
0.09	0.384	1	1	0.384	0%
0.095	0.396	1	1	0.396	0%
0.1	0.408	1	1	0.408	0%
0.11	0.427	1	1	0.427	0%
0.12	0.444	1	1	0.444	0%
0.13	0.459	1	1	0.459	0%
0.133	0.462	1	1	0.462	0%
0.14	0.471	1	1	0.471	0%
0.15	0.481	1	1	0.481	0%
0.16	0.486	1	1	0.486	0%
0.17	0.489	1	1	0.489	0%
0.18	0.492	1	1	0.492	0%

For Comparsion Plots of Min. Sprectra, Paste Special into Cells

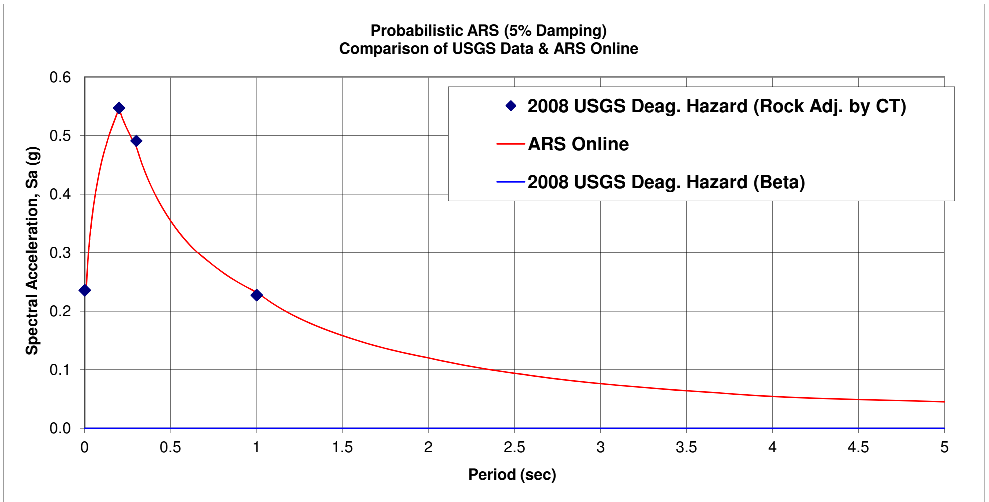
Min. Spectrum for CA		Min Sprectrum for ECSZ	
T (sec)	S (a)	T (sec)	S (a)

Deterministic_Response_Spectrum_072809.xls 5/9/2012 12:22 PM

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data (unlock spreadsheet "shmi")
Spectral Accelerations Points from USGS Website at http://earthquake.usgs.gov/research/hazmaps/products_data/2008/data/

*** Note: This spreadsheet uses the given latitude and longitude data provided by the user to estimate spectral acceleration values with a probability of exceedence 5% in 50 yrs (or 975 yr return period). The four spectral acceleration data points plotted on the graph are from the USGS website and are based on a 0.05 degree grid. Basic interpolation is used to estimate intermediate values inside each grid. Raw Data points are provided in the tabs of this spreadsheet. Corner grid spectral acceleration data are shown in the "calculation" tab.**

Input Site Information	
Latitude	Longitude
32.5635	-116.9356
V_{S30} (m/s) =	560
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	19.3
$Z_{1.0}$ (m) =	74
$Z_{2.5}$ (km) =	2



Place ARS Online Probabilistic Data Here "Paste"

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.237	1	1	0.237
0.02	0.288	1	1	0.288
0.022	0.296	1	1	0.296
0.025	0.307	1	1	0.307
0.029	0.321	1	1	0.321
0.03	0.324	1	1	0.324
0.032	0.33	1	1	0.33
0.035	0.338	1	1	0.338
0.036	0.341	1	1	0.341
0.04	0.351	1	1	0.351
0.042	0.356	1	1	0.356
0.044	0.361	1	1	0.361
0.045	0.363	1	1	0.363
0.046	0.366	1	1	0.366
0.048	0.37	1	1	0.37
0.05	0.375	1	1	0.375
0.055	0.385	1	1	0.385
0.06	0.395	1	1	0.395
0.065	0.404	1	1	0.404
0.067	0.407	1	1	0.407
0.07	0.412	1	1	0.412
0.075	0.42	1	1	0.42
0.08	0.428	1	1	0.428
0.085	0.436	1	1	0.436
0.09	0.443	1	1	0.443
0.095	0.45	1	1	0.45
0.1	0.456	1	1	0.456
0.11	0.468	1	1	0.468
0.12	0.478	1	1	0.478
0.13	0.488	1	1	0.488
0.133	0.491	1	1	0.491
0.14	0.498	1	1	0.498
0.15	0.507	1	1	0.507
0.16	0.515	1	1	0.515
0.17	0.523	1	1	0.523
0.18	0.531	1	1	0.531
0.19	0.538	1	1	0.538
0.2	0.546	1	1	0.546
0.22	0.53	1	1	0.53
0.24	0.516	1	1	0.516
0.25	0.51	1	1	0.51

Analysis of ARS Online Results vs USGS Deaggregation Hazard (Adj. By CT)

Period (sec)	USGS Interpolated Spectral Accel.	Adj. for Near Fault Effect	Adj. for Soil Amplification	Adj. For Basin Effect	Final Adj. USGS Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.217	1.000	1.088	1.000	0.236	0.237	-0.4%
0.2	0.512	1.000	1.070	1.000	0.547	0.546	0.3%
0.3	0.424	1.000	1.159	1.000	0.491	0.482	1.9%
1	0.164	1.114	1.250	1.000	0.228	0.232	-1.8%

Max % Difference = 1.9%

USGS Deaggregation Hazard (Beta) with Near Field and Basin Factors

Period (sec)	INPUT USGS Deagg. Spec Accel	Adj. for Near Fault Effect	Adj. For Basin Effect	Final Adj. USGS Deagg Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0		1.000	1.000		0.237	0.0%
0.1		1.000	1.000		0.456	0.0%
0.2		1.000	1.000		0.546	0.0%
0.3		1.000	1.000		0.482	0.0%
0.5		1.000	1.000		0.355	0.0%
1		1.114	1.000		0.232	0.0%
2		1.114	1.000		0.12	0.0%
3		1.114	1.000		0.076	0.0%
4		1.114	1.000		0.054	0.0%
5		1.114	1.000		0.045	0.0%

Max % Difference = 0.0%

Probabilistic_Response_Spectrum_080409.xls 5/9/2012 12:23 PM

SITE DATA

Shear Wave Velocity, V_{S30}:	560 m/s
Latitude:	32.563489
Longitude:	-116.935558
Depth to Vs = 1.0 km/s:	74 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Newport Inglewood-Rose Canyon fault zone (Silver Strand section-Downtown Graben fault)

Fault ID:	423
Maximum Magnitude (MMax):	7.5
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	18.14 km
Rjb:	18.14 km
Rx:	18.14 km
Fnorm:	0
Frev:	0

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.209	1.000	1.000	0.209
0.02	0.213	1.000	1.000	0.213
0.022	0.215	1.000	1.000	0.215
0.025	0.220	1.000	1.000	0.220
0.029	0.225	1.000	1.000	0.225
0.03	0.227	1.000	1.000	0.227
0.032	0.231	1.000	1.000	0.231
0.035	0.237	1.000	1.000	0.237
0.036	0.240	1.000	1.000	0.240
0.04	0.248	1.000	1.000	0.248
0.042	0.253	1.000	1.000	0.253
0.044	0.258	1.000	1.000	0.258
0.045	0.260	1.000	1.000	0.260
0.046	0.263	1.000	1.000	0.263

0.048	0.267	1.000	1.000	0.267
0.05	0.272	1.000	1.000	0.272
0.055	0.287	1.000	1.000	0.287
0.06	0.302	1.000	1.000	0.302
0.065	0.316	1.000	1.000	0.316
0.067	0.322	1.000	1.000	0.322
0.07	0.330	1.000	1.000	0.330
0.075	0.344	1.000	1.000	0.344
0.08	0.358	1.000	1.000	0.358
0.085	0.371	1.000	1.000	0.371
0.09	0.384	1.000	1.000	0.384
0.095	0.396	1.000	1.000	0.396
0.1	0.408	1.000	1.000	0.408
0.11	0.427	1.000	1.000	0.427
0.12	0.444	1.000	1.000	0.444
0.13	0.459	1.000	1.000	0.459
0.133	0.462	1.000	1.000	0.462
0.14	0.471	1.000	1.000	0.471
0.15	0.481	1.000	1.000	0.481
0.16	0.486	1.000	1.000	0.486
0.17	0.489	1.000	1.000	0.489
0.18	0.492	1.000	1.000	0.492
0.19	0.493	1.000	1.000	0.493
0.2	0.494	1.000	1.000	0.494
0.22	0.485	1.000	1.000	0.485
0.24	0.476	1.000	1.000	0.476
0.25	0.470	1.000	1.000	0.470
0.26	0.465	1.000	1.000	0.465
0.28	0.454	1.000	1.000	0.454
0.29	0.448	1.000	1.000	0.448
0.3	0.443	1.000	1.000	0.443
0.32	0.430	1.000	1.000	0.430
0.34	0.418	1.000	1.000	0.418
0.35	0.411	1.000	1.000	0.411
0.36	0.406	1.000	1.000	0.406
0.38	0.394	1.000	1.000	0.394
0.4	0.383	1.000	1.000	0.383
0.42	0.372	1.000	1.000	0.372
0.44	0.362	1.000	1.000	0.362
0.45	0.357	1.000	1.000	0.357
0.46	0.353	1.000	1.000	0.353
0.48	0.344	1.000	1.000	0.344
0.5	0.335	1.000	1.000	0.335
0.55	0.312	1.000	1.014	0.316
0.6	0.291	1.000	1.027	0.299
0.65	0.274	1.000	1.041	0.285

0.667	0.268	1.000	1.046	0.281
0.7	0.258	1.000	1.055	0.272
0.75	0.245	1.000	1.069	0.261
0.8	0.232	1.000	1.082	0.251
0.85	0.221	1.000	1.096	0.243
0.9	0.211	1.000	1.110	0.234
0.95	0.202	1.000	1.123	0.227
1	0.194	1.000	1.137	0.220
1.1	0.178	1.000	1.137	0.202
1.2	0.164	1.000	1.137	0.187
1.3	0.152	1.000	1.137	0.173
1.4	0.141	1.000	1.137	0.161
1.5	0.132	1.000	1.137	0.150
1.6	0.123	1.000	1.137	0.140
1.7	0.115	1.000	1.137	0.131
1.8	0.108	1.000	1.137	0.123
1.9	0.101	1.000	1.137	0.115
2	0.096	1.000	1.137	0.109
2.2	0.085	1.000	1.137	0.097
2.4	0.077	1.000	1.137	0.088
2.5	0.073	1.000	1.137	0.083
2.6	0.070	1.000	1.137	0.080
2.8	0.064	1.000	1.137	0.073
3	0.059	1.000	1.137	0.067
3.2	0.055	1.000	1.137	0.062
3.4	0.051	1.000	1.137	0.058
3.5	0.049	1.000	1.137	0.056
3.6	0.048	1.000	1.137	0.054
3.8	0.045	1.000	1.137	0.051
4	0.042	1.000	1.137	0.048
4.2	0.040	1.000	1.137	0.045
4.4	0.038	1.000	1.137	0.043
4.6	0.036	1.000	1.137	0.041
4.8	0.034	1.000	1.137	0.039
5	0.033	1.000	1.137	0.037

To use above data in Excel, copy/paste:

```
0.01       0.209      1.000      1.000      0.209
0.02       0.213      1.000      1.000      0.213
```

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)

0.01	0.237	1.000	1.000	0.237
0.02	0.288	1.000	1.000	0.288
0.022	0.296	1.000	1.000	0.296
0.025	0.307	1.000	1.000	0.307
0.029	0.321	1.000	1.000	0.321
0.03	0.324	1.000	1.000	0.324
0.032	0.330	1.000	1.000	0.330
0.035	0.338	1.000	1.000	0.338
0.036	0.341	1.000	1.000	0.341
0.04	0.351	1.000	1.000	0.351
0.042	0.356	1.000	1.000	0.356
0.044	0.361	1.000	1.000	0.361
0.045	0.363	1.000	1.000	0.363
0.046	0.366	1.000	1.000	0.366
0.048	0.370	1.000	1.000	0.370
0.05	0.375	1.000	1.000	0.375
0.055	0.385	1.000	1.000	0.385
0.06	0.395	1.000	1.000	0.395
0.065	0.404	1.000	1.000	0.404
0.067	0.407	1.000	1.000	0.407
0.07	0.412	1.000	1.000	0.412
0.075	0.420	1.000	1.000	0.420
0.08	0.428	1.000	1.000	0.428
0.085	0.436	1.000	1.000	0.436
0.09	0.443	1.000	1.000	0.443
0.095	0.450	1.000	1.000	0.450
0.1	0.456	1.000	1.000	0.456
0.11	0.468	1.000	1.000	0.468
0.12	0.478	1.000	1.000	0.478
0.13	0.488	1.000	1.000	0.488
0.133	0.491	1.000	1.000	0.491
0.14	0.498	1.000	1.000	0.498
0.15	0.507	1.000	1.000	0.507
0.16	0.515	1.000	1.000	0.515
0.17	0.523	1.000	1.000	0.523
0.18	0.531	1.000	1.000	0.531
0.19	0.538	1.000	1.000	0.538
0.2	0.546	1.000	1.000	0.546
0.22	0.530	1.000	1.000	0.530
0.24	0.516	1.000	1.000	0.516
0.25	0.510	1.000	1.000	0.510
0.26	0.504	1.000	1.000	0.504
0.28	0.492	1.000	1.000	0.492
0.29	0.487	1.000	1.000	0.487
0.3	0.482	1.000	1.000	0.482
0.32	0.464	1.000	1.000	0.464

0.34	0.447	1.000	1.000	0.447
0.35	0.440	1.000	1.000	0.440
0.36	0.432	1.000	1.000	0.432
0.38	0.418	1.000	1.000	0.418
0.4	0.406	1.000	1.000	0.406
0.42	0.394	1.000	1.000	0.394
0.44	0.383	1.000	1.000	0.383
0.45	0.378	1.000	1.000	0.378
0.46	0.373	1.000	1.000	0.373
0.48	0.364	1.000	1.000	0.364
0.5	0.355	1.000	1.000	0.355
0.55	0.330	1.000	1.014	0.334
0.6	0.309	1.000	1.027	0.317
0.65	0.290	1.000	1.041	0.302
0.667	0.285	1.000	1.046	0.298
0.7	0.275	1.000	1.055	0.290
0.75	0.260	1.000	1.069	0.278
0.8	0.247	1.000	1.082	0.267
0.85	0.234	1.000	1.096	0.257
0.9	0.223	1.000	1.110	0.248
0.95	0.213	1.000	1.123	0.240
1	0.204	1.000	1.137	0.232
1.1	0.187	1.000	1.137	0.212
1.2	0.172	1.000	1.137	0.195
1.3	0.159	1.000	1.137	0.181
1.4	0.148	1.000	1.137	0.169
1.5	0.139	1.000	1.137	0.158
1.6	0.131	1.000	1.137	0.149
1.7	0.123	1.000	1.137	0.140
1.8	0.117	1.000	1.137	0.133
1.9	0.111	1.000	1.137	0.126
2	0.106	1.000	1.137	0.120
2.2	0.095	1.000	1.137	0.108
2.4	0.086	1.000	1.137	0.098
2.5	0.082	1.000	1.137	0.094
2.6	0.079	1.000	1.137	0.090
2.8	0.072	1.000	1.137	0.082
3	0.067	1.000	1.137	0.076
3.2	0.062	1.000	1.137	0.071
3.4	0.058	1.000	1.137	0.066
3.5	0.056	1.000	1.137	0.064
3.6	0.054	1.000	1.137	0.062
3.8	0.051	1.000	1.137	0.058
4	0.048	1.000	1.137	0.054
4.2	0.046	1.000	1.137	0.052
4.4	0.044	1.000	1.137	0.050

4.6	0.042	1.000	1.137	0.048
4.8	0.041	1.000	1.137	0.047
5	0.040	1.000	1.137	0.045

To use above data in Excel, copy/paste:

```
0.01     0.237    1.000    1.000    0.237
0.02     0.288    1.000    1.000    0.288
```

MINIMUM DETERMINISTIC SPECTRUM

Period	SA
0.01	0.210
0.02	0.214
0.022	0.217
0.025	0.221
0.029	0.227
0.03	0.228
0.032	0.233
0.035	0.240
0.036	0.243
0.04	0.252
0.042	0.257
0.044	0.262
0.045	0.265
0.046	0.267
0.048	0.272
0.05	0.277
0.055	0.294
0.06	0.310
0.065	0.326
0.067	0.332
0.07	0.342
0.075	0.357
0.08	0.371
0.085	0.386
0.09	0.399
0.095	0.413
0.1	0.425
0.11	0.444
0.12	0.461
0.13	0.476
0.133	0.480
0.14	0.488
0.15	0.499
0.16	0.502
0.17	0.503
0.18	0.504

0.19	0.505
0.2	0.504
0.22	0.490
0.24	0.477
0.25	0.470
0.26	0.463
0.28	0.449
0.29	0.442
0.3	0.436
0.32	0.421
0.34	0.407
0.35	0.400
0.36	0.394
0.38	0.381
0.4	0.369
0.42	0.355
0.44	0.341
0.45	0.335
0.46	0.329
0.48	0.317
0.5	0.306
0.55	0.278
0.6	0.254
0.65	0.233
0.667	0.227
0.7	0.216
0.75	0.201
0.8	0.187
0.85	0.175
0.9	0.165
0.95	0.155
1	0.147
1.1	0.131
1.2	0.118
1.3	0.107
1.4	0.097
1.5	0.089
1.6	0.081
1.7	0.075
1.8	0.069
1.9	0.064
2	0.060
2.2	0.052
2.4	0.046
2.5	0.044
2.6	0.042

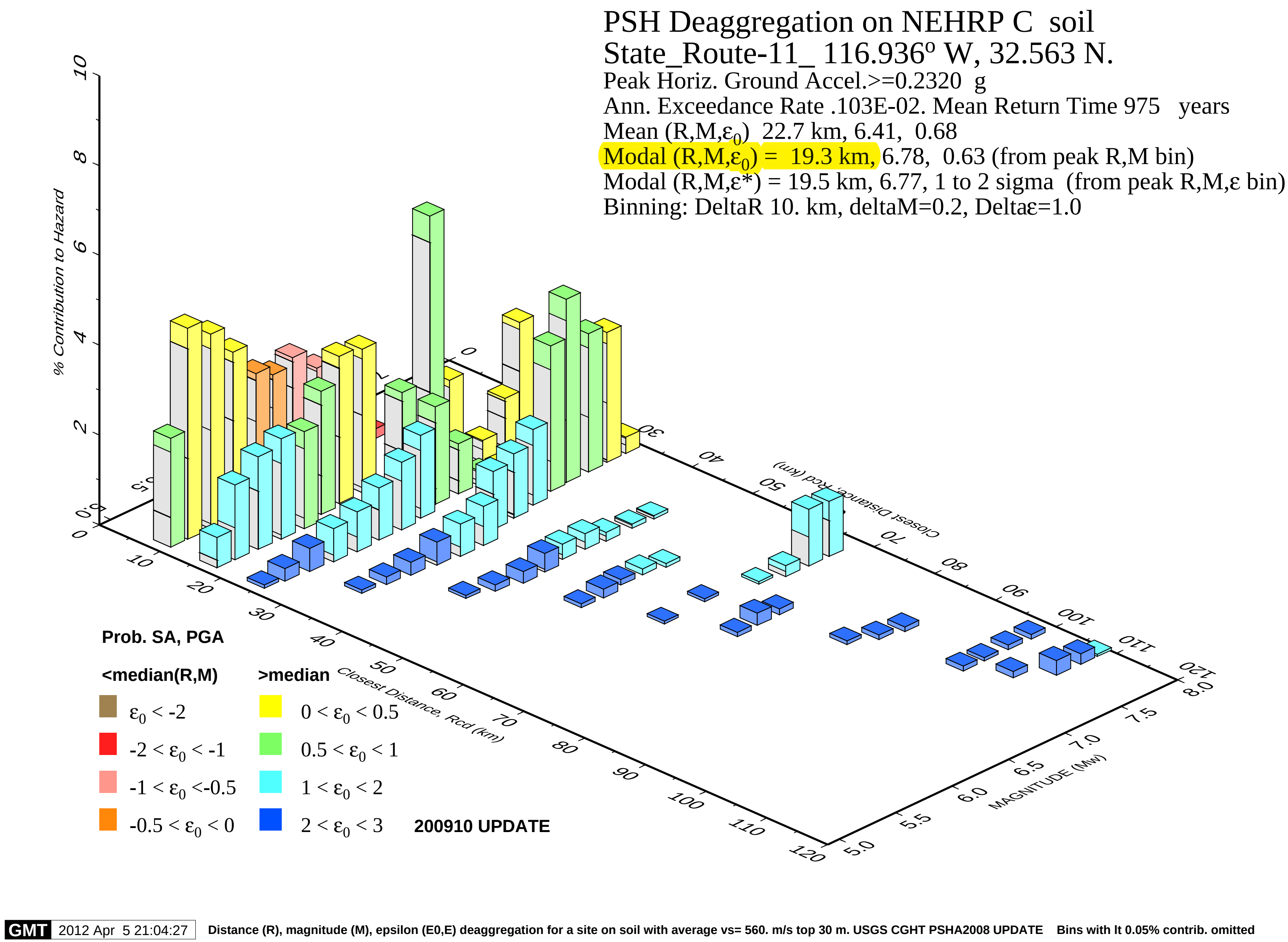
2.8	0.038
3	0.034
3.2	0.031
3.4	0.029
3.5	0.028
3.6	0.027
3.8	0.025
4	0.023
4.2	0.022
4.4	0.020
4.6	0.019
4.8	0.018
5	0.017
To use above data in Excel, copy/paste:	0.01 0.210 0.02 0.214

Envelope Data

Period	**SA**
0.01	0.237
0.02	0.288
0.022	0.296
0.025	0.307
0.029	0.321
0.03	0.324
0.032	0.330
0.035	0.338
0.036	0.341
0.04	0.351
0.042	0.356
0.044	0.361
0.045	0.363
0.046	0.366
0.048	0.370
0.05	0.375
0.055	0.385
0.06	0.395
0.065	0.404
0.067	0.407
0.07	0.412
0.075	0.420
0.08	0.428
0.085	0.436
0.09	0.443
0.095	0.450
0.1	0.456
0.11	0.468

0.12	0.478
0.13	0.488
0.133	0.491
0.14	0.498
0.15	0.507
0.16	0.515
0.17	0.523
0.18	0.531
0.19	0.538
0.2	0.546
0.22	0.530
0.24	0.516
0.25	0.510
0.26	0.504
0.28	0.492
0.29	0.487
0.3	0.482
0.32	0.464
0.34	0.447
0.35	0.440
0.36	0.432
0.38	0.418
0.4	0.406
0.42	0.394
0.44	0.383
0.45	0.378
0.46	0.373
0.48	0.364
0.5	0.355
0.55	0.334
0.6	0.317
0.65	0.302
0.667	0.298
0.7	0.290
0.75	0.278
0.8	0.267
0.85	0.257
0.9	0.248
0.95	0.240
1	0.232
1.1	0.212
1.2	0.195
1.3	0.181
1.4	0.169
1.5	0.158
1.6	0.149

1.7	0.140
1.8	0.133
1.9	0.126
2	0.120
2.2	0.108
2.4	0.098
2.5	0.094
2.6	0.090
2.8	0.082
3	0.076
3.2	0.071
3.4	0.066
3.5	0.064
3.6	0.062
3.8	0.058
4	0.054
4.2	0.052
4.4	0.050
4.6	0.048
4.8	0.047
5	0.045
To use above data in Excel, copy/paste:	0.01 0.237 0.02 0.288


PSH Deaggregation on NEHRP C soil
State_Route-11_ 116.936° W, 32.563 N.
Peak Horiz. Ground Accel.>=0.2320 g
Ann. Exceedance Rate .103E-02. Mean Return Time 975 years
Mean (R,M,ε_0) 22.7 km, 6.41, 0.68
Modal (R,M,ε_0) = 19.3 km, 6.78, 0.63 (from peak R,M bin)
Modal (R,M,ε*) = 19.5 km, 6.77, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
$\varepsilon_0 < -2$
$-2 < \varepsilon_0 < -1$
$-1 < \varepsilon_0 < -0.5$
$-0.5 < \varepsilon_0 < 0$
$0 < \varepsilon_0 < 0.5$
$0.5 < \varepsilon_0 < 1$
$1 < \varepsilon_0 < 2$
$2 < \varepsilon_0 < 3$
200910 UPDATE
GMT 2012 Apr 5 21:04:27
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 560. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

Caltrans

Fault & Site Data Input Sheet

The input sheet is to help the user organize the site data for developing the design response spectrum. Beta-Testers: If you fill out the fault and site information for each location, please provide this document and the *checker* to facilitate the QC/QA procedures listed in the 2009 Deterministic Fault Information & Seismic Procedures QC/QA checklist.

Project Information

Dist – EA: 11-056321 County: SD Route: 11 PM: 0.0/1.7

Bridge/Facility Name: — Bridge/Facility No.: —

Latitude: 32.5635 Longitude: -116.9356

Fault Information (#1)

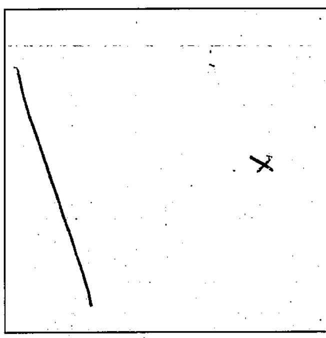
Fault Name: Newport/Rose Fault ID#: 423

MMax: 7.5 Fault Type: RLSS

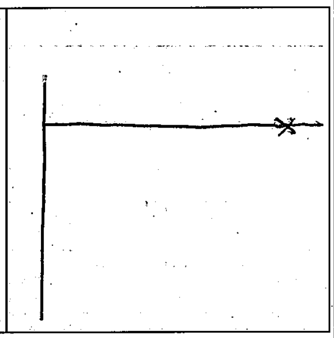
Fault Dip: 90° Dip Direction: V

Top of Rupture: 0 Bottom of Rupture: 13 Km

Plan View



Elevation View



Calculated or Measure Distances

R_{RUP}: 18.14

R_{JB}: 18.14

R_X: 18.14

Determination of V_{S30}

V_{S30} (m/s): 560

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): 74

$Z_{2.5}$ (km/s): 2

Notes:

Fault Information (#2)

Fault Name: ________ Fault ID#: ____

MMax: ____ Fault Type: ____

Fault Dip: ____ Dip Direction: ____

Top of Rupture: ____ Bottom of Rupture: ____

Plan View

Elevation View

Calculated or Measure Distances

R_{RUP}: ________

R_{JB}: ________

R_X: ________

Determination of V_{S30}

V_{S30} (m/s): ________

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): ________

$Z_{2.5}$ (km/s): ________

Notes:

Caltrans

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

This document is to be filled out by *checker* to evaluate the fault parameters and design response spectrum used for seismic design recommendations for bridge structures. To facilitate the quality check, the designer shall provide the checker all pertinent project information, geologic information and approved exceptions (if applicable) needed to complete this form. The *checker* must be familiar with the Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and Geotechnical Services Design Manual in order to successfully perform a quality check. Tools available to checkers include the Deterministic Response Spectrum Spreadsheet, Probabilistic Response Spectrum Spreadsheet (after USGS), 2008 USGS National Seismic Hazard Map and the ARS Online web tool. The above documents and tools are available at http://dap3.dot.ca.gov/shake_stable/technical.php.

Project Information

Dist – EA: 11-056321 County: SD Route: 11 PM: 0.0/1.7

Bridge/Facility Name: — Bridge/Facility No.: —

Latitude: 32.5635 Longitude: -116.9356

Deterministic Fault Information

Fault Name: Newport/Rose Cy Fault ID#: 423 M_{MAX}: 7.5 Fault Type: RLSS

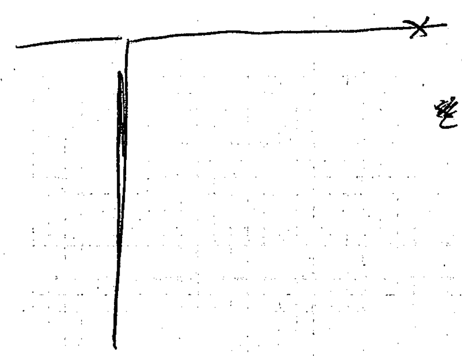
Fault Dip: 90° Dip Direction: V Top of Rupture: 0 Bottom of Rupture: 13 km

Plan View

(rough sketch; show dimensions)

Elevation View

(rough sketch; show dimensions)



Calculated or Measured Distances

R_{RUP}: 18.14 km ☒ Calculated / graphically ☐ Same as Rx (by definition)

R_{JB}: 18.14 km ☒ Calculated / graphically ☐ Same as Rx (by definition)

R_X: 18.14 km ☒ "Ruler" function on ARS Online ☐ Deterministic PGA Map

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2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Determination of V_{S30}

V_{S30} (m/s): 560

Method of Determining V_{S30}: SPT (e.g. P-S logging, Geophysics, SPT correlations, etc)

Additional Explanation (if needed): ______

Determination of Z1.0 and Z2.5 (if site located in designated California deep basin)

$Z_{1.0}$ (m/s): 74 $Z_{2.5}$ (km/s): 2

Method of Determining $Z_{1.0}$ & $Z_{2.5}$: ARS ONLINE (e.g. ARS Online, SDC figure, other)

Additional Explanation (if needed): ______

Deterministic - Special Conditions

Yes	No	N/A	
☒	☐		Was the Errata Deterministic Fault Database Spreadsheet reviewed to ensure that the correct fault parameters used in the analysis.
☒	☐	☐	Were the Near-Fault Factors applied correctly? *Applies to sites with a R_{RUP} distance of 25 km or less, as defined in the SDC.*
☐	☐	☒	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
☐	☐	☒	If the site is located within the Eastern California Shear Zone (ECSZ), was the design ARS larger than the minimum spectrum for the ECSZ (as defined in the SDC, Appendix B, Figure B.2)?
☐	☐	☒	If the controlling fault is the Cascadia Subduction Zone, was the alternate seismic procedure applied correctly (as defined in the SDC, Appendix B)?
☐	☐	☒	If the deterministic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the deterministic design spectrum?
☒	☐		Did the ARS Online deterministic spectrum correspond within 10% of the calculated deterministic spectrum? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Probabilistic - Special Conditions

Yes	No	N/A	
☒	☐	☐	Were Near-Fault Factors applied correctly (as defined by SDC)? *Applies to sites with a deaggregation R distance of 25 km or less.*
☐	☐	☒	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
☐	☐	☒	If the site has a V_{S30} of less than 300 m/s, was the resulting ARS curve checked against spectral acceleration from USGS Interactive Deaggregation tool?
☐	☐	☒	If the USGS Interactive Deaggregation tool and spectral acceleration data were used, were the appropriate near-fault and basin correction factors applied?

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2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Yes	No	N/A	
☐	☐	☒	If the probabilistic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the design spectrum?
☒	☐		Did the ARS Online design spectrum correspond within 10% of the USGS spectral acceleration data from the verification spreadsheet? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Comments / Observations Encountered during QC/QA process:

____

____

____

____

I certify that I have performed a quality check of the referenced fault information and design response spectrum provided by the geotechnical designer. The quality check is based on Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and the Geotechnical Services Design Manual.

Mike Fordham — Checker (Print)
TE — Title

[signature] — Checker (Signature)
3/5/2012 — Date

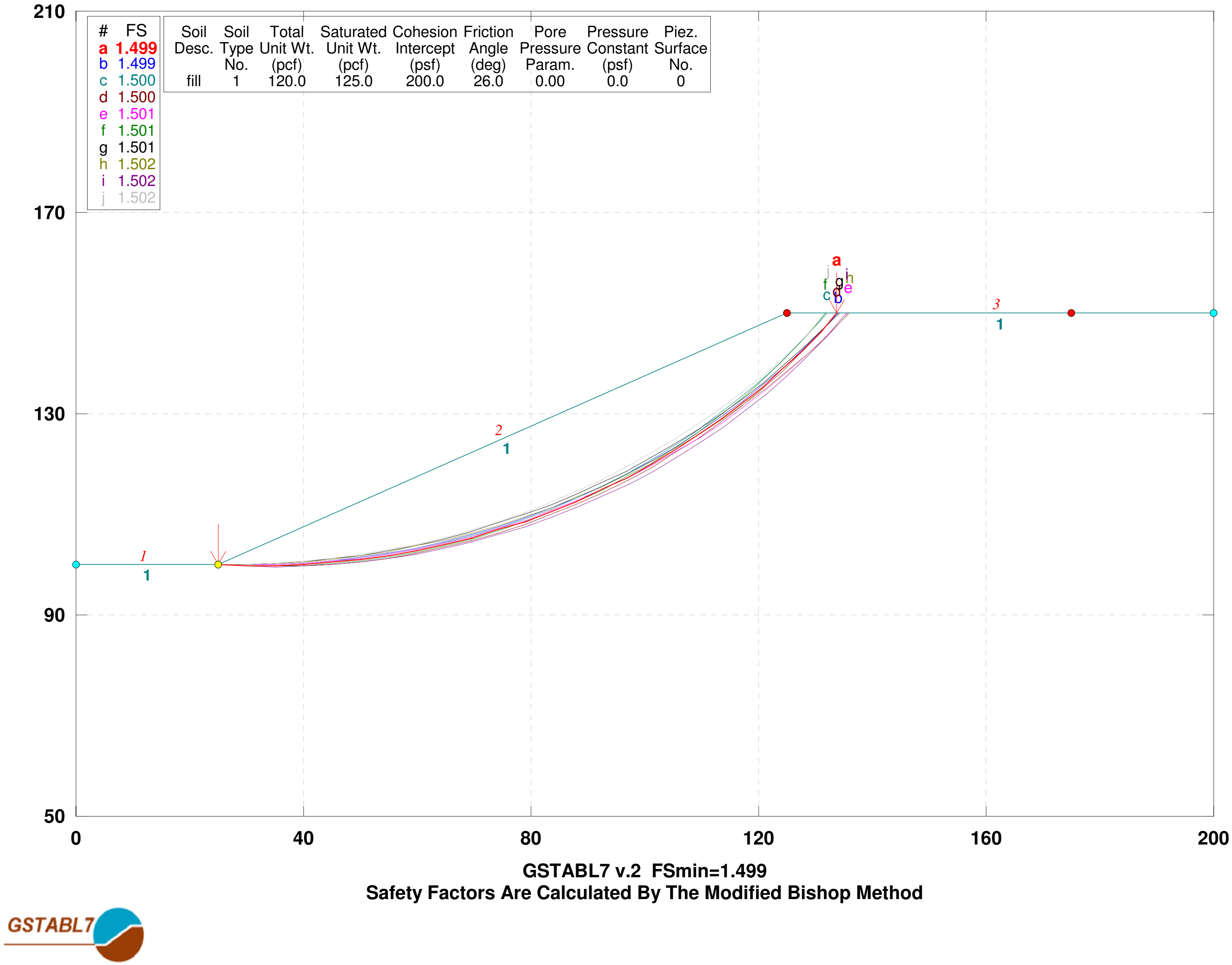
I certify that the referenced project complies with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance for the 2009 Seismic Design Procedures", dated August 12, 2009.

BRIAN HINMAN — Functional Supervisor (Print)
SENIOR T.E. — Title

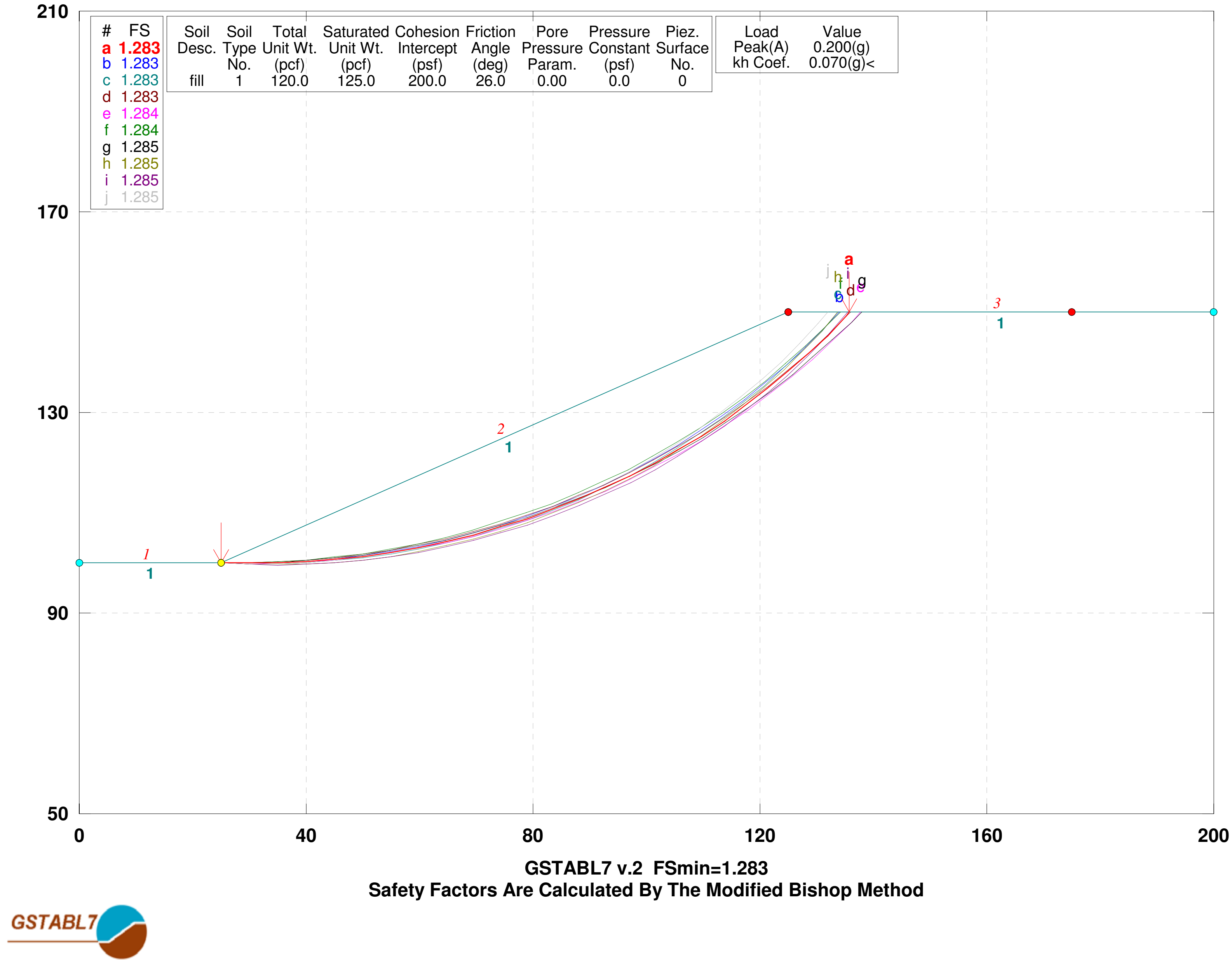
[signature] — Functional Supervisor (Signature)
4/10/12 — Date

(This original checklist and signature sheet shall be placed in the geotechnical project file, and a copy sent to the Mark Willian of the Geotechnical Services Corporate Unit).

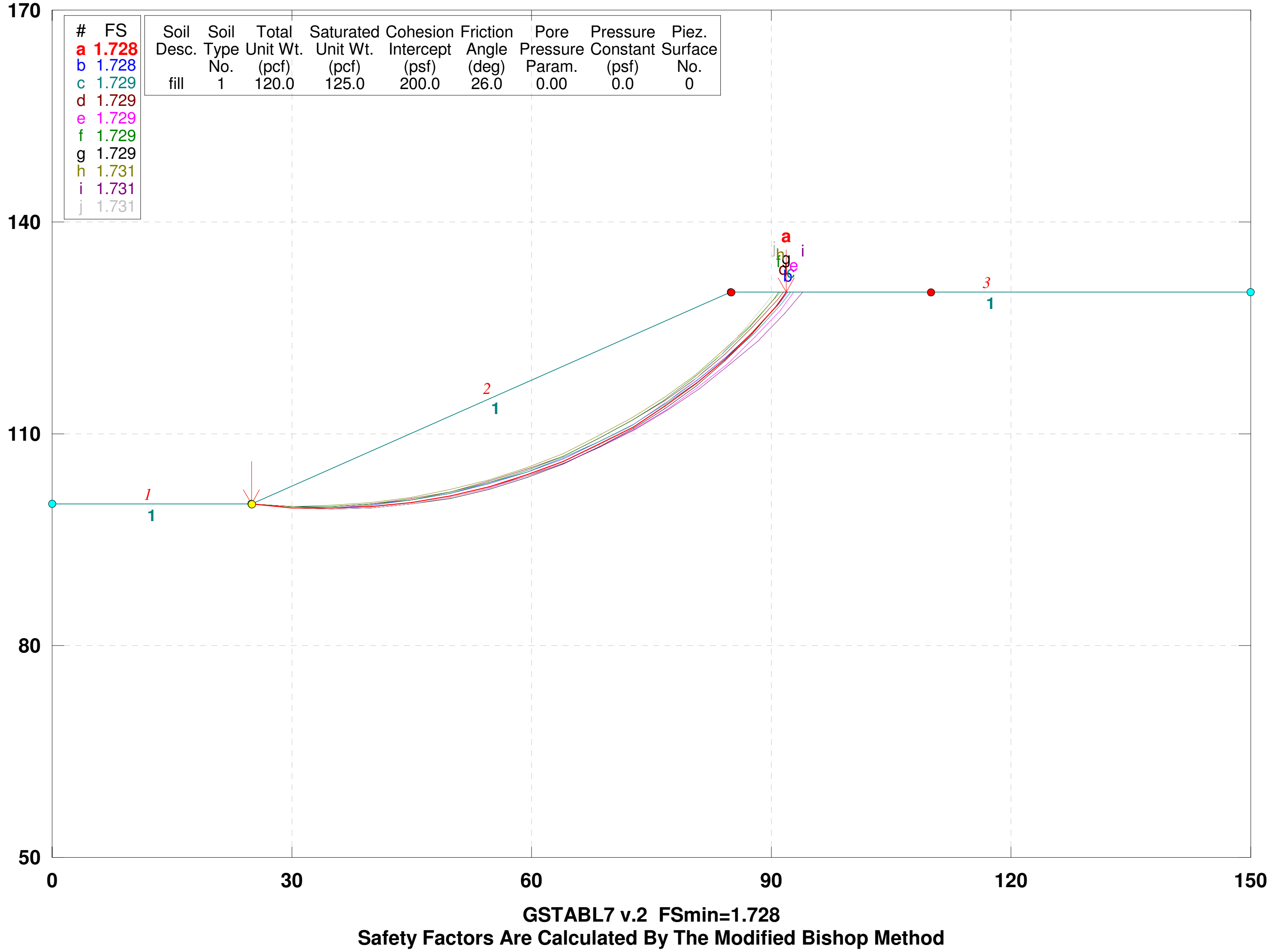
Static Analysis- 50ft, 2:1 Fill Slope



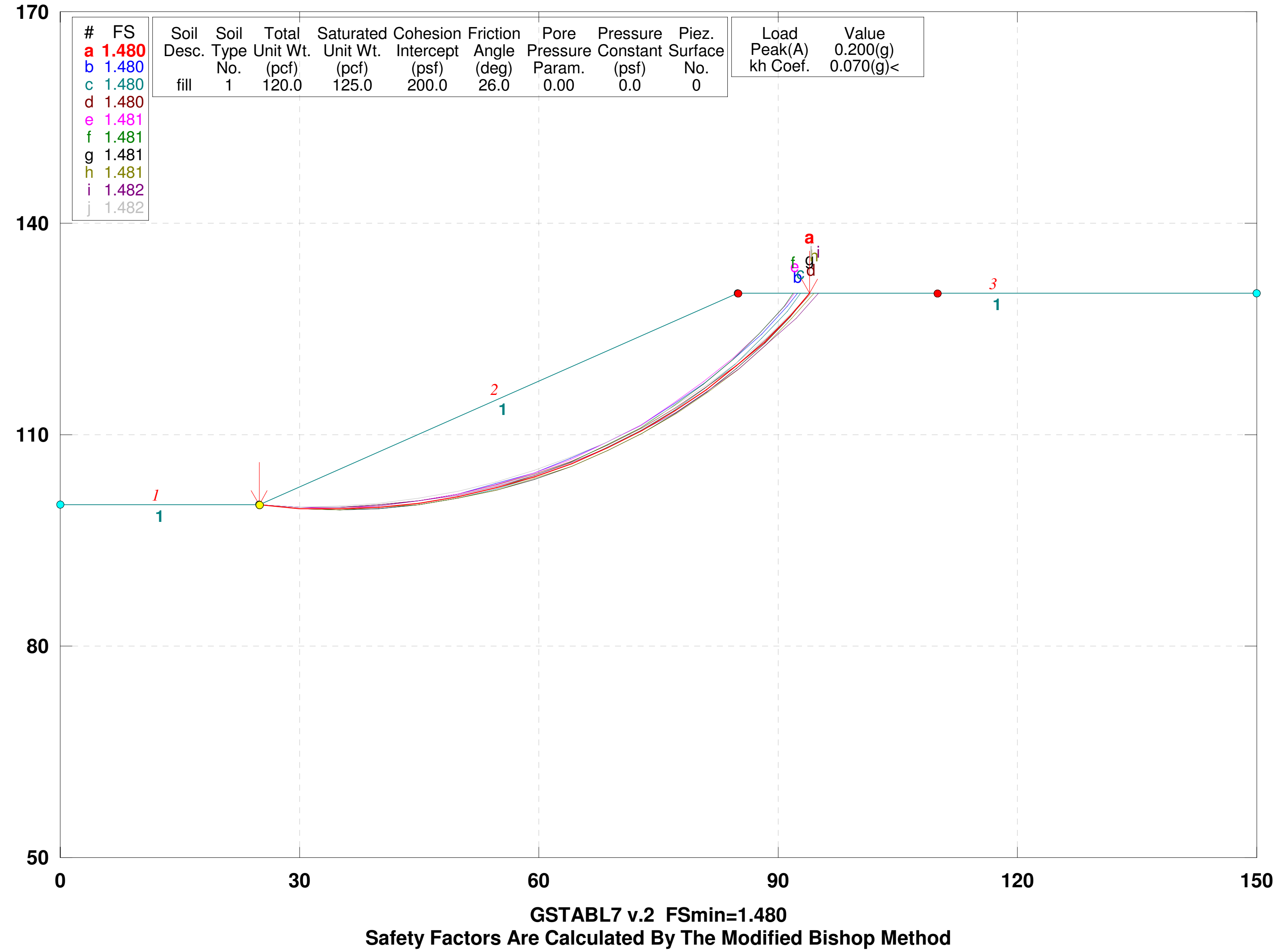
Seismic Analysis- 50ft, 2:1 Fill Slope



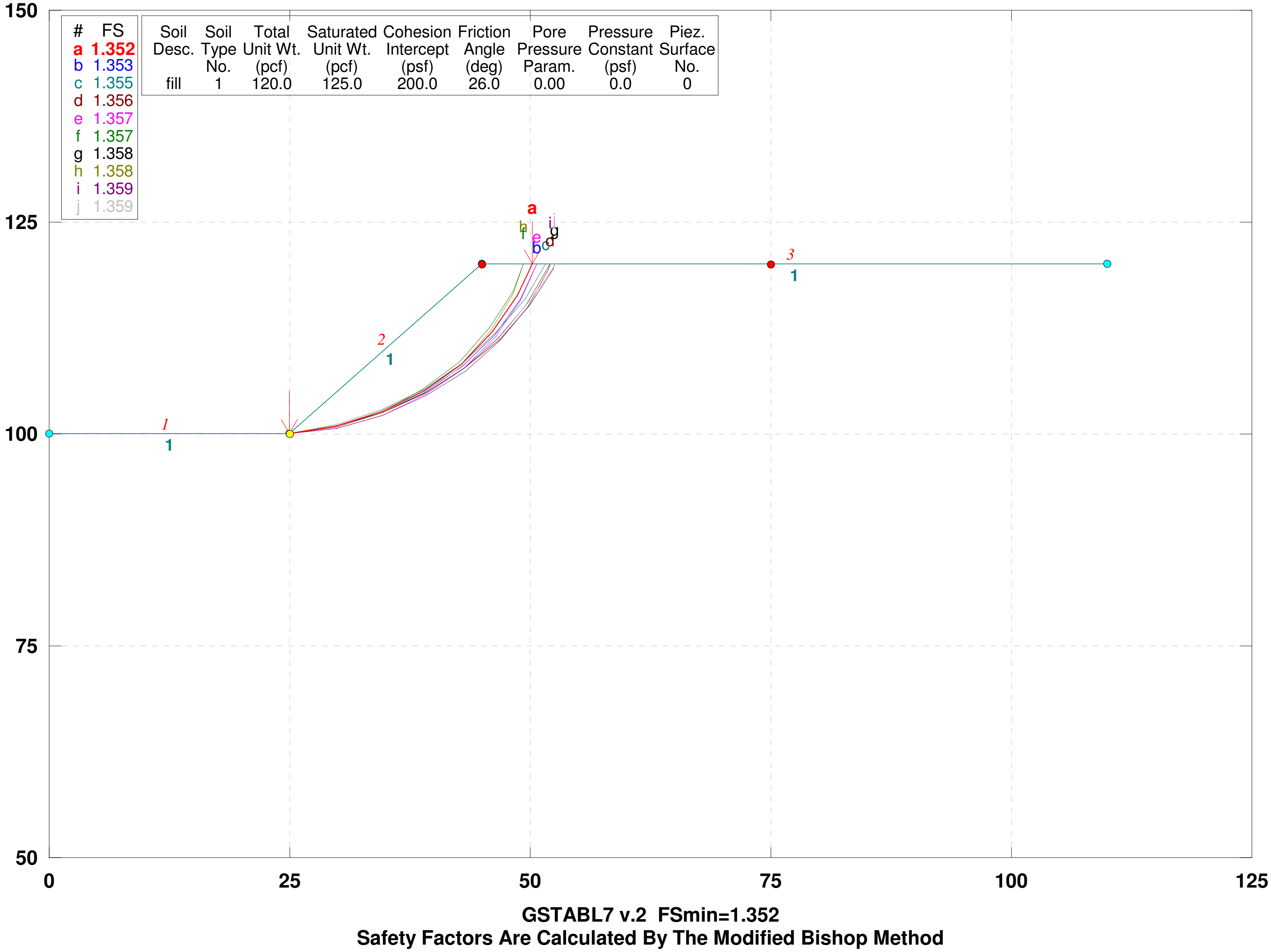
Static Analysis- 30ft, 2:1 Fill Slope



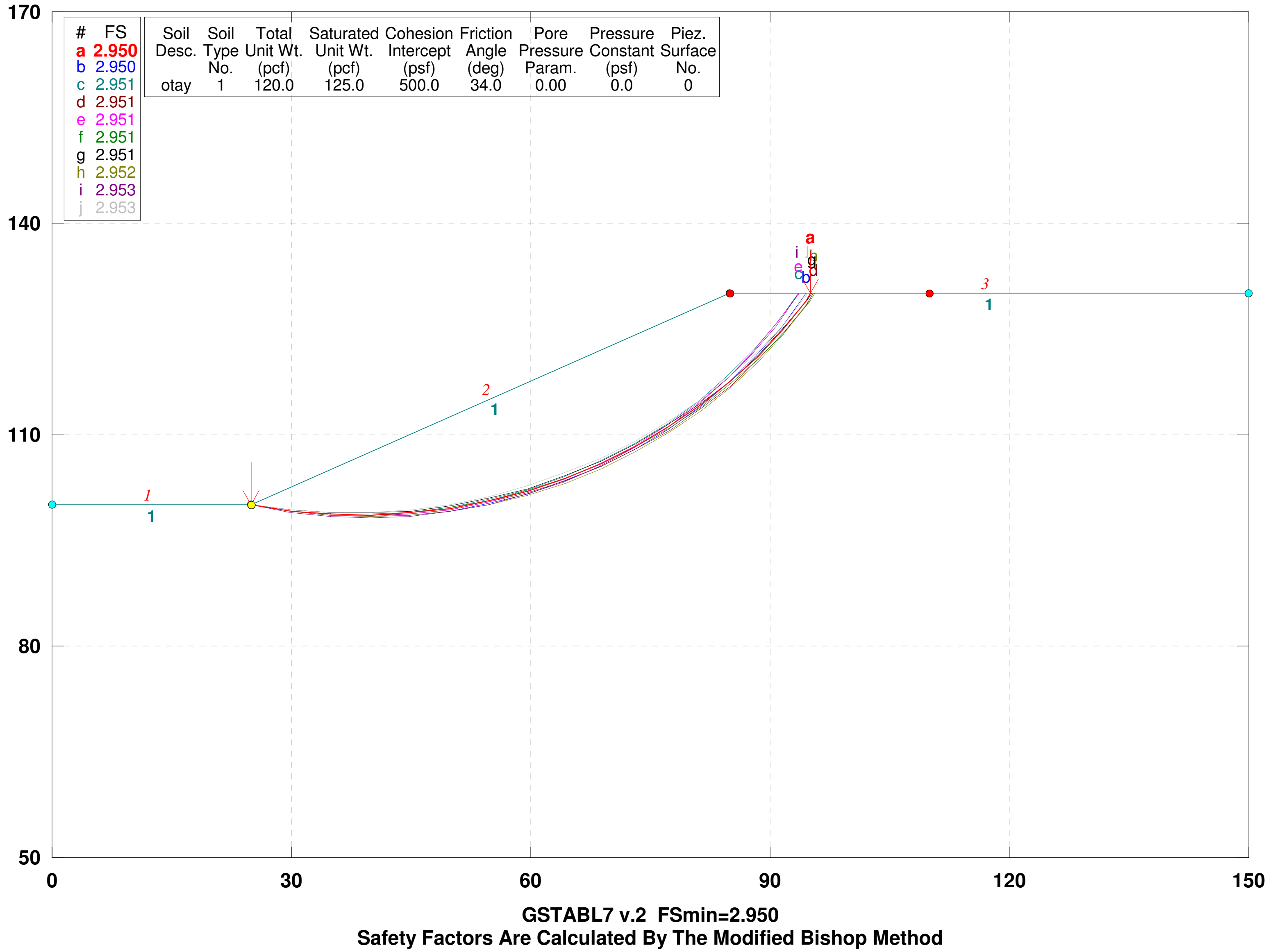
Seismic Analysis- 30ft, 2:1 Fill Slope



Static Analysis- 20ft, 1:1 Temporary Cut Slope in Documented Fill

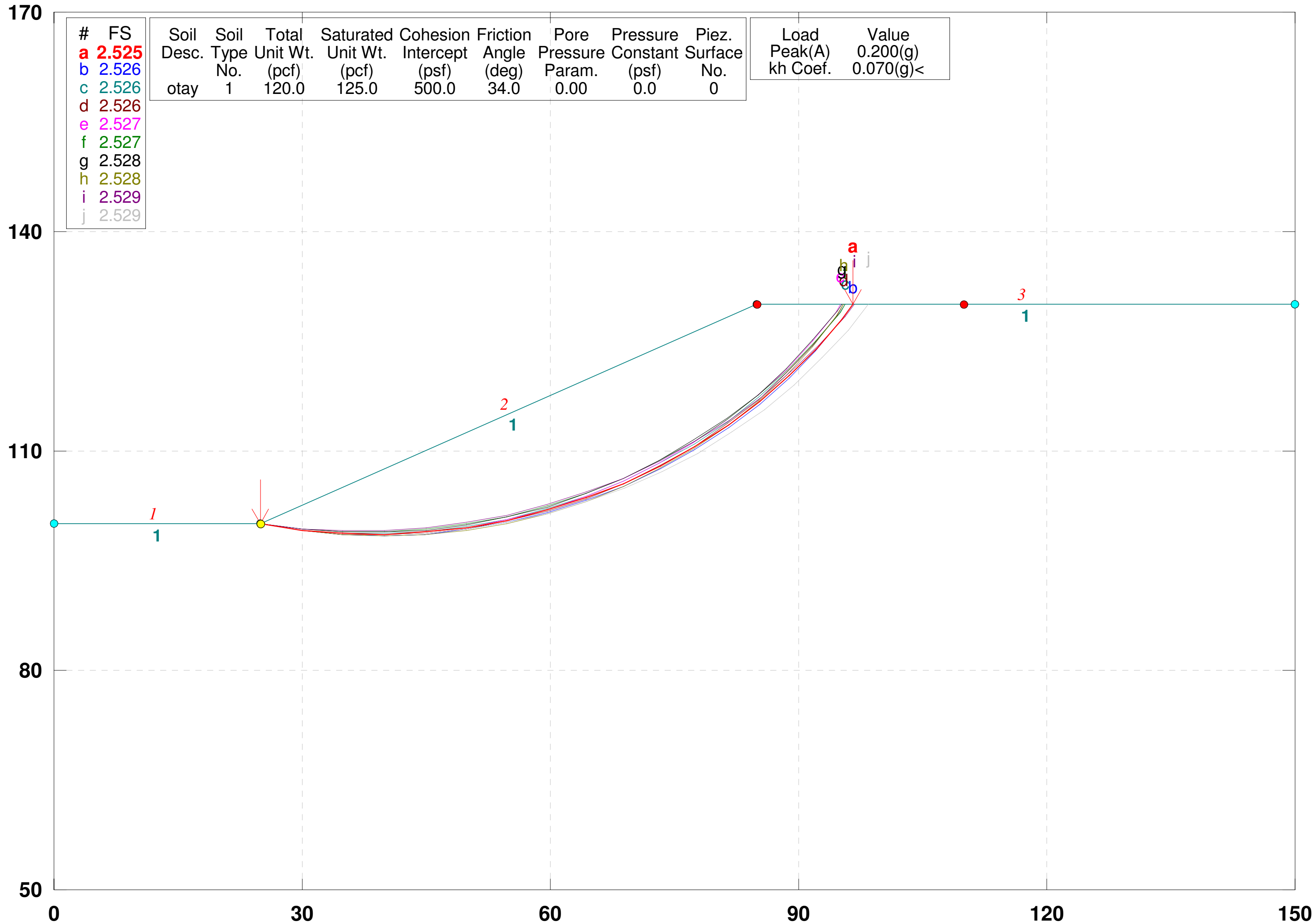


Static Analysis- 30ft, 2:1 Cut Slope in Otay Formation



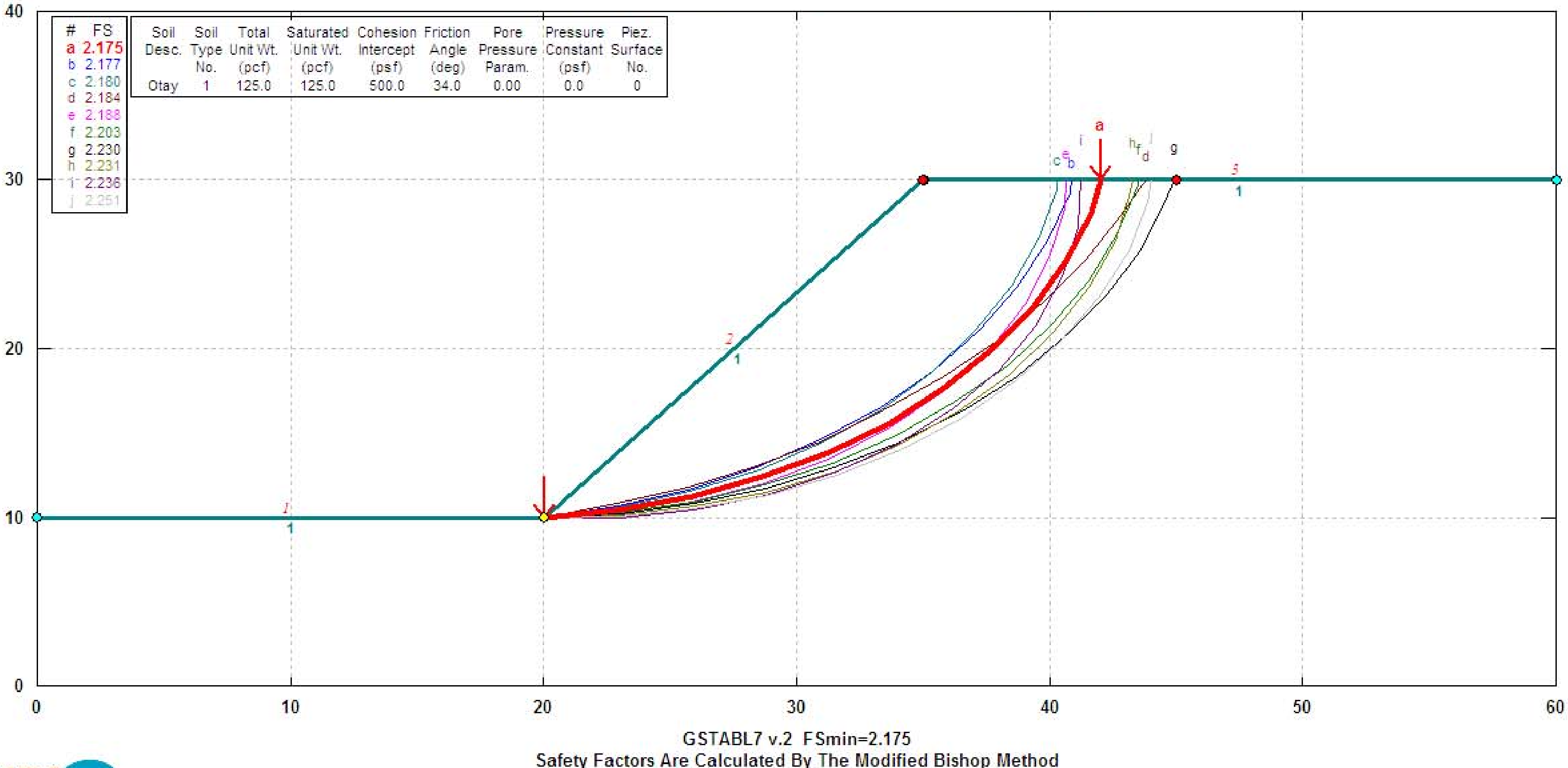
GSTABL7

Seismic Analysis- 30ft, 2:1 Cut Slope in Otay Formation



GSTABL7 v.2 FSmin=2.525
Safety Factors Are Calculated By The Modified Bishop Method

Static Analysis- 20ft, 0.75:1 Temporary Cut Slope in Otay Formation



APPENDIX II

DRAFT GEOTECHNICAL DESIGN REPORT, LEIGHTON CONSULTING, INC.

DRAFT GEOTECHNICAL DESIGN REPORT
SR-125 / SR-905 CONNECTOR
SAN DIEGO COUNTY, CALIFORNIA

Prepared For

PARSONS

110 West "A" Street, Suite 1050
San Diego, California 92101

Project No. 600158-905

February 6, 2008

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

February 6, 2008

Project No. 600158-905

To: Parsons
110 West "A" Street, Suite 1050
San Diego, California 92101

Attention: Ms. Marie Santos, PE

Subject: Draft Geotechnical Design Report,
SR-125 and SR-905 Connector
San Diego County, California

In accordance with your request and authorization, we have conducted a draft geotechnical design study for the proposed SR-125 / SR-905 Connector located in southwestern San Diego County. The Connector project is to consist of roadways and structures (retaining walls, drainage systems, etc.) located approximately between Otay Mesa Road and Airway Road. The accompanying draft report presents a summary of our preliminary study and provides preliminary geotechnical conclusions and recommendations relative to the proposed project.

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

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Sean Colorado, GE 2507
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER SEAN A. COLORADO No. 2507 Exp: 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

Robert C. Stroh, CEG 2099
Senior Project Geologist

PROFESSIONAL GEOLOGIST ROBERT C. STROH NO. 2099 CERTIFIED ENGINEERING GEOLOGIST EXP. 10/31/09 STATE OF CALIFORNIA

Distribution: (5) Addressee

Caltrans Oversight Review Form

In general accordance with Deputy Director Richard P. Weaver's January 28, 1993 memorandum the project is approved regarding impact on State facilities and conformance with applicable State standards and practices, and technical oversight was performed as described in the California Department of Transportation A&E Consultant Services Manual.

Caltrans personnel who had responsibility of geotechnical oversight:

Name	Title	Registration No.
Civil Engineer		

Name	Title	Registration No.
Engineering Geologist		

TABLE OF CONTENTS

Leighton

TABLE OF CONTENTS (Continued)

Leighton

TABLE OF CONTENTS (Continued)

Section | Page

Figures

Tables

Plates

Appendices

1.0 INTRODUCTION

The SR-125/SR-905 Connectors will extend from the south terminus of the SR-125 Toll Road Segment 1A improvements to the proposed realigned and widened SR-905. The alignment falls within the City of San Diego and, along the northern portions of the site, within the County of San Diego (Figure 1). The Connector project also includes three bridge structures that will be addressed in separate design reports.

1.1 Scope of Services

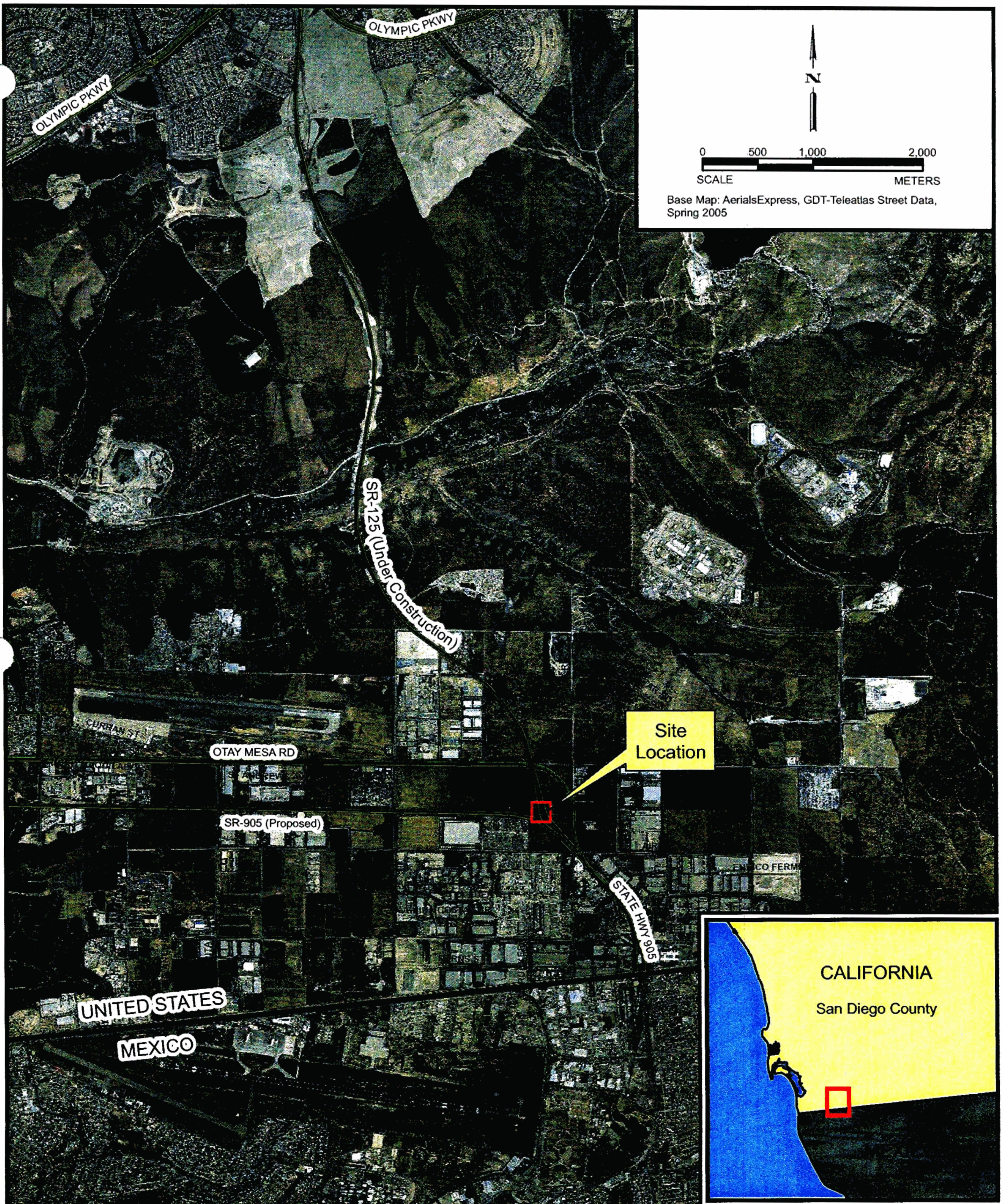
The scope of our investigation included review of information for nearby sites, limited field investigation, and preparing this geotechnical report for the project site improvements. This report was prepared in accordance with the current Caltrans Guidelines for Preparing Geotechnical Design Reports, Version 1.3, dated December 2006.

The scope of work for the geotechnical investigation included the following tasks:

- Review of existing information from previous geotechnical and seismicity studies within and adjacent to the project alignment. Relevant references are cited in Appendix A.
- Geologic mapping supplemented with review of geologic maps and analysis of available aerial photographs to evaluate surface conditions.
- Drilling, sampling, logging, and backfilling 20 hollow-stem auger borings.
- Excavation, sampling, logging and backfilling of 6 backhoe exploratory trenches.
- Laboratory testing of selected soil samples to characterize the subsurface materials.
- Evaluation of liquefaction, expansion, settlement, and corrosion potentials.
- Evaluation of cut, fill, and natural slope stability.
- Development of earthwork recommendations.
- Preparation of this report.

The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the roadway portions of the project.

This report is intended for use by the project design engineer, construction personnel, bidders and contractors.



SR125/905 Connector **San Diego, California**	**SITE LOCATION MAP**	Project No. **600158-905** Date **February 2008** Figure 1

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2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 Existing Facilities

The existing SR-125 alignment approaches the site (SR-125/SR-905 Connector) from the north and terminates prior to reaching Otay Mesa Road. There are several existing roadways, both overhead and underground utilities, storm drains, and commercial developments that fall into the proposed Connector alignment. Starting from the north, the first roadway to be encountered is the Otay Mesa Road/SR-905, which runs generally east-west and turns north-south across the proposed alignment. As a result one bridge structure (Otay Road Undercrossing) is proposed in this area.

The Connector alignment passes southward for approximately 600 meters across undeveloped lands. Previously operations of the SR-125 Toll Road construction to the north utilized portions of this area for a fill stockpile area. The alignment will pass over this fill, portions of which will be left in-place and other portions outside of the alignment will be removed and utilized for import materials elsewhere on the Connector project or the SR-905 project.

Prior to reconnecting with southern and completed SR-905 improvements the proposed Connector alignment passes over Airway Road (Airway Road Undercrossing) and adjacent to existing structures associated with a self storage facility, which are to remain. As a result, retaining structures in this area are proposed to provide grade separation between the Connector alignment and the storage facility.

As previously mentioned, there are several areas of existing overhead power lines. These lines generally are located along Airway Road (east-west) and Otay Mesa Road/SR-905, also referred to as Paseo Internacional. These overhead utilities will be relocated. In addition, the existing roadways have underground utilities, some of which will be relocated to account for the location of new site improvements such as bridge foundations and retaining structure foundations.

2.2 Proposed Improvements

The northbound Connector will extend approximately 1.2 km from the SR-905 "A" Line STA 199+40 to the SR-125 "A" Line STA 30+60. The southbound Connector will extend approximately 1.8 km from SR-905 "A" Line STA 204+00 to SR-125 "A" Line STA 32+10. To provide access to the Siempre Viva exit, an approximately 1 km exit ramp will be constructed alongside the proposed SR-905 from SR-905 "A" Line STA 192+40 to STA 202+20.

The southbound Connector will traverse three bridges: the Otay Mesa Road Undercrossing (two span), the Southbound Connector Separation (three span), and the Airway Ramp Undercrossing (single span). Retaining walls are planned along the right side of the approach embankment to Abutment 1 of the Flyover and along the left side of the of the approach embankment to Abutment 1 of the Airway Road Ramp. Another retaining wall is planned along the left side of the Siempre Viva exit ramp embankment. The northbound Connector will traverse one bridge, the Otay Mesa Road Undercrossing. We understand a culvert is planned to cross the northbound and southbound Connectors near the existing natural drainage course at approximately "N" Line Station 14+40 and "S" Line Station 17+40. Cuts on the order of 5m are proposed along the "SV-1" Line while the remainder of proposed grading will provide embankment fills up to 10m in height.

It is noted that at the time of preparing this plan, the mainline paving for the SR-125 Toll Road had been constructed to approximately STA 32+20 along the southbound lanes and STA 28+50 along the northbound lanes.

Separate preliminary foundation reports have been prepared to address the preliminary foundation recommendations for the three bridge structures (Leighton, 2007a, b, c).

3.0 PERTINENT REPORTS AND INVESTIGATIONS

This study included a review of the field and laboratory testing programs previously conducted by various investigators. Those investigations include:

1. State Route 125 Toll Road Stations 27+00 to 168+30, San Diego County, California, Phase 1 Preliminary Geotechnical Design Report and Phase 1 Preliminary Bridge Foundation Reports, prepared by Ninyo and Moore and dated September 17, 1999.

2. Geotechnical Design Report State Route 125 South Toll Road Segment 1A/K.P. 2.7 To 8.2 San Diego, California, May 2005, prepared by Ninyo and Moore and dated May 16, 2005.

3. Airway Road Undercrossing, Log of Test Borings, 4 Sheets, prepared by Caltrans, last revision dated February 11, 2005.

4. Geotechnical Design Report, 11-SD-905, KP 9.2/18.0, 11-091821, prepared by Caltrans, dated September 14, 2005.

5. Foundation Recommendations, 11-SD-905-KP 17.60, 11-091-821, Airway Road UC, BR. #57-1148 4R, Airway Road Ramp, BR. #57-1148S, dated March 17, 2004.

Leighton performed additional field reconnaissance, geologic mapping and subsurface exploration, laboratory testing, and engineering analysis to verify and/or supplement geologic information along the proposed Connector alignment. Previous logs and pertinent laboratory tests are presented in Appendix D of this report.

4.0 PHYSICAL SETTING

The following sections describe the topographic, geologic, climatological and surface drainage, conditions across the project site area.

4.1 Climatic Conditions

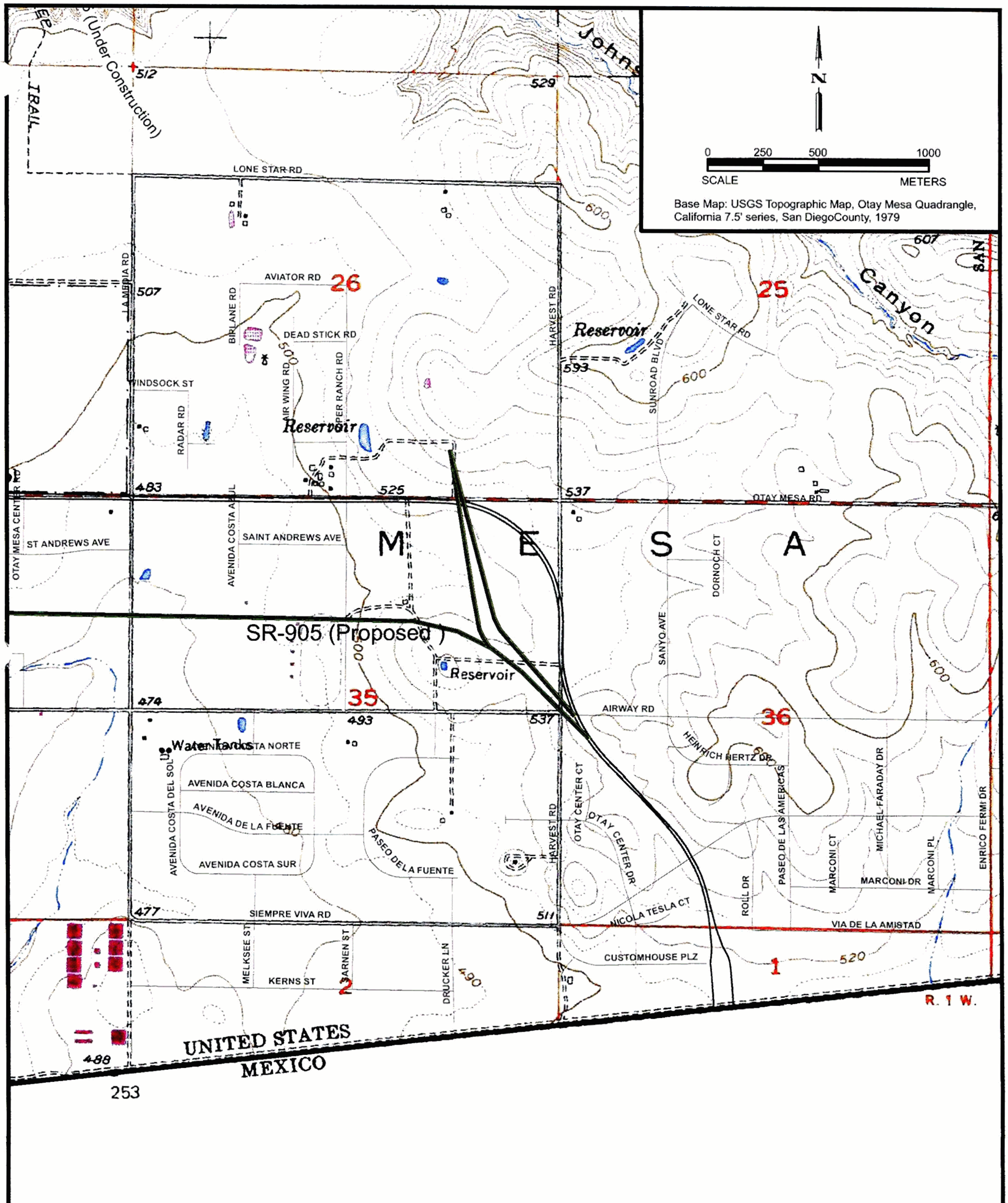
Southern California has a relatively mild, Mediterranean climate. Over the last approximately 50 years, the site area (zip code 92154 – Chula Vista, California), has an average temperature of 16° Celsius (C); an average high temperature of 20° C; and an average low temperature of 12° C. The recorded average yearly precipitation is 24 cm, with on average the most precipitation occurring during the months of January and February. Snowfall is extremely rare, and the area is considered frost-free. As such, freeze-thaw effects will be negligible and recommendations specific to them are not included in the present study.

4.2 Topography and Drainage

The overall site consists of a relatively flat to gently sloping area of little natural topographic relief. Elevations range from approximately 170 meters (msl) in the southeastern connection with the SR125, to 150 meters at the tie in with the Otay Mesa Road to the west. The site drains by sheet flow from east to west, with some concentration of drainage within a broad east-wet oriented swale across the central portion of the site. The natural topographic contour has been altered by the placement of artificial embankments related to the existing portions of the SR-125 already constructed. Existing topographic contours are illustrated on the Geotechnical Maps (Plates 1 through 3). The USGS topographic map in Figure 2 depicts regional topography.

4.3 Features of Engineering and Construction Significance

As previously described, the site is transected by several roadways, and utilities. In addition to those features, a relatively large stockpile of temporary Caltrans fill up to 6 meters high is located between approximately STA 15+50 to STA 17+00 ("N" Line) of SR-125. Also of significance is the presence of an environmentally sensitive area (ESA) located at approximately STA 14+25 to STA 14+75 ("N" Line) of SR-125 located just south of the existing stockpile described above.



SR125/905 Connector **San Diego, California**	**AREA TOPOGRAPHIC MAP**	Project No. **600158-905** Date **February 2008** Figure 2

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4.4 Regional Geology and Seismicity

The Connector alignment 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. 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 on the basement complex. Together the Santiago Peak Volcanics and the granitics of the Southern California batholiths make up the basement complex that these units are deposited onto (Kennedy, 1975).

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. Accelerated fluvial erosion during periods of heavy rainfall, coupled with the lowering of the base sea level during Quaternary time, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms we see in the general site area today. Specifically, the site is located within the southeast portion of the San Diego Embayment in an area characterized by the presence of terraced coastal sedimentary formations of Quaternary to Tertiary age. Regional geology is presented on Figure 3.

San Diego, like the rest of Southern California, is seismically active as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional fault zones such as the San Andreas, San Jacinto and Elsinore Faults Zones, as well as along less active faults such as the Rose Canyon Fault Zone. Our review of geologic literature pertaining to the site and general vicinity indicates that there are no known major or active faults on or in the immediate vicinity of the site (Jennings, 1994). The nearest known active fault is the Rose Canyon Fault Zone located approximately 11.6 km west of the site. Table 1 summarizes the known faults within 100 km of the site considered to have a potential seismogenic affect on the site, and the assigned maximum credible earthquake magnitude, if applicable. Figure 4 presents a Regional Fault Map for the site area.

Table 1
Regional Faults

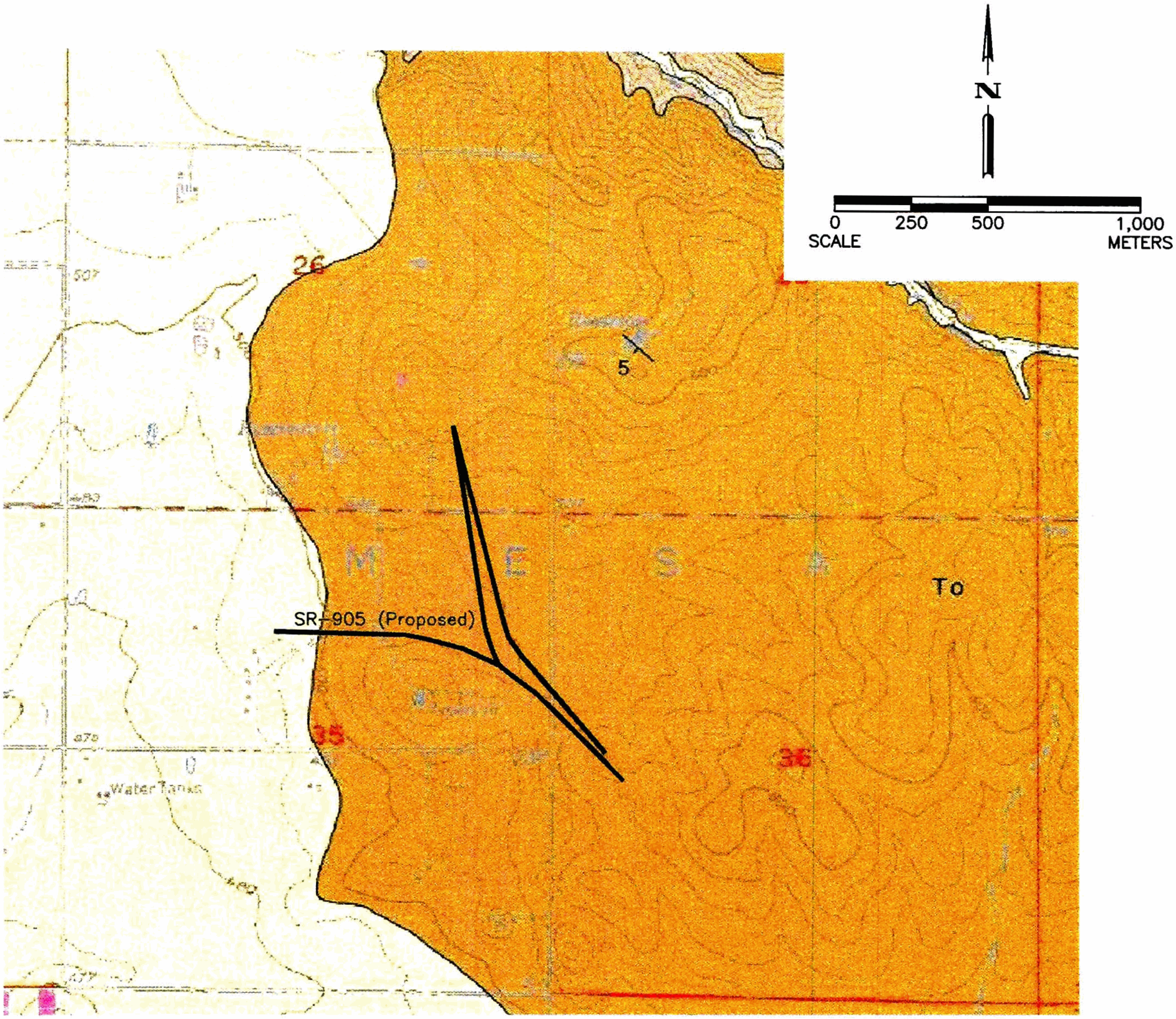
Fault	Distance	Maximum Magnitude	Maximum Credible Earthquake (MCE)
		CGS	Caltrans
Rose Canyon	11.6 km	7.2	7.0
Point Loma	25 km	N/A	6.5
Coronado Banks	30 km	7.6	7.75
San Diego Trough	50 km	N/A	7.25
Elsinore (Julian)	69 km	7.1	7.5
Elsinore (Coyote Mountain)	71 km	6.8	7.5
Earthquake Valley	74 km	6.5	6.5
Newport-Inglewood	80 km	7.1	7.0
San Clemente	90 km	N/A	7.25
Elsinore (Temecula)	91 km	6.8	7.5

N/A – not part of CGS seismic hazard model.

4.5 Soil Survey Mapping

Based on our review of historic maps published by the United States Department of Agriculture (USDA, 1973) the site is underlain by clays derived from calcerous sandstones and shales. These include the Diablo Clay (DaC) characterized by gentle to moderate (2 to 9 percent) slopes, poor drainage, and slight to moderate erosion. In addition, the Salinas Clay Loam (ScA) is mapped within the lower portions of the site, formed on relatively flat (0 to 2 percent) slopes that have been washed from the Diablo series soils. These are also slightly erodible, with moderate drainage (USDA, 1973)

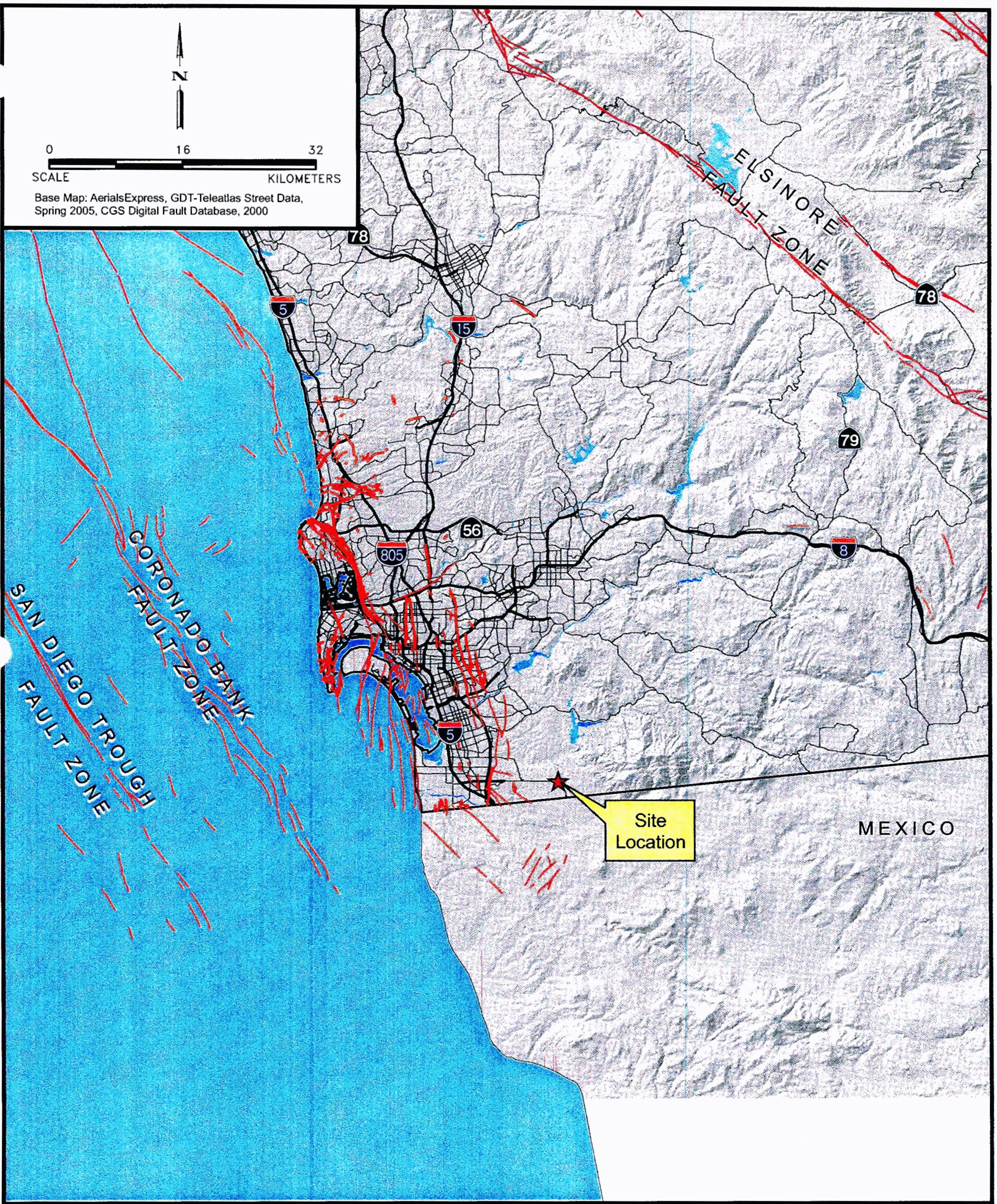
Because of the generalized nature of soils mapping, more detailed assessment of earth material is found in our site specific geotechnical information. Figure 5 presents the USDA mapping for the site area.



DESCRIPTION OF MAP UNITS

Qvoa	Alluvial deposits (middle to early Pleistocene); well consolidated, poorly sorted flood plain deposits consisting of gravel, sand, silt and clay.
To	Otay Formation (Oligocene to Miocene); poorly indurated massive light-colored sandstone, siltstone and claystone, interbedded with bentonite lenses.
Tof	Otay Formation-fanglomerate facies (Oligocene to Miocene); poorly cemented bouldery conglomerate and coarse-grained sandstone. Interfingered with overlying To.

SR125/905 Connector **San Diego, California**	**REGIONAL GEOLOGIC MAP**	Project No. **600158-905** Date **February 2008** Figure 3



SR125/905 Connector
San Diego, California

REGIONAL FAULT ZONE MAP

Project No.
600158-905

Date
February 2008

Figure 4

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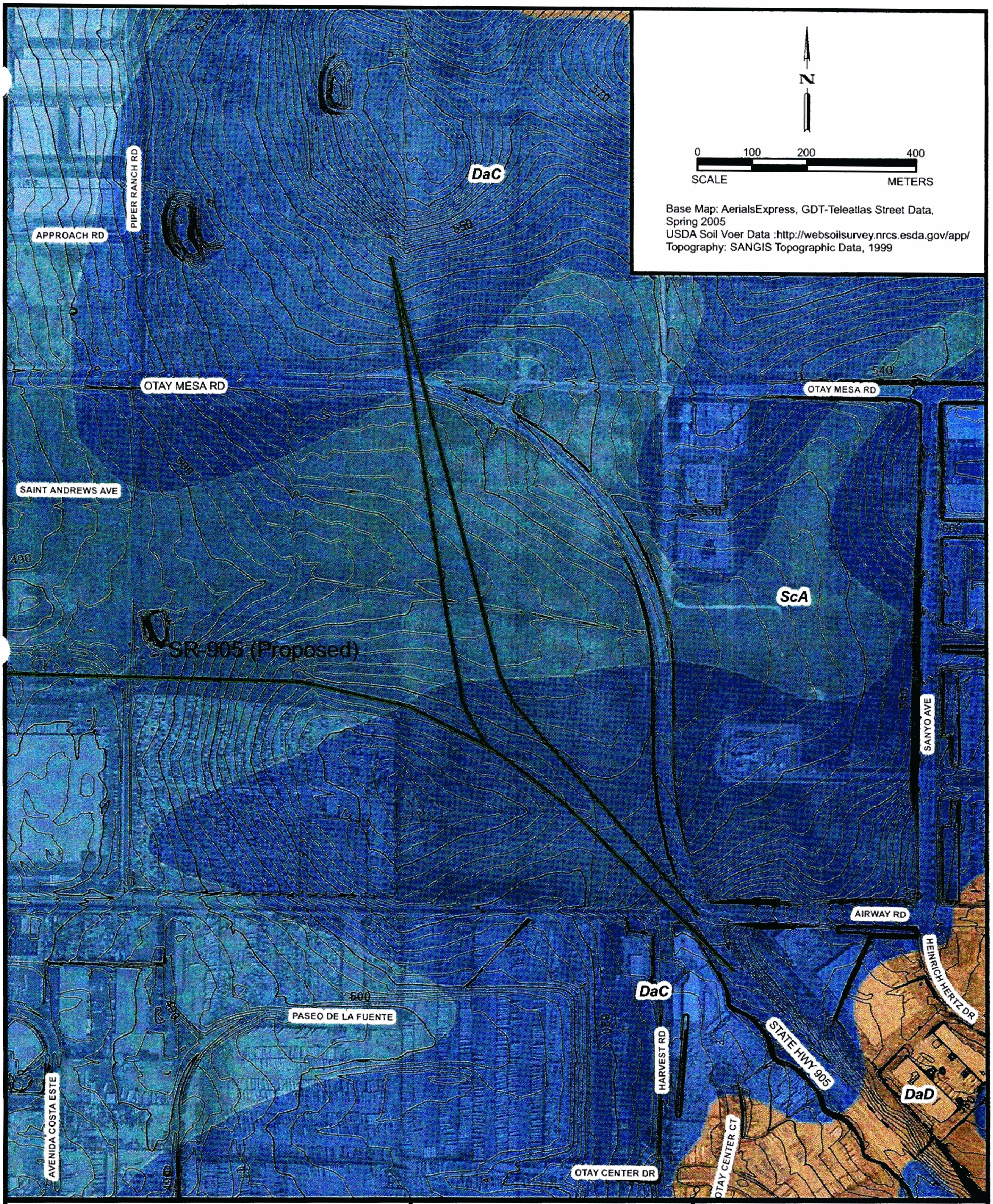

SR125/905 Connector
San Diego, California

SOIL SURVEY MAP

Project No.
600158-905

Date
February 2008

Figure 5

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5.0 EXPLORATION

Leighton's field exploration program included geologic mapping and subsurface investigations, conducted to supplement existing geotechnical data and describe geologic conditions likely to be encountered in the development of the Connector. A field reconnaissance of the site was conducted prior to commencement of the subsurface investigation. The primary purpose of the reconnaissance was to determine suitable locations for the proposed borings and test pits with respect to geologic conditions, location of the proposed alignment, existing utilities, accessibility, and cultural and biological constraints.

The field investigation was completed utilizing the following techniques: review of existing data, analysis of aerial photographs, geologic mapping along the proposed alignment, and excavation and logging of exploration borings and trenches. Laboratory testing of soil and bedrock materials collected during the field investigation was performed to evaluate geotechnical characteristics of the onsite material. Logs of the borings and trenches are included in Appendix B. A summary of the borings and trenches is provided in Table 2.

5.1 Borings

A total of 20 hollow stem auger borings (B-1 through B-10, B-14 through B-22 and B-26) were excavated, sampled, and logged by a geologist from our office. The borings were excavated to depths of 6.5 to 24.8 meters below ground surface (bgs). Leighton Consulting located the proposed borings based on the locations provided in our work plan dated July 31, 2007 and updated maps dated August 14, 2007. Because not all the proposed borings were excavated due to refinement of geometrics and access constraints, the completed borings are not sequentially numbered. Figure 6 is a site index map to be utilized with Plates 1 through 3 which present the locations of our completed explorations.

The borings were advanced using a CME 75 drill rig with 200 mm diameter hollow stem augers. Our field geologist maintained logs of the borings, visually classified materials encountered according to the Unified Soil Classification System (ASTM D 2488) and in accordance with the Caltrans Soil and Rock Logging, Classification Manual (2007), and obtained samples of the subsurface materials. Samples were generally obtained from the borings at 1.5 m intervals using either a SPT sampler (51 mm O.D. and 35 mm I.D) or a California sampler (76 mm O.D. and 61 mm I.D.) with 150 mm long sample tubes. The samplers were driven into the subsurface materials with an automatic trip hammer (63.5 kg hammer dropping 760 mm). Blow counts were recorded at 150 mm intervals for each sample, except where sampler refusal was encountered at a lesser increment (greater than 50 blows per 150 mm). The blow counts recorded on the boring logs represent the raw field data and have not been corrected for the effects of overburden pressure, rod effects, borehole diameter, variation in sampler size, or hammer energy correction. Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our laboratory for further testing. Each boring was backfilled with bentonite-cement grout immediately subsequent to excavation and logging.

In selected borings (B-6, B-17, and B-22), the upper 12 meters of the boring was advanced as a continuous soil core boring to investigate for the possible presence of shallow clay seams or planes of weakness.

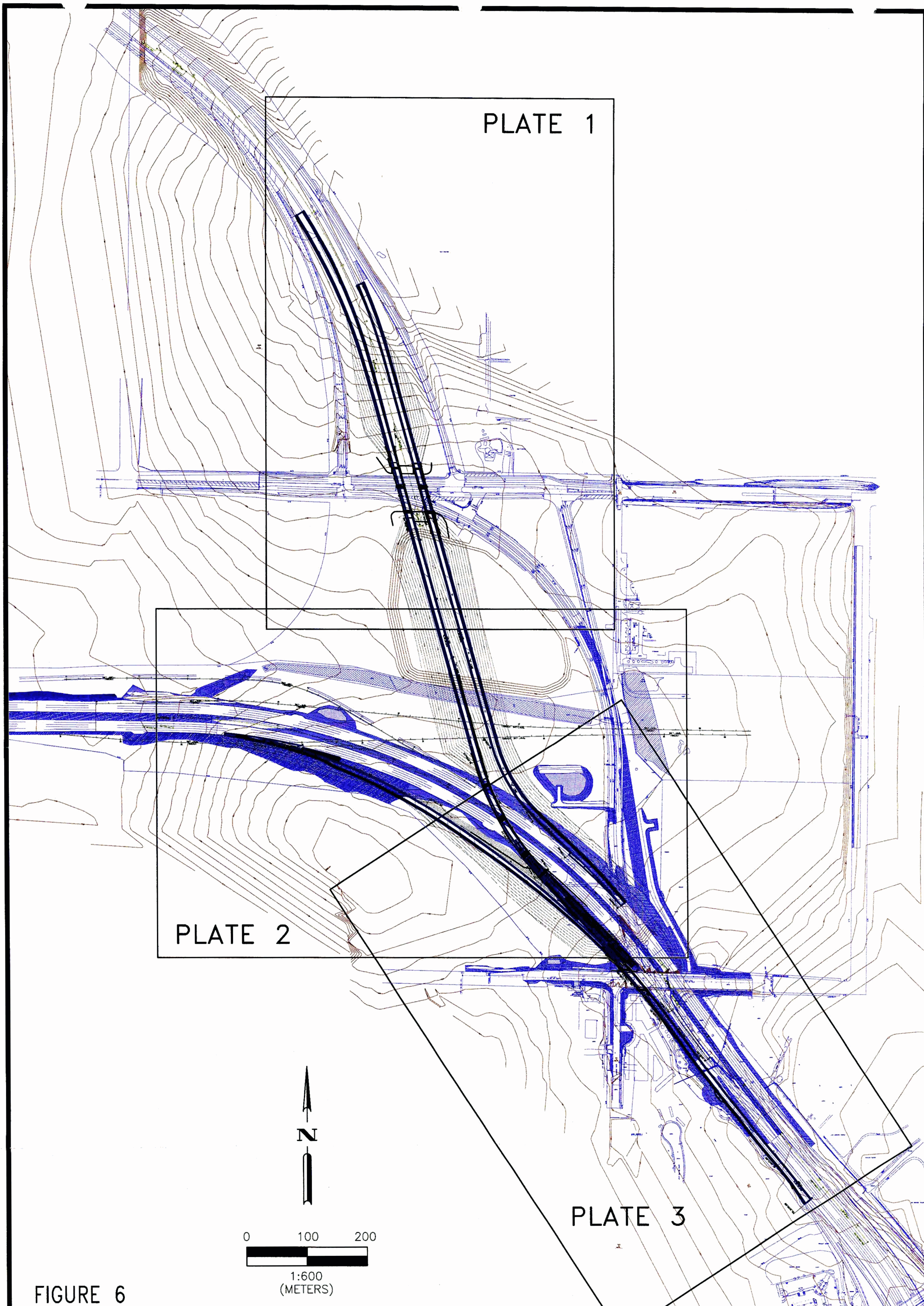

FIGURE 6

SITE INDEX MAP

SR125/905 CONNECTOR
SAN DIEGO, CALIFORNIA

Leighton	Proj: 600158-905	Scale: 1:600	Date: 02/08
	Eng/Geol: SAC/RCS	Drafted By: MAM	CP By: SAC

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Table 2
SUMMARY OF EXPLORATORY EXCAVATIONS

Investigation	Type[1]	Date[2]	Plate No.	Location	Surface Elevation (meters msl)	Total Depth (meters)	Groundwater Elevation[3] (meters)	Reference
B-1	HS	7-27-2007	1	B Line 27+52 17m Left	160.5	12.5	NR	Ongoing Leighton Investigation
B-2	HS	7-27-2007	1	B Line 27+41 18m Right	160.6	24.5	154.5	Ongoing Leighton Investigation
B-3	HS	7-31-2007	1	B Line 27+12 13m Right	159.0	15.4	148.3	Ongoing Leighton Investigation
B-4	HS	7-26-2007	1	B Line 26+77 17m Left	158.9	24.7	153.3	Ongoing Leighton Investigation
B-5	HS	8-1-2007	1	B Line 26+63 17m Right	159.0	15.4	152.3	Ongoing Leighton Investigation
B-6	HSC	9-18-2007	1	B Line 27+20 17m Left	160.2	24.5	151	Ongoing Leighton Investigation
B-7	HS	8-20-2007	1	B Line 20+15 26m Left	156.8	8	NR	Ongoing Leighton Investigation
B-8	HS	8-17-2007	1	N Line 16+54 6m Right	163	11.1	NR	Ongoing Leighton Investigation
B-9	HS	8-17-2007	1	S Line 18+04 5m Left	163	12.7	NR	Ongoing Leighton Investigation
B-10	HS	8-20-2007	1 and 2	N Line 13+55 6m Right	157.7	9.5	152.5	Ongoing Leighton Investigation
B-11	HS	NC						Ongoing Leighton Investigation
B-12	HS	NC						Ongoing Leighton Investigation
B-13	HS	NC						Ongoing Leighton Investigation
B-14	HS	8-17-2007	2	SV1 Line 18+04 3m Right	160	9.5	NR	Ongoing Leighton Investigation
B-15	HS	8-17-2007	2	SV1 Line 17+42 5m Right	160.2	9.5	NR	Ongoing Leighton Investigation
B-16	HS	8-16-2007	2	SV1 Line 16+81 4m Right	160.5	9.6	155.5	Ongoing Leighton Investigation
B-17	HSC	8-20-2007	2	SV1 Line 15+71 2m Right	160	18.6	152.1	Ongoing Leighton Investigation
B-18	HS	8-15-2007	2	N Line 10+56 4m Right	160	6.5	NR	Ongoing Leighton Investigation
B-19	HS	8-16-2007	2	S Line 14+05m Right	160	24.8	155.4	Ongoing Leighton Investigation
B-20	HS	8-15-2007	2	S Line 13+25 1m Right	161	9.5	157.3	Ongoing Leighton Investigation
B-21	HS	8-15-2007	2	S Line 12+46 1m Right	162.0	9.5	NR	Ongoing Leighton Investigation

Leighton

Table 2 (Continued)
SUMMARY OF EXPLORATORY EXCAVATIONS

Investigation	Type[1]	Date[2]	Plate No.	Location	Surface Elevation (meters msl)	Total Depth (meters)	Groundwater Elevation[3] (meters)	Reference
B-22	HSC	8-22-2007	2	SV2 Line 11+94 4m Left	163.5	24.8	151.5	Ongoing Leighton Investigation
B-23	HS	NC						Ongoing Leighton Investigation
B-24	HS	NC						Ongoing Leighton Investigation
B-25	HS	NC						Ongoing Leighton Investigation
B-26	HS	8-23-2007	1	B Line 28−26 15m Left	163	6.5	NR	Ongoing Leighton Investigation
TP-1	T	8-24-2007	1	N Line 16+96 20 Right	159.0	2.2	NR	Ongoing Leighton Investigation
TP-2	T	B-26 Substituted						Ongoing Leighton Investigation
TP-3	T	8-24-2007	1	N Line 15+72 10m Left	164.0	1.5	NR	Ongoing Leighton Investigation
TP-4	T	8-24-2007	2	N Line 11+78 17m Right	159.0	2.0	NR	Ongoing Leighton Investigation
TP-5	T	8-24-2007	2	SV1 Line 16+22 3m Right	160.0	1.8	NR	Ongoing Leighton Investigation
TP-6	T	8-24-2007	2	S Line 13+85 2m Right	159.5	1.6	NR	Ongoing Leighton Investigation
TP-7	T	8-24-2007	2	SV 2 Line 15+05 10m Right	162.5	2.0	NR	Ongoing Leighton Investigation
TP-8	T	NC						Ongoing Leighton Investigation
TP-136	T	5-12-2004	1	Otay Mesa Road	160	1.4	NR	Ninyo Moore, 2005
TP-137	T	5-12-2004	1	Otay Mesa Road	160.5	1.5	NR	Ninyo Moore, 2005
TP-138	T	5-12-2004	1	Otay Mesa Road	161.6	0.9	NR	Ninyo Moore, 2005
B-1	HS	8-18-1999	1	Otay Mesa Road	±160	20.2	147.2	Ninyo Moore, 1999
B-1-03	DC	10-8-2003	2	Airway Road	165	37	158.2	Caltrans, 2003
B-2-03	DC	10-9-2003	2	Airway Road	164	36	NR	Caltrans, 2003
B-3-03	DC	10-9-2003	2	Airway Road	167	39	NR	Caltrans, 2003
B-4-03	DC	10-15-2003	2	Airway Road	163	34	NR	Caltrans, 2003
BH-1	HS		2	SR-905				Caltrans, 2005
BH-2	HS	10-22-2003	2	SR-905	159.9	8.1	152.8	Caltrans, 2005

Leighton

Table 2 (Continued)
SUMMARY OF EXPLORATORY EXCAVATIONS

Investigation	Type[1]	Date[2]	Plate No.	Location	Surface Elevation (meters msl)	Total Depth (meters)	Groundwater Elevation[3] (meters)	Reference
BH-3	HS	10-22-2003	2	SR-905	161.2	9.6	151.8	Caltrans, 2005
BH-4	HS		2	SR-905				Caltrans, 2005

1. HS=Hollow Stem Auger, HSC =Hollow Stem Auger with Core, T =Trench/Test Pit, DC=Diamond Core
2. Date Completed; NC=Proposed Investigation Not Yet Completed
3. Groundwater noted during drilling. NR=Not Recorded

Leighton

5.2 Trenches

A total of 6 exploration trenches (TP-1 and TP-3 through TP-7) were excavated, sampled, and logged by a geologist from our office. The trenches were excavated to depths of up to approximately 2.2 meters below the existing ground surface (bgs). The trenches were excavated utilizing a rubber track John Deere JD-410G excavator utilizing a 0.9 meter wide bucket. The purpose of these excavations was to evaluate the physical characteristics of the surficial soils and assess the depth to competent material within limits of the proposed development. The trenches also allowed evaluation of the soils to be encountered at the proposed design elevations, the general nature of the soils proposed for use as compacted fills, the approximate depth to formational material, and provided representative samples for laboratory testing. After logging and sampling, the excavations were backfilled and compacted with effort using the bucket of the excavator. No compaction testing was performed.

5.3 Geologic Mapping

Geologic mapping along the project alignment was performed and is presented on Plates 1 through 3. Our mapping included the use of our field explorations, site reconnaissance, and previously published geologic maps (Appendix A). The limits of mapped soil units and bedrock units are further discussed in Section 7 of this report.

5.4 Geophysical Studies

At this time, we do not plan to complete further exploration utilizing geophysical methods at the site with regard to the Draft Geotechnical Design Report. Planned exploration for the SR 125 SB/905 Separator bridge structure may use geophysical methods.

5.5 Instrumentation

At this time, we do not plan to install instrumentation at the site with regard to the Draft Geotechnical Design Report. Currently, project plans do not indicate that instrumentation would be applicable to the design phase of the project.

5.6 Exploration Notes

Our exploration of the alignment indicates that in general, native areas of the site are overlain by a thin layer of generally expansive and compressible clayey topsoil. Underlying these materials are formational materials of moderately cemented and well indurated sandstone and siltstone/claystone. Locally, some of these materials may require heavy ripping, where cuts are planned.

Localized areas of artificial fill exist across the project area. The fills appear associated with the minor grading of the site associated with the current roadways (Airway Road and SR-905) and the adjacent commercial structure. In addition, a fill stockpile exists across the alignment. The stockpile fill will be partially removed during the proposed grading of SR-905, and is anticipated to be utilized on other fill portions of the adjacent SR-905 project.

Seepage was not encountered in our trench explorations. Perched groundwater was encountered in several of our exploration borings (B-2 through B-6, B-10, B-16, B-17, B-19, B-20, and B-22). However, ground water is not expected to be a constraint to the design of the project.

Active grading for the widening and realignment of Otay Mesa Road was ongoing during the time of our field exploration.

6.0 LABORATORY TESTING

Laboratory tests were performed on representative subsurface materials to check the field classifications of recovered samples and evaluate the geotechnical engineering properties of subsurface materials. The following laboratory tests were performed:

Table 3
Laboratory Testing Summary

Description	Test Method	Quantity
Grain-size Distribution	ASTM D422 and CT 202	25
Atterberg Limits	ASTM D4318 and CT 204	15
In-situ moisture Content and Density	ASTM D2216 and ASTM D2937	55
Percent passing #200 sieve	ASTM D422 and CT 202	25
Corrosivity (soluble sulfate and chloride contents, pH, and resistivity)	CT 417 , CT 422, and CT 643	9
Expansion Index	ASTM D4829	10
One-dimensional Swell	ASTM D4546	12
Maximum Density and Optimum Moisture Content	CT 216 and CT 226	2
R-value	CT 301	3
Consolidation	ASTM D 2435	11
Unconsolidated Undrained Triaxial	ASTM D2850	4
Consolidated Undrained Triaxial	ASTM D4767	7
Direct shear	ASTM D3080	18
Unconfined Compressive Strength	ASTM D2166	2
Collapse	ASTM D5333	3

ASTM = American Society of Testing Materials
CT = California Test (Caltrans)

All laboratory tests, except corrosivity tests, R-value, and Maximum Density and Optimum moisture content, were performed in general accordance with ASTM procedures. The corrosivity tests were performed in accordance with Caltrans procedures. The results of laboratory tests are presented in Appendix C.

7.0 GEOTECHNICAL CONDITIONS

7.1 Site Geology

Based on our subsurface exploration, and review of pertinent geologic literature and maps, the primary bedrock unit at the site is Oligocene-age Otay Formation, which is generally overlain by surficial units consisting of topsoil and both documented (part of SR-905 grading operations) and undocumented fills.

7.2 Lithology

The approximate areal extent of the geologic units encountered during our exploration is depicted on Plates 1 through 3. A brief description of the geologic units encountered on the site is presented below.

7.2.1 Documented Artificial Fill (Af)

Based on mapping performed at the site during our geologic reconnaissance, areas of documented fill exist across the site. The fills are associated with grading for the on-going roadway construction of the SR-125 Toll Road and stockpile activities for the SR-905. Based on our observations, the fill materials generally consisted of moist, medium dense to dense, light brown to brown clayey sand and moist, stiff, sandy clays.

7.2.2 Undocumented Fill (Afu)

Based on mapping performed at the site during our investigation, localized areas of undocumented fill exist across the project area. The fills appear associated with the minor grading of the site associated with the current roadways (Airway Road and SR-905) and the adjacent commercial structure. It is noted that deeper undocumented fills associated with utility trenches or other underground improvements are present at the site. Based on our observations, undocumented fill materials generally consisted of dark brown clayey sands and sandy clays with scattered rock fragments. We estimate that undocumented fill thicknesses range up to approximately 1.5 m locally, and potentially up to 2.0 m where existing underground utilities are located. In their current condition, these materials are not considered suitable for the support of structural improvements.

7.2.3 Topsoil (Unmapped)

A layer of topsoil mantles the site area. As encountered in our exploratory borings and trenches, the topsoil generally consists of brown to dark brown, dry to moist, stiff to hard, locally porous, sandy silty clay with a trace of scattered fine gravel. The topsoil was approximately 1.0 m in thickness. As encountered the topsoil was generally very desiccated with abundant rootlets. Therefore, in their current condition, the topsoil materials are not suitable for the support of structural improvements.

7.2.4 Otay Formation (To)

The entire site is underlain at depth by bedrock material consisting of Tertiary-aged Otay Formation. This unit was encountered in each of the exploration borings below the surficial materials to the total depth explored (maximum 24.7 m). During our drilling exploration, this material generally excavated to light brown to brown, moist, silty fine sand. Where undisturbed, these materials can be classified as a "soft-rock" and are essentially intermediate in physical strength between soil and rock. For the purpose of physical description, we have utilized soil descriptions modified with "stone" to characterize the relatively higher strength of the unit relative to the soil counterpart.

7.3 Structure

Based on our review of available literature (Appendix A) and our preliminary site investigation, the underlying geologic unit (Otay Formation) contains generally flat-lying bedding. Our conclusion is corroberated by the results of three soil core borings (B-6, B-17, and B-22). Those borings provided continous soil cores for observation and logging in the upper 12 m of the Otay Formation that did not indicate the presence of clay seams that would be adverse to the construction of the project.

7.4 Natural Slope Stability

Landslides are deep-seated ground failures (several tens to hundreds of feet deep) in which a large arcuate shaped section of a slope detaches and slides downhill. Landslides are not to be confused with minor slope failures (slumps), which are usually limited to the topsoil zone and can occur on slopes composed of almost any geologic material. Landslides can cause damage to structures both above and below the slide mass. Structures above the slide area are typically damaged by undermining of foundations. Areas below a slide mass can be damaged by being overridden and crushed by the failed slope material.

Several formations within the San Diego region are particularly prone to landsliding including the Otay Formation, which is considered generally susceptible to slope instability in the site area (CDMG, 1995). 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 active landslides or indications of deep-seated landsliding were noted at the site during our field reconnaissance or our review of available geologic literature, topographic maps, and stereoscopic aerial photographs. Additionally, we also did not observe minor slope failures or slumps along the alignment. Due to the relatively flat surface topography, and lack of native slopes, the existing site areas adjacent to the proposed alignment do not include natural slopes subject to instability. Existing slopes at the site are limited to embankment fills placed in conjunction with the construction of the SR-125 alignment and will be modified during construction of the proposed Connector. Therefore, the potential for significant landslides or large-scale slope instability at the site is considered low.

7.5 Soil and Ground Water Conditions

Based on the results of our subsurface exploration and laboratory testing, the underlying lithologic units of the Otay Formation consist generally of fine-grained sandstone to siltstone and claystone. Bedding observed within our exploration pits indicates that lithologic units generally dip in a southwesterly direction. Generally, we observe an upper sandy unit, underlain by lower interbeded silty and clayey units (Plates 4 and 5) across the site. These lithologic units characteristically are dense to well indurated, with no visible indication of porosity. Locally, we observe that interbedded sandstones at depths below 5 meters can be saturated. We attribute these localized zones of saturation to a perched ground water table that varies in depth and extent across the site, but on average begins at a depth of more than 5 meters.

In addition, soil development across the site generally ranges up to 1 meter in total thickness. As observed, the soils are well developed based on their pedogenic characteristics, since much of the observed soil is very clayey, with a very well developed blocky to prismatic character. Of significance, we also note that the soil is generally very desiccated within the upper 0.5 meters. Laboratory testing indicates that pedogenic soils are characteristically highly expansive across the site.

7.5.1 Ground Water

The project site is situated in the San Ysidro Hydrologic Subarea with the Tijuana Hydrologic Area of the Tijuana Hydrologic Unit (RWQCB, 1991). The principal ground water body in the region occurs in deep sand and silt units within the Otay Formation. Based on available water well data, the depth to the regional ground water body is on the order of about 130 meters below ground surface (DWR, 1986).

However, perched ground water contained within thin sandy layers was encountered underlying the site at a depth of approximately 12.2 m below the existing ground surface (i.e., elevation 151.4 m above mean sea level). In addition, and as previously mentioned, a piezometer was placed in the Caltrans (2004) boring B-1-03. Ground water in that boring was measured on January 13, 2004, at an elevation of 158.2 m. The difference observed in the ground water elevations may be explained by the presence of sand layers located at various depths below the site, along with the expected normal fluctuation of perched ground water elevation with time. Ground water levels may fluctuate during periods of precipitation. We do not anticipate ground water will be a constraint to the construction of the project.

7.6 Surface Water

Based on site topography, surface water drains as sheet flow across the site during rainy periods in a southerly to southwesterly direction. Generally, water flows from the north from two collection points along the northern portion of Otay Mesa Road southward into the site area. Flow combines westward of the temporary fill stockpile and project alignment located south of Otay Mesa Road, and flows southerly to southwesterly from there. Surface water then combines with a generally east-west oriented minor drainage. This minor drainage has been established as an Environmentally Sensitive Area (ESA). The nature of this drainage is generally a gentle gradient of flow toward the west, with less than 1- to 2-foot deep erosion rills along the drainage.

7.6.1 Scour

The previously mentioned drainages located transecting the site are considered minor. Water flowing in the drainages will be related to rainfall events or from the neighboring developments. The proposed improvements are expected to mitigate scour potential by containing runoff in drainage systems. Therefore, the potential for scour is considered low.

It should be noted however, that the presence of highly expansive surficial soils across the site could have an adverse affect on the performance of earthen drainage structures such as detention basins. Based on our experience, wetting and drying of detention basin walls consisting of highly expansive clays will result in desiccation that will accelerate scour and erosion.

7.6.2 Erosion

Based on USDA soil maps (Appendix A), the surficial soils and formational materials across the site are considered erodible, although erodilbility is not considered a constraint to project development. Recommendations are presented in the following sections to reduce erosion potential during construction. Best Management Practices (BMP) should be performed in accordance with Caltrans Construction Site Best Management Practices Manual (March 1, 2003).

7.7 Project Site Seismicity

The proposed project is located within the seismically active region of southern California and should be designed in accordance with current Caltrans Seismic Design Criteria (June, 2006). Our preliminary recommendations for seismic design of the proposed structures are described in the following sections.

7.7.1 Ground Motions

The dominant active seismic source for the project is the Rose Canyon Fault, which is located approximately 11.6 km west of the site. This fault is mapped by Caltrans as the Newport Inglewood-Rose Canyon Fault-East, or NIE (Mualchin, 1996). The NIE fault is capable of producing a Maximum Credible Earthquake (MCE) with a moment magnitude Mw of 7.0 (Mualchin, 1996). The site lies between the 0.3g and 0.4g contours of the Caltrans 1996 Seismic Hazards Map. To verify the appropriateness of the mapped values, a check was performed using that attenuation relationship of Sadigh et (1997) using a Mw of 7.2 as identified as the maximum magnitude by the California Geologic Survey (CGS, 2003). That calculation indicated a peak bedrock acceleration of 0.36g. We recommend using a design bedrock acceleration of 0.4g for evaluating the seismic response at the site.

7.7.2 Ground Rupture

No active or potentially active faults are mapped crossing the site, and the site is not located within a mapped Alquist-Priolo Earthquake Fault Zone for active faults. Ground rupture hazard at the site is considered low.

The nearest mapped segment of the active Rose Canyon Fault extends to within approximately 11.6 km west of the site. Cracking due to shaking from distant seismic events is not considered a significant hazard, although it is possible at any site in southern California.

It should be noted for the purpose of discussion, the closest mapped fault to the site is the La Nacion Fault, which is considered potentially active. For definition purposes, an Active fault exhibits evidence of ground displacement in the last 11,000 years, and a Potentially Active fault is a fault that has exhibited ground displacement in the last 1,600,000 years. A geologic map covering the Imperial Beach Quadrangle (Kennedy and Tan, 1977), and fault maps by Treiman (1993) indicate the fault is approximately 8 km west of the site. In addition, two minor short faults are located approximately 5 km west of the site. However, we do not consider the La Nacion Fault Zone, a potential seismogenic source and therefore have not included it in our analysis.

8.0 GEOTECHNICAL ANALYSES AND DESIGN

8.1 Dynamic Analysis

The following sections discuss our methodology for seismic parameter selection and calculation of the site ARS Curve, along with secondary seismic effects for the site including liquefaction, earthquake induced settlement, lateral spreading and slope instability.

8.1.1 Parameter Selection

As discussed in the previous section, the Newport Inglewood (East) NIE fault is capable of producing a Maximum Credible Earthquake (MCE) with a moment magnitude Mw of 7.0 (Mualchin, 1996). We recommend using a design bedrock acceleration of 0.4g for evaluating the seismic response at the site.

Based on our subsurface exploration and experience regarding the Otay Formation at adjacent sites, the formational soils (Otay Formation) below the site are classified as Type C, very dense soil/soft rock. Our classification is based on average standard penetration "N-Values" greater than 50 blows/300 mm, undrained strengths greater than 100 kPa, and our field observations. Therefore, we recommend using soil profile Type C, Magnitude Group 7.25±0.25, and a peak bedrock acceleration of 0.4g to determine the appropriate 5% damped acceleration response spectra (ARS) curve for seismic design.

Because the site is within 15 kilometers of an active fault, the standard ARS curve should be modified to account for near-source effects in accordance with Caltrans criteria. The adjusted ARS curve for periods of 0 to 4 seconds is shown on Figure 7. The recommended modifications, as referenced to the structure period (T) are as follows:

- Spectral acceleration magnification is not required for $T \leq 0.5$ second.
- Increase the spectral accelerations for $T \geq 1.0$ second by 20 percent.
- Linear interpolate spectral accelerations for $0.5 \leq T \leq 1.0$.

The effective seismic horizontal coefficient, k_h used in pseudo-static slope stability analysis is specified in Caltrans Guidelines for Structures Foundation Reports (Version 2.0) as 1/3 of the peak ground acceleration. Therefore, we propose to use k_h values of 0.15 in seismic slope stability evaluation for formational and fill area. See Section 8.2.1 for discussion of our seismic slope stability results.

CALTRANS DESIGN ARS SPECTRUM

Project: SR125/SR905 Connector
Project Number: 600158-905
Location: San Diego, California

Calculation by: SC Date: 2/1/2008
Reviewed by: RCS Date: 2/1/2008

SEISMIC DESIGN CRITERIA, JUNE 2006 - VERSION 1.4

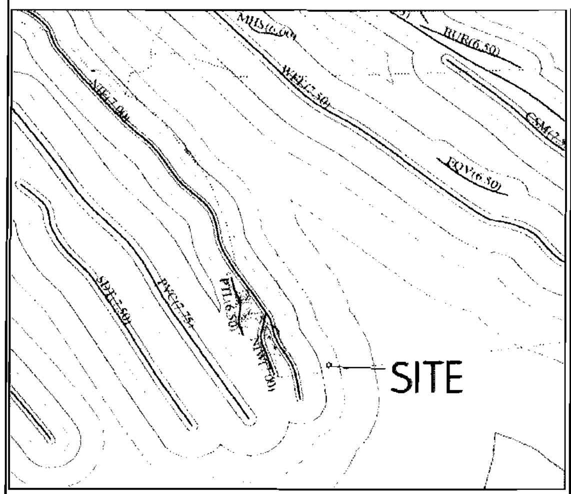
Seismic Parameters

PBA	Peak Bedrock Acceleration	**0.4**	*g*
M_w	Magnitude Group	**7.25 ± 0.25**	
r_{rup}	Distance to Rupture Plane	**11.6**	*km*
S	NEHRP Soil Type	**C**	*Soft rock and very dense soil*
	Verification Calculation		
	Sadigh et al. (1993, 1997)	0.36	*g*

Adjustment of Standard Curve

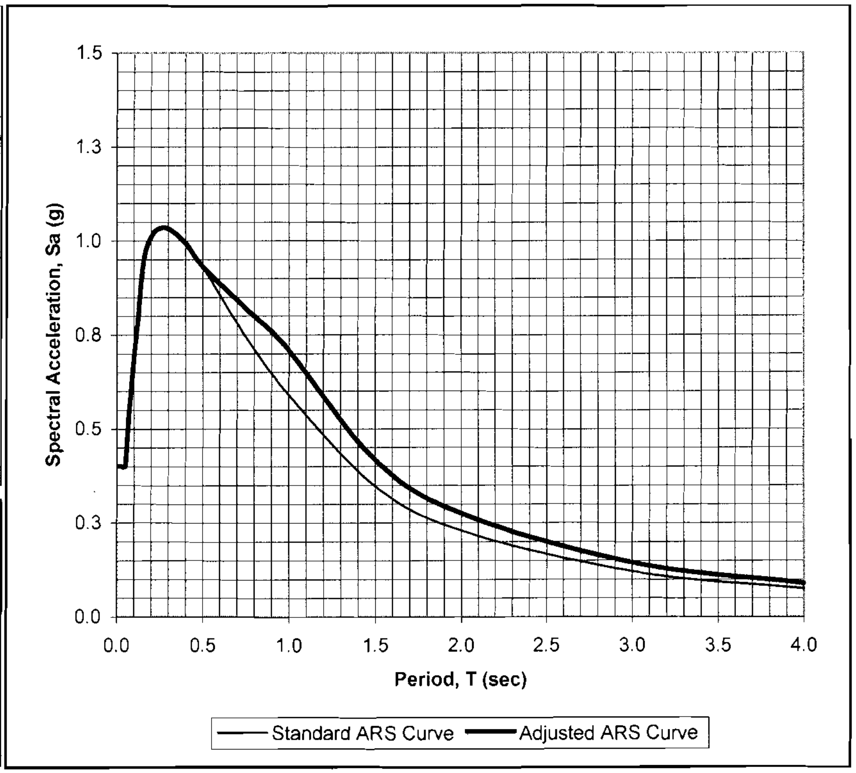
For preliminary design of structures within 15km of an active fault:

- No increase in Sa for T ≤ 0.5 second
- Increase Sa values 20% for T ≥ 1.0 second
- Linear interpolate for 0.5 ≤ T ≤ 1.0 second



LEGEND:

- 0.7g Peak Acceleration Contour
- 0.6g Peak Acceleration Contour
- 0.5g Peak Acceleration Contour
- 0.4g Peak Acceleration Contour
- 0.3g Peak Acceleration Contour
- 0.2g Peak Acceleration Contour
- 0.1g Peak Acceleration Contour
- Special Seismic Source (SSS)
- Faults with Fault Codes (MCE)



PERIOD T (s)	STANDARD ARS CURVE Sa (g)	ADJUSTED ARS CURVE Sa (g)
0.010	0.4002	0.4002
0.020	0.4002	0.4002
0.030	0.4002	0.4002
0.050	0.4002	0.4002
0.075	0.5499	0.5499
0.100	0.6795	0.6795
0.120	0.7677	0.7677
0.150	0.9145	0.9145
0.170	0.9744	0.9744
0.200	1.0099	1.0099
0.240	1.0311	1.0311
0.300	1.0330	1.0330
0.400	0.9937	0.9937
0.500	0.9315	0.9315
0.750	0.7455	0.8204
1.000	0.5910	0.7092
1.500	0.3475	0.4170
2.000	0.2293	0.2751
3.000	0.1197	0.1436
4.000	0.0737	0.0884

Figure 7

8.1.2 Liquefaction

Liquefaction of soils can be caused by strong vibratory motion due to earthquakes. Both research and historical data indicate that loose, saturated, granular soils are susceptible to liquefaction and dynamic settlement. Liquefaction is typified by a reduction in of shear strength in the affected soil layer. Liquefaction may be manifested by excessive settlement, sand boils, and bearing failure.

Subsurface data underlying the site for the Otay Formation indicated dense granular to moderately indurated fine-grained soils, which correspond to Soil Profile Type C per Table B.1, 2006 Caltrans Seismic Design Criteria. Type C soil is characterized by very dense soil and soft rock with shear wave velocity of 360m/s < v s≤ 760m/s, standard penetration resistance N>50 or undrained strength greater than 100 kPa. Due to its density, Type C soil is not considered liquefiable.

8.1.3 Earthquake Induced Settlement

Granular soils tend to densify when subjected to shear strains induced by ground shaking during earthquakes. Simplified methods were proposed by Tokimatsu and Seed (1987) and Ishihara and Yoshimine (1992) involving SPT N-values used to estimate earthquake-induced soil settlement.

Due to low susceptibility of the site to liquefaction, the potential for earthquake-induced settlements is considered to be low during strong ground shaking. Earthquake-induced settlements tend to be most damaging when differential settlements result. Earthquake-induced total and differential settlement are expected to be negligible.

8.1.4 Lateral Spread

Empirical relationships have been derived by Youd and others (Youd et. al., 2002) to estimate the magnitude of lateral spread due to liquefaction. These relationships include parameters such as earthquake magnitude, distance of the earthquake from the site, slope height and angle, the thickness of liquefiable soil, and gradation characteristics of the soil.

The susceptibility to earthquake-induced lateral spread is considered to be low for the site because of the low susceptibility to liquefaction.

8.1.5 Seismic Slope Stability

As previously mentioned, no active landslides or indications of deep-seated landsliding were noted at the site during our field reconnaissance or our review of available geologic literature, topographic maps, and stereoscopic aerial photographs. Due to the relatively flat surface topography, and lack of native slopes, the existing site areas adjacent to the proposed alignment do not include natural slopes subject to seismic instability.

8.2 Cuts and Excavations

The planned grading includes excavation of cut slopes up to approximately 5 meters in height located approximately near the proposed "SV1" Line STA 20+00, Section D-D′ Plate 2. Shallower cuts associated with a proposed detention basin are also planned right of "N" Line Station 12+50. No other areas of cuts are proposed along the Connector alignment.

With regard to temporary excavations less than 5 feet deep with vertical sides performed in formational materials we anticipate that these excavations should remain stable for the period required to construct the utility, provided they are free of adverse geologic conditions. However, it should be noted that loose and saturated artificial fill present on site may cave during trenching operations. In accordance with OSHA requirements, excavations deeper than 1.5 m 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.

8.2.1 Stability

Cut slopes performed along the proposed alignment will expose topsoil and Oligocene-age Otay Formation. Our investigation did not indicate the presence of any adverse bedding. Based on our review of the 35 percent grading plan (PTG, 2008) a proposed cut slope is planned at approximately ("SV1" Line STA 20+00). To evaluate the stability of the proposed Section D-D' cut slope, we utilized the computer program GSTABL7 v2.0, considering both circular failure surfaces using the Modified Bishop Method, and block failure surfaces using the Simplified Janbu Method. The strength parameters utilized in the analysis are summarized below in Table 4. Based on the results of our analysis for the maximum cut height of 5 meters the factors of safety are at least than 1.5 and 1.1 for static and pseudo-static analysis, respectively. Therefore, our analysis indicates that the proposed cut slope is stable under both static and seismic conditions.

Table 4 Slope Stability Shear Strength Parameters			
Geologic Unit	Total Unit Weight (kN/m3)	Friction Angle (degrees)	Cohesion (kPa)
Embankment Fill (planned)	20	22	13
Engineered Fill (existing)	20	22	13
Topsoil (unmapped)	18	11	10
Otay Formation (To)	18	34	24

Idealized models were constructed using the geologic sections and soil strengths derived from laboratory test results from the site specific exploration, and our professional engineering judgment. Topsoil strength (secant residual friction angle) was determined via correlation of liquid limit to ball milled liquid limit and associated clay fraction (Stark et. al., 2005). Static and pseudostatic slope stability was calculated for sections B-B', C-C', and D-D'. The pseudo-static analysis was performed using a horizontal seismic coefficient (k_h) of 0.15. Static and pseudo-static calculations are provided in Appendix E.

8.2.2 Rippability

Based on our field explorations and professional experience with similar sites, we anticipate that the surficial materials (artificial fills and topsoils) and the Otay Formation should be rippable with conventional heavy earth moving equipment in good operating condition. Locally cemented zones could occur within the Otay Formation that could result in more difficult ripping and the generation of oversize materials.

8.2.3 Grading Factors

Based on the results of our explorations and our professional experience with similar projects in the general vicinity of the site, we have estimated bulking and shrinkage of the on-site soils. The volume change of excavated on-site materials upon recompaction as fill is expected to vary with materials and location. Typically, the surficial soils and bedrock materials vary significantly in natural and compacted density. However, the following factors (based on the results of our investigation, geotechnical analysis and professional experience on similar sites) are as follows:

Table 5 Grading Factors	
Material	Volume Change
Surficial Deposits (Fill and Topsoil)	3 to 8 percent shrinkage
Otay Formation	4 to 6 percent bulking

8.3 Embankments

Embankment slopes up to a maximum height of approximately 9 meters with a slope ratio of 1:2 (V:H) or flatter are proposed to support the Connector and associated ramps. Fill materials for embankment construction will be predominantly from imported borrow sources. All fill soil should be placed in thin, loose lifts, uniformly moisture-conditioned, and compacted to a minimum 90 percent relative compaction as determined by CTM 216. Fill at structure approach embankments, structure backfill below retaining wall footings in embankments, and at other locations as specified by the Caltrans Standard Specifications (2006b) should be compacted to a minimum relative compaction of 95 percent. The 95 percent compaction zone of the approach embankment is shown on Figure 208.11A of the Highway Design Manual (Caltrans, 2006b).

8.3.1 Removal of Undocumented Fill Materials and Rubbish

Undocumented fill materials are generally porous and contain organic materials and are highly expansive. These soils locally blanket portions of the site and are considered unsuitable for support of site improvements or additional fill soils in their present condition. Generally, the most significant location of these materials is north of Otay Mesa Road. The mapped areal extent of these materials is presented on Plates 1 and 2.

8.3.2 Stability

Based on our review of the 35 percent grading plans (PTG, 2008) the proposed embankment fill slopes are planned between approximately ("SV2" Line from STA 195+00 to STA 200+00; and "S" and "N" Lines from STA 15+00 to 20+00 and 10+00 to 17+00, respectively). Stability analyses were performed for typical fill slopes constructed with materials derived from the onsite surficial units and bedrock formations. Geologic sections depicting subsurface geologic conditions and site topography are presented on Plates 4 and 5. To evaluate the stability of the proposed embankment slopes, we utilized the computer program GSTABL7 v2.0, using both circular failure surfaces using the Modified Bishop Method, and block failure surfaces using the Simplified Janbu Method. The strength parameters utilized in the analysis are summarized in Table 4.

The materials anticipated for use in fill slope grading will predominantly consist of imported, clayey silt to silty sands derived from the Otay Formation. Our analysis, assuming homogeneous slope conditions, indicates the proposed embankment fill slopes have calculated factors of safety of 1.5 and 1.1 or greater, with respect to global stability under both static and seismic conditions.

8.3.3 Settlement

The height of embankment fill will vary, but will not exceed approximately 10 meters in height. The embankment fill will be supported on mostly clayey topsoil which as been subjected to desiccation and organic intrusion over time. Generally, topsoils blanket the site, but are no more than approximately 1 meter in thickness. Underlying the compressible topsoil is dense and well indurated formational materials of the Otay Formation. Topsoils, when subjected to new loads and potential surface water infiltration will consolidate. Materials of the underlying Otay Formation are anticipated to be generally incompressible.

Settlement calculations were performed utilizing samples obtained from the various topsoil layers across the site. The calculations show estimated settlement up to 25 mm where loading represents a fill height of 10 meters. Due to the relatively thin character of the topsoils, the settlements are expected to occur rapidly during construction of the embankments. Accordingly, embankment settlement should not impact the integrity of the roadway.
Internal settlement of new embankment fill is estimated range between 0.5 and 1.0 percent of the overall embankment height, or between 50 and 100 mm.

8.4 Earth Retaining Systems

Based on the 35 percent submittal plans three retaining walls are proposed along the SR-125/SR-905 Connector alignment. The walls are proposed to be standard Caltrans concrete retaining walls (Type 1 though Type 5). At this time Caltrans Standard crib walls or Mechanically Stabilized Earth (MSE) walls are not proposed along the Connector alignment. The currently proposed retaining walls are summarized in the table below:

Table 6 Retaining Wall Summary			
Wall ID	Maximum Wall Height (meters)	Wall Length (meters)	Station Location
RW-SV2-1346	4.8	88.647	13+46.343 – 14+34.990
RW-S-1240	7.3	158.853	12+40.000 – 13+98.853
RW-S-1592	7.3	158.361	15+91.639 – 17+50.000

8.4.1 Allowable Net Bearing Pressure and Minimum Embedment

To reduce the effect of soil expansion on wall footings, such as for retaining and free-standing walls, the footings should penetrate through the soil zone that is most likely prone to volume change. On level ground, it is recommended the footings be embedded at least 0.6 meters below lowest adjacent finish grade. Where footings are located on or adjacent to slopes, footings should have a minimum setback of 1.5 meters from face of slope. Plans for free-standing walls located at the top of slopes should be reviewed by the geotechnical consultant prior to construction.

For spread footings founded in compacted fill, footings may be designed for a bearing pressure of 240 kPa. For spread footings in founded in Otay Formation, footings may be designed for a bearing pressure of 340 kPa. Where retaining walls are founded on or adjacent to slopes bearing pressures should be reduced to 160 kPa and 225 kPa, for fill and Otay Formation, respectively. The wall footings should be designed and reinforced with structural considerations.

Soil resistance developed against lateral structural movement can be obtained from the passive pressure value provided in the section below. Further, for sliding resistance, a friction coefficient of 0.40 may be used at the concrete and soil interface. These values may be increased by one-third when considering loads of short duration including wind or seismic loads. The total resistance may be taken as the sum of the frictional and passive resistances provided that the passive portion does not exceed one half of the total resistance.

8.4.2 Lateral Earth Pressures

Embedded structural walls should be designed for lateral earth pressures exerted on them. The magnitude of these pressures depends on the amount of deformation that the wall can yield under load. If the wall can yield (0.6 cm laterally over 0.2

percent of the wall height) enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. We recommend the following lateral earth pressures for active and at-rest conditions.

Table 7

Equivalent Fluid Weight (kPa/m)

Condition	Level	1:2 (V:H) Slope
Active	5.6	7
At-Rest	9	11

The above values assume non-expansive backfill and free-draining conditions. If conditions other than those assumed above are anticipated, the equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer. Surcharge loads should be considered in addition to the values above.

8.4.3 Wall Backfill

Structure backfill should conform to Section 19-3 of the Caltrans Standard Specifications (2006).

8.4.4 Wall Drainage

All retaining wall structures should be provided with appropriate drainage. Drains in accordance with Caltrans Standard Plans BO-3 (2006a) should be provided. The pipe should be sloped to drain to a suitable outlet.

8.5 Culvert Foundations

Improvements along the proposed SR-125/SR-905 Connector will also include the construction of culvert structures. Our review of the 35 percent submittal plans indicates that the culvert locations have not been located at the time of our preparing this report. However, existing drainage patterns indicate that surface runoff from the northern and eastern areas adjacent to the project will need to be directed through the site toward the southwest to follow existing drainage gradients. In particular, an area classified as ESA which currently contains a minor drainage, crosses the project alignment where an approximately 9 meter high embankment is proposed. We therefore anticipate that removal of topsoils in these areas will need to be performed.

8.6 Minor Foundations

No specific locations for minor structures such as sound walls have been identified on the 35 percent submittal plans. However, we anticipate that sound walls may be required where existing adjacent commercial improvements are currently located or may be located in the future. Therefore, we recommend for Caltrans Standard soundwall designs, an ultimate lateral passive soil pressure of 47.1 kPa/m be utilized.

9.0 MATERIAL SOURCES

Mining operations eligible to supply materials such as aggregates in San Diego County are outlined in Table 8 below. The following is the AB 3098 list, as of January 1, 2008. Sections 10295.5 and 20676 of the Public Contract Code preclude mining operations that are not on the AB 3098 List from selling sand, gravel, aggregates or other mined materials to state or local agencies. Note this list is updated continuously, and a current listing is maintained by the California Department of Conservation, Office of Mine Reclamation.

Table 8
Summary of Mine Material Sources

Mine ID	Mine Name	Operator
91-37-0005	PALA ROCK PLANT (SAND)	HANSON AGGREGATES PSW, INC.
91-37-0007	CARROLL CANYON PLANT	HANSON AGGREGATES PSW, INC.
91-37-0010	LAKESIDE SAND PIT	C.W. MCGRATH, INC.
91-37-0011	HILLSDALE GRANITE PI	MICHAEL P. MCGRATH - C.W. MCGRATH, INC.
91-37-0013	MIRAMAR	HANSON AGGREGATES PSW, INC.
91-37-0015	UCLH SAN MARCOS	HANSON AGGREGATES PSW, INC.
91-37-0019	TTT QUARRY	SUPERIOR READY MIX CONCRETE
91-37-0020	HESTER'S GRANITE	HANSON AGGREGATES
91-37-0021	SLAUGHTERHOUSE CANYON	HANSON AGGREGATES PSW, INC.
91-37-0022	TUNNEL HILL PIT	MICHAEL P. MCGRATH - C.W. MCGRATH, INC.
91-37-0024	MISSION GORGE PIT	SUPERIOR READY MIX CONCRETE
91-37-0025	RCP PITS 1,2,3, & 5 INCLUSIVE	RCP BLOCK & BRICK, INC.
91-37-0026	MISSION VALLEY	CALMAT COMPANY
91-37-0027	SLOAN CANYON	SYCUAN TRIBAL DEVELOPMENT CORP.
91-37-0028	MISSION VALLEY - EX FENTON	CALMAT COMPANY
91-37-0029	CARROLL CANYON	VULCAN MATERIALS
91-37-0030	CALMAT - POWAY	CALMAT COMPANY
91-37-0034	EL MONTE PIT	HANSON AGGREGATES PSW, INC.
91-37-0035	OTAY RANCH PIT #11	HANSON AGGREGATES PSW, INC.
91-37-0036	HIGHWAY 67 & VIGILANTE ROAD PIT	HANSON AGGREGATES PSW, INC.
91-37-0044	BUCKMAN PIT	SAN DIEGO COUNTY, DEPARTMENT OF PUBLIC WORKS
91-37-0045	OLIVE STREET PIT	SAN DIEGO COUNTY, DEPARTMENT OF PUBLIC WORKS
91-37-0046	MCCAIN PIT	SAN DIEGO COUNTY, DEPARTMENT OF PUBLIC WORKS
91-37-0047	BURNAND BORROW PIT	SAN DIEGO COUNTY, DEPARTMENT OF PUBLIC WORKS
91-37-0048	WARNER PIT	SAN DIEGO COUNTY, DEPARTMENT OF PUBLIC WORKS
91-37-0052	NATIONAL QUARRIES	NATIONAL QUARRIES
91-37-0054	INLAND VALLEY MATERIALS	INLAND VALLEY MATERIALS
91-37-0056	PALO VERDE DESILTATION & RECLAMATION PROJECT	PALO VERDE RANCH HOA
91-37-0057	PAUMA VALLEY COUNTRY CLUB	THE PAUMA VALLEY COUNTRY CLUB
91-37-0063	WOODWARD SAND	LAKESIDE LAND COMPANY, INC.
91-37-0064	BAXTER QUARRY	M. J. BAXTER DRILLING COMPANY
91-37-0066	ROSEMARY'S MOUNTAIN	GRANITE CONSTRUCTION COMPANY

Source: http://www.conservation.ca.gov/omr/ab_3098_list/Pages/Index.aspx

10.0 MATERIAL DISPOSAL

We do not anticipate that significant amounts of unsuitable materials will be generated during the proposed grading. Removals of topsoil will result in the generation of clayey and expansive soils, however, we anticipate that these materials will be mixed into the proposed fills along the alignment where embankments are planned and located outside of proposed approach embankment and structure backfill. Should unsuitable materials as defined in Section 19-2.02 of the Caltrans Specifications (2006a) be encountered, they should be disposed of off-site

11.0 CONSTRUCTION CONSIDERATIONS

The following sections outline considerations potentially influencing project design, specifications, construction monitoring, and instrumentation.

11.1 Construction Advisories

Overhead as well as underground utilities are present across the project alignment. These utilities include inactive (abandoned) as well as active gas, electric, water, and cable services, some of which are relatively new alignments given the active construction along the SR-125 route. The locations of existing utilities should be noted as appropriate.

11.2 Construction Considerations Influencing Design

Specific earthwork considerations are outlined in Section 12.1 of this report. In addition, the presence of clayey soils at the site is anticipated, and therefore, these earth materials generally will exhibit higher expansion potential, higher corrosion potential, and lower R-Values than relatively sandy materials. Selective grading of sandy materials where encountered may be desirable in order to achieve enhanced engineering properties.

Based on our review of the 35 percent submittal plans, the majority of the proposed grading will consist of embankment placement. Therefore, we anticipate that the import of materials will be required to complete the proposed grading.

11.3 Construction Considerations Influencing Specifications

Specifications are expected to generally correspond to Caltrans Standard Plans and Specifications. Recommendations presented in the following sections are intended to be incorporated into the project special provisions as appropriate.

11.4 Construction Monitoring and Instrumentation

Grading and construction operations should be monitored, tested, and approved as required utilizing the most current Caltrans established criteria, project special provisions, and those presented in the following sections of this report. Excavations, including cut slopes, foundations, and remedial removals performed prior to fill placement should be observed by the on-site geotechnical engineer or engineering geologist to confirm the exposed geologic conditions, and to monitor for the presence of unanticipated geologic conditions.

11.5 Hazardous Waste Considerations

A hazardous waste evaluation was beyond the scope of our services. No hazardous waste evaluation is included herein. It should be noted that previous construction in the vicinity of the alignment has encountered hazardous wastes generally related to agricultural uses.

11.6 Differing Site Conditions

The conclusions and recommendations presented 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. The nature of many sites is such that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if the geotechnical consultant has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. Any questions regarding the contents of this report should be directed to the attention of Sean Colorado, GE, (858) 300-8490 or Robert Stroh, CEG, (858) 300-4090 of Leighton Consulting, Inc.

12.0 RECOMMENDATIONS AND SPECIFICATIONS

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 Caltrans Standard Plans and Specifications.

12.1 Earthwork

Based on the subsurface soil investigation and laboratory test results, the subsurface conditions are expected to satisfactorily support the proposed roadway improvements, provided the following geotechnical recommendations are implemented.

12.1.1 Site and Subgrade Preparation and Remedial Removals

All earthwork should be conducted in accordance with Section 19 of the Caltrans Standard Specifications (2006b). Vegetation, trash, construction debris, and other deleterious materials should be removed and disposed offsite. Removal of surficial and highly compressible soils including existing undocumented fill (see Plates 1 through 3 for mapped extents), to competent materials prior to placement of structural improvements or structural fills is recommended. Estimated removal depths of these materials are generally 1 to 1.5 meters below the existing ground surface. Depths and limits are subject to verification and revision based on additional investigations and by the geotechnical engineer during construction.

Remedial removals of unsuitable topsoil materials in the vicinity of SR-905, "SV1" Line, STA 195+50 will be required to mitigate a transition from roadway embankment to cut. We recommended that a removal and replacement of 1.4 meters below the pavement structural section be performed in this area. Removals should be performed in accordance with Section 19-2.02 of the Caltrans Standard Specifications (2006b).

Where the proposed detention basin is planned (right of "N" Line STA 12+50), the expansive topsoil materials exposed along the top of slope should be removed and replaced with compacted materials that have an expansion index (EI) of less than 90. The removal should extend a horizontal distance of 2 meters outside of the proposed detention basin footprint.

12.1.2 Embankment Construction

Embankment fill slopes should be no steeper than 1:2 (V:H). Construction of embankments should be in accordance with Section 19 of Caltrans Standard Specifications (2006b). Embankments within 50 meters of bridge structures, such as bridge abutments and retaining walls should be placed on competent sedimentary materials of the Otay Formation and compacted to at least 95 percent relative compaction. In addition, materials with a greater dimension than 7.5 cm should not be used in structural approach fills where pile foundations are proposed. Locally, highly expansive materials may be used as compacted fill provided that they are no closer than 2 meters from the slope face. Materials placed within 1.2 meters of finished grades in all embankment areas should have an Expansion Index (EI) of 90 or less. In addition, with regard to import materials, we recommend that those materials have an EI of 90 of less.

Where expansive soils are recompacted, the moisture content of those materials should be above optimum moisture content as determined by California Test Method 216.

12.1.3 Temporary Excavations

All temporary excavations should be performed in accordance with the safety requirements of Cal-OSHA. Shoring, if required, may be designed in accordance with the methods presented in the Caltrans *Trenching and Shoring Manual* (1990).

12.1.4 Trench Backfill

Underground utility trenches should be backfilled with fill compacted in accordance with Caltrans Standard Specifications (2006a). Special care should be used in backfilling and compacting immediately adjacent to pipelines, conduits, and pipe couplings.

12.2 Pavement Structural Section Design

Pavement structural sections for the SR-125/SR905 Connector are based on Section 600 of the Caltrans Highway Design Manual. Our pavement sections are summarized below in Table 9. Regarding pavement subgrade materials, we have assumed that materials placed within 1.5 meters of finish grade have an R-Value of at least 15.

Table 9
Pavement Structural Sections

Traffic Index	Subgrade R Value	Section Layers	Thickness of Layers (mm)	Total Thickness (mm)
12.5	15	AC/AB	195/645	840
		PCC Section	See Table 623.1E of HDM	
12.0	15	AC/AB	180/630	810
		PCC Section	See Table 623.1E of HDM	
11.5	15	AC/AB	180/585	765
		PCC Section	See Table 623.1E of HDM	
11.0	15	AC/AB	165/570	735
		PCC Section	See Table 623.1E of HDM	
10.5	15	AC/AB	165/525	690
		PCC Section	See Table 623.1E of HDM	
10.0	15	AC/AB	150/525	675
		PCC Section	See Table 623.1E of HDM	
9.5	15	AC/AB	150/465	615
		PCC Section	See Table 623.1E of HDM	
9.0	15	AC/AB	135/450	585
		PCC Section	See Table 623.1E of HDM	
8.5	15	AC/AB	120/435	555
		PCC Section	See Table 623.1E of HDM	
8.0	15	AC/AB	120/390	510
		PCC Section	See Table 623.1E of HDM	
7.5	15	AC/AB	105/360	465
		PCC Section	See Table 623.1E of HDM	
7.0	15	AC/AB	105/330	435
		PCC Section	See Table 623.1E of HDM	
6.5	15	AC/AB	90/315	405
		PCC Section	See Table 623.1E of HDM	
6.0	15	AC/AB	75/300	375
		PCC Section	See Table 623.1E of HDM	
5.5	15	AC/AB	75/255	330
		PCC Section	See Table 623.1E of HDM	
5.0	15	AC/AB	60/240	300
		PCC Section	See Table 623.1E of HDM	

12.3 Corrosivity

A preliminary geochemical screening of representative samples from geotechnical borings and trenches of the on-site soils was performed. The screening is meant to serve as an indicator for the design professionals in determining the level of input necessary from a qualified corrosion engineer. Soil samples were tested for minimum electrical resistivity, soil pH, chloride content, and sulfate content using Caltrans test methods. The corrosion test results are included in Appendix C.

The samples tested had measured pH ranging from 7.5 to 8.2 with an average of approximately 7.9, which is considered slightly basic. The samples also had measured minimum electrical resistivity that ranged from 1,507 to 3,151 ohm-cm with an average of 2,460 ohm-cm, a chloride content that ranged from approximately 120 and 1,980 ppm with an average of approximately 880 ppm and a sulfate content that ranged from less than approximately 150 to 600 ppm with an average of less than approximately 270 ppm.

Based on Caltrans (2003) criteria, a site is considered corrosive if the chloride concentration is 500 ppm or greater, sulfate concentration is 2,000 ppm or greater, or the pH is 5.5 or less. Therefore, based on the results of the laboratory testing and using Caltrans criteria, the site would be characterized as a corrosive site and corrosion mitigation is required. Based on Table 854.1A of Topic 854 in the Highway Design Manual (Caltrans, 2006c), no special restrictions are prescribed for concrete based on sulfate concentration or pH. Requirements for additional cover over reinforcing steel due to chloride content are also addressed in Topic 854. Structural corrosion mitigation measures are provided in Article 8.22 of the Caltrans Bridge Design Specifications, with concrete cover requirements for chloride content mitigation summarized in Table 8.22.1.

Proposed reinforced concrete structures should conform to Caltrans standards (reinforced concrete culverts). Concrete in contact with the ground should be batched using cement, in accordance with the Caltrans Standard Specifications (2006b). Adequate concrete cover over reinforcing steel should be provided in accordance with Caltrans standards.

13.0 FUTURE STUDIES

Because of currently existing environmentally sensitive habitat areas across the site, a number of exploration borings and pits that we had proposed could not be completed for inclusion in this report. These explorations are depicted in red on our Plates 1 through 3. We recommend that these subsurface explorations be completed prior to our completion of this Geotechnical Design Report. In addition, 35 percent design plans that were utilized for this report did not contain locations for proposed drainage facilities or retaining wall profiles. Therefore, we also anticipate that final design of these facilities will require additional geotechnical input that can not be provided at this time.

14.0 LIMITATIONS

The recommendations contained in this draft-Geotechnical Design Report are based on preliminary project information regarding the 35 percent submittal plans provided by Parsons. Conceptual changes made during final project design, should be reviewed by Leighton Consulting, Inc. during preparation of the Geotechnical Design Report to determine if these are still applicable. Any questions regarding the contents of this report should be directed to the attention of Sean Colorado, GE, (858) 300-8490 or Robert Stroh, CEG, (858) 300-4090 of Leighton Consulting, Inc.

Please also note that our evaluation was limited to assessment of the preliminary geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

APPENDIX A

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GEOTECHNICAL BORING LOG B-1

Date 7-27-07 | Sheet 1 of 2

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri County Drilling | Type of Rig CME-75

Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76 m

Borehole Elevation(m) 160.5 | Location Station 27+52/17m left of B-Line

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.5	0							SC	**TOPSOIL** Disturbed clayey SAND; dry and loose along dirt road shoulder; scattered road base gravel intermixed	EI,SA,H,CR
									OTAY FORMATION	
159.5	1			B-1						
158.5	2			R-1	38	12.88	30.2		@ 1.5m: Light gray-brown and pinkish-gray clayey SILTSTONE (ML) and silty CLAYSTONE (CL), slightly moist, very stiff; weathered with blocky texture	CN
157.5	3			S-1	50				@ 3.1m: Light gray silty SANDSTONE (SM), moist, medium dense; fine-grained; friable; trace clay	AT,SA
.5	4									
155.5	5			R-2	98	17.57	12.1		@ 4.6m: Upper sample is gray silty SANDSTONE (SM), very moist, dense; micaceous, fine-grained. Lower sample is gray-brown clayey SILTSTONE (ML), moist, stiff; indurated, low to medium plasticity	DS
154.5	6			S-2	69				@ 6.1m: Light gray-brown to clayey SILTSTONE (ML); moist, hard; homogeneous; low plasticity (similar to much of B-4). Note some moisture on outside of sampler	
153.5	7									
152.5	8			R-3	50/ 130mm	15.61	23.7		@ 7.6m: Light brownish gray, fine sandy SILTSTONE (ML) to silty SANDSTONE with trace clay; moist, very dense; micaceous, very fine grained	DS
151.5	9			S-3	54				@ 9.1m: Light gray-brown, very fine sandy SILTSTONE (ML) with trace clay, generally similar to sample at 7.6m	AT,SA
150.5	10									

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

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GEOTECHNICAL BORING LOG B-1

Date 7-27-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76 m
Borehole Elevation(m) 160.5 | Location Station 27+52/17m left of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
149.5	11			R-4	72	12.83	36.5		@ 10.7m: Light gray-brown and pinkish gray-brown, silty CLAYSTONE (CL), slightly moist, stiff to very stiff; thinly bedded and somewhat fissile; blocky weathered texture, otherwise tight; waxy with low to medium plasticity; siltier upper sample	CR
148.5	12			S-4	50/130mm				@ 12.2m: Light brown, very fine sandy SILTSTONE (ML) to silty SANDSTONE (SM), moist, very dense/stiff; only minor clay	
147.5	13								Total Depth = 12.5m Minor seepage at 4.6m to 5.5m No ground water in hole prior to backfill Backfilled with bentonite cement slurry on 7/27/07	
.5	14									
145.5	15									
144.5	16									
143.5	17									
142.5	18									
141.5	19									
140.5	20									

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 7-27-07 | Sheet 1 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.6 | Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.6	0							CL	**TOPSOIL** Dark brown, silty CLAY, damp, firm, abundant rootlets; dessicated	
									OTAY FORMATION @ 1.5m: Light brown, silty SANDSTONE (SM), fine-grained, damp, medium dense, friable, mottled with medium brown	
159.6	1									
				S-1	27					
158.6	2									MD,DS,HC
				B-1						
157.6	3			R-1	50/ 130mm	16.29	16.0		@ 3.1m: Dense, very friable	TR
156.6	4									
									@ 4.6m: Moist, slightly more clayey	
155.6	5			S-2	77					
154.6 ▽	6			R-2	50/ 50mm	16.81	17.8		@ 6.1m: Increase clay content, moist to wet, fine- to coarse-grained, friable	CN
153.6	7									
				S-3	91/ 180mm				@ 7.6: Light brown to light olive-brown, moist, slightly friable	
152.6	8									
151.6	9			R-3	50/ 150mm	18.85	10.9		@ 9.1m: Light brown to light pink brown SILTSTONE (ML), moist, hard, mottled with light brown to tan carbonates	TR
150.6	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 7-27-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.6 | Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sampl No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-4	32				@ 10.7m: Light brown to light olive-brown, SILTSTONE (ML) to CLAYSTONE (CL), moist, hard, blocky, trace thin (less than 1 mm) maganese and clay infilled fractures	AT,SA,H
149.6	11									
148.6	12									
				R-4	50/ 130mm	11.58	14.6		@ 12.2m: Light gray-brown SILTSTONE (ML), moist, very dense, slightly cemented, trace mica, thinly laminated	
147.6	13									
				S-5	50/ 130mm				@ 13.7m: Water in sample, light gray-brown SILTSTONE (ML), sample interbedded with pink bentonite clay seam (3 cm thick)	
.6	14									
145.6	15									
				R-5	50/ 100mm	14.72	26.2		@ 15.2m: Gray-brown, silty SANDSTONE (SM), fine-grained, very dense, friable, wet	TR
144.6	16									
				S-6	70				@ 16.8m: Brown to pinkish brown CLAYSTONE (CL), wet, hard	SA,H
143.6	17									
142.6	18									
				R-6	50/ 130mm				@ 18.3m: Brown CLAYSTONE (CL), wet, hard, slightly less plastic than previous	TR
141.6	19									
				S-7	98/				@ 19.8m: Brown, slightly clayey SILTSTONE (ML), wet, very dense,	
140.6	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-2

Date 7-27-07 | Sheet 3 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.6 | Location Station 27+41/18.5m right of B-Line

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
					230mm				slightly friable, trace maganese oxide blebs, trace mica	
139.6	21									
				R-7	50/ 130mm	15.31	24.2		@ 21.3m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	DS
138.6	22									
137.6	23			S-8	50/ 76mm				@ 22.9m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	SA
[illegible].6	24									
				R-8	50/ 100mm	15.73	27.0		@ 24.4m: Olive-brown to light brown, silty, fine-grained SANDSTONE (SM), wet, very dense, slightly micaceous, moderately friable	CR
									Total Depth = 24.5m Ground water measured at 6.1m below ground surface at completion of drilling Backfilled with bentonite cement slurry on 7/31/07	
135.6	25									
134.6	26									
133.6	27									
132.6	28									
131.6	29									
130.6	30									

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** Dark brown sandy CLAY, damp, stiff to hard, abundant rootlets, trace fine gravel	
158.0	1								**OTAY FORMATION** @ 0.9m: Light brown, silty SANDSTONE (SM); fine-grained, slightly moist, dense	
157.0	2									
156.0	3			R-1	50/ 100mm	16.81	19.8		@ 3.1m: Light brown, silty SANDSTONE (SM), fine-grained, slightly moist, dense, moderately friable, slightly mottled with pinkish brown, massive	CN
155.0	4			B-1						
				S-1	58				@ 4.6m: Very dense	SA
154.0	5									
153.0	6			R-2	50/ 100mm	17.07	18.5		@ 6.1m: Slight increase in moisture and clay content	CN
152.0	7			S-2	50/ 75mm				@ 7.6m: Strongly cemented silty SANDSTONE (SM); layer approximately 0.46m thick	
151.0	8									
150.0	9			R-3	50/ 100mm	17.71	14.7		@ 9.1m: Moist	
149.0	10									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-3	31				@ 10.7m: Light brown to light olive-brown SILTSTONE (ML); wet, very stiff to hard, well indurated, slightly micaceous, massive	SA
148.0	11									
147.0	12			R-4	50/ 130mm	15.98	23.5		@ 12.2m: Thin pinkish brown CLAYSTONE (CL) interbed @ 12.3m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
146.0	13									
145.0	14			S-4	50/ 100m				@ 13.7m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
144.0	15			R-5	50 130mm				@ 15.2m: Micaceous	
143.0	16								Total Depth = 15.4m Ground water measured at 10.7m below ground surface at completion of drilling Backfilled with bentonite cement slurry on 7/31/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date 7-26-07 **Sheet** 1 **of** 3

Project SR125/905 Interchange **Project No.** 600158-905

Drilling Co. Tri County Drilling **Type of Rig** CME-75

Hole Diameter 0.20m **Drive Weight** 63.5 kg **Drop** 0.76m

Borehole Elevation(m) 158.9 **Location** Station 26+77.5/17m left of B-Line

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
158.9	0								**OTAY FORMATION** Light gray-brown to olive-brown, clayey SILTSTONE (ML), slightly moist; low to medium plasticity, trace sand	MD,EI,AT SA,H,CR
157.9	1			B-1						
				R-1	24	13.51	34.0		@ 1.5m: Light gray-brown, silty CLAYSTONE (CL); slightly moist, stiff; low to medium plasticity; clayey silt in sampler, tips cohesive with slightly blocky texture	HC
156.9	2									
155.9	3			S-1	20				@ 3.1m: Light gray-brown, clayey SILTSTONE (ML); moist, stiff; some light gray caliche stains, slightly plastic, homogeneous color	SA,H
.9	4									
				R-2	86/ 250mm	15.95	24.4		@ 4.6m: Wet, seepage or ground water encountered	HC
153.9	5									
152.9	6			S-2	44				@ 6.1m: Light gray-brown, silty SANDSTONE (SM), wet, very dense; fine-grained; similar color/appearance to above; trace clay	
151.9	7									
				S-3	71				@ 7.6m: Light gray-brown SILTSTONE (ML) to sandy SILTSTONE (ML), moist to wet, very stiff; ground water appears perched above	SA
150.9	8									
149.9	9			R-3	85	14.97	27.3		@ 9.1m: Light brownish-gray, sandy SILTSTONE (ML), moist, hard; fine-grained; indurated but weakly fissile along near-horizontal planes	CN
148.9	10									

SAMPLE TYPES:
- [S] SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-4

Date 7-26-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 158.9 | Location Station 26+77.5/17m left of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									@ 10.7m: Light gray-brown, silty CLAYSTONE (CL) to clayey SILTSTONE (ML), slightly moist, hard; massive; pinkish hue to sample tip	
147.9	11			S-4	60					
									@ 11.6m: Ground water encountered, perched	
146.9	12									
				S-5	75				@ 12.2m: Light brown, silty SANDSTONE (SM), wet, very dense; friable, massive; some very fine mica	
145.9	13									
				R-4	50/ 50mm	15.27	24.3		@ 13.7m: Light brown, fine sandy to clayey SILTSTONE (ML), moist, hard; well indurated; moist to wet; slightly blocky texture, otherwise massive	
1.9	14									
143.9	15									
				S-6	83/ 280mm				@ 15.2m: Light gray-brown, clayey SILTSTONE (ML), moist, very stiff; well indurated; pinkish hue similar 10.7m	
142.9	16									
				R-5	50/ 130mm				@ 16.8m: Light pinkish brown clayey SILTSTONE (ML), moist, very stiff; minor very fine sand and mica flake; still indurated with soMe blocky texture; slightly sandier in upper sample; low to medium plasticity	CN
141.9	17									
140.9	18									
				S-7	40				@ 18.3m: Light gray-brown, clayey to fine sandy SILTSTONE (ML), slightly moist to moist, stiff; upper and lower sample sandiest; homogeneous appearance	
139.9	19									
138.9	20			R-6	50/	15.61	23.7		@ 19.8m: Light gray-brown silty SANDSTONE (SM); moist, dense;	TR

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-4

Date 7-26-07 | Sheet 3 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 158.9 | Location Station 26+77.5/17m left of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
					75mm				fine-grained; micaceous; generally similar to above	
137.9	21									
				S-8	79				@ 21.3m: Light gray-brown SILTSTONE (ML); moist, hard, some minor fine sand and clay; slightly plastic, otherwise similar to above	
136.9	22									
135.9	23			S-9	50/ 50mm				@ 22.9m: Light gray-brown, silty, very fine-grained SANDSTONE (SM); moist to wet, very dense; friable; very fine-grained	
1.9	24								@ 24.4m: Light gray-brown SILTSTONE (ML) with some clay and very fine sand; slightly moist, very dense to hard; generally similar to 21.3m	
				R-7	50/ 130mm	16.69	17.8			TR
133.9	25								Total Depth = 24.7m Ground water noted at 4.6m to7.3m and 11.6m to 13.4m Measured at approximately 6.4m prior to backfill Backfilled with bentonite cement slurry on 7/26/07	
132.9	26									
131.9	27									
130.9	28									
129.9	29									
128.9	30									

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 26+63.5/17 m right of B-Line

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meters	Depth Meters	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** rk brown, silty CLAY, moist, stiff, abundant organics to fine rootlets, trace fine-grained gravel; approximately 1m thick, but discontinuous elsewhere across the site	
158.0	1								**OTAY FORMATION** @1.5m: Light reddish-brown, silty SANDSTONE (SM), moist, slightly compact, mottled with light brown, fine-grained	
157.0	2			S-1	15					
				B-1						SA
156.0	3			R-1	91	16.10	23.0		@ 3.1m': Light brown to light olive-brown, silty SANDSTONE (SM), fine-grained, mottled with reddish-brown, moist, dense	DS
5.0	4									
154.0	5			S-2	54				@ 4.6m: Light gray silty SANDSTONE (SM), moist, dense; fine-grained; mottled with reddish brown	
153.0	6			R-2	82	17.47	18.2		@ 6.1m: Light brownish-gray silty to clayey SANDSTONE (SC); moist dense; homogeneous and unstained; upper sampler includes orange-brown silty claystone bed, moist, stiff, and waxy, displays dip of 10 to 20 degrees Driller notes ground water encountered	DS
152.0	7									
151.0	8			S-3	52				@ 7.6m: Light gray, silty to clayey SANDSTONE (SM), moist, dense; fine-grained as above	
150.0	9			R-3	77	15.25	28.3		@ 9.1m: Generally light gray silty SANDSTONE (SM), similar to above; sampler tip is sandy SILTSTONE (ML)with clay; moist, stiff; some pinkish stain/hue locally	
149.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 26+63.5/17 m right of B-Line

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
148.0	11			S-4	30				@ 10.7m: Light brownish-gray, clayey SILTSTONE (ML), wet, medium stiff	
147.0	12			R-4	50/ 130mm	16.65	21.9		Ground water appears perched above @ 12.2m: Light gray-brown, silty to clayey SANDSTONE (SC), moist to wet, dense; Note, sands may have flowed, fine-grained	
146.0	13									
145.0	14			S-5	50/ 100mm				@ 13.7m: Light gray-brown SILTSTONE (ML), moist, very dense; sample tip is light brown claystone; moist, very stiff to hard	
144.0	15			R-5	50/ 130mm	16.88	21.2		@ 15.2m: Light gray-brown, very fine sandy SILTSTONE (ML), moist, very stiff to hard; localized medium	DS
143.0	16								Total Depth = 15.4m Ground water noted at 6.7m to 11.9m approximately Ground water measured at 5.2m prior to backfill Backfilled with bentonite cement slurry on 7/27/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 9-18-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig D-120
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.2 | Location Otay Mesa Road Overcrossing

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	Type of Tests
160.2	0							ML	
159.2	1								
158.2	2			NR C-1					
157.2	3								
156.2	4			C-2					
155.2	5			C-3					
154.2	6								
153.2	7			C-4					
152.2	8			NR					
151.2	9			C-5					
150.2	10			C-6					
149.2	11			NR					
148.2	12			C-7					
147.2	13								
146.2	14			S-1	64				
145.2	15			R-1	27/ 230mm				
144.2	16								
143.2	17			S-2	91/ 280mm				
142.2	18			R-2	86/ 250mm				
141.2	19								
140.2	20								

DESCRIPTION

ARTIFICIAL FILL (see adjacent Test Pits)
@ 0-1.7m: Spoils include light yellow-brown sandy SILT, and darker brown sandy to silty clay; moist, medium stiff

@ 1.8-1.9m: Mixed brown sandy CLAY and light gray-brown, very fine sandy SILT, damp to moist, medium stiff

OTAY FORMATION
@ 1.9-4.3m: Generally light gray-brown SILTSTONE (ML), moist, medium stiff; weathered; some near horizontal caliche pockets/layers to 1cm thickness
@ 2.6m: Grades slightly sandier

@ 4.3-5.0m: Light brownish-gray very fine sandy SILTSTONE to silty fine SANDSTONE (SM), very moist, medium dense; faint yellow-brown staining and slightly weathering
@ 5.0-5.1m: Grades finer grained; cohesive but still weathered and blocky texture; some diffuse, faint, near horizontal lamination
@ 5.1-6.6m: Light brownish-gray clayey SILTSTONE (ML), moist, medium stiff; some horizontal banding, no parting surfaces
@ 6.6-7.4m: Generally silty CLAYSTONE (CL), moist, stiff; otherwise similar to above

@ 7.4-9.1m: Light gray to brownish gray, very fine sandy SILTSTONE (ML), moist to very moist, medium stiff/dense; clayier sample tip
@ 7.6-7.8m: No sample recovery. Broken/disturbed core through 8.5m
@ 9.1-10.5m: Light gray to olive-gray SILTSTONE (ML) moist, stiff

@ 9.6-10.2m: Zones of reddish-brown silty CLAYSTONE, moist, stiff; indurated; no clear parting surfaces
@ 10.3-10.7m: Light gray, very fine sandy SILTSTONE (ML) to very fine-grained SANDSTONE (SM), damp, very dense; generally more homogeneous than above
@ 10.7-10.8m: No recovery
@ 10.8-11.2m: Light gray-brown clayey SILTSTONE (ML) damp to moist, very stiff
@ 11.2-11.8m: Includes laminated light olive to very light brown CLAYSTONE (CH), moist, stiff; bentonitic; pinkish hue near bottom; wavy laminations, with 5-8° dip to waxy, whitish layers
@ 11.8-12.2m: Light brown clayey SILTSTONE (ML) moist, stiff to very stiff; generally similar to upper hole @ 12.2m: end core sampling
@ 13.7m: Brownish-gray silty very fine SANDSTONE (SM) very moist to wet, dense; friable; micaceous. Red-brown coloration to upper sample
@ 15.2m: Light brownish-gray, very fine sandy SILTSTONE (ML) to silty SANDSTONE (SM), minor clay; very moist to wet, dense to very dense; soft and wet in upper sample; generally similar to 13.7m; water appears perched/confined in this interval
@ 16.7m: Light brown to pinkish-brown silty CLAYSTONE (CL) moist, very stiff

@ 18.2m: Light olive-brown clayey SILTSTONE (ML-CL) moist, very stiff; some bright adobe-red staining to lower sample; minor very fine sand locally in upper sample

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 9-18-07 **Sheet** 2 **of** 2
Project SR125/905 Interchange **Project No.** 600158-905
Drilling Co. Tri County Drilling **Type of Rig** D-120
Hole Diameter 200mm **Drive Weight** 63.5 kg **Drop** 0.76m
Borehole Elevation(m) 160.2 **Location** Otay Mesa Road Overcrossing

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-3	62				@ 19.8m: Light gray very fine sandy SILTSTONE (ML) moist, very stiff; homogeneous	
139.2	21									
				R-3	70/ 280mm					
138.2	22								@ 21.3m: Less sandy than above, minor clay; local weak cementation/induration in lower sampler	
137.2	23			S-4	88/ 280mm				@ 22.8m: Light gray-brown silty CLAYSTONE (CL) moist, very stiff; faint pinkish coloration locally	
136.2	24								@ 24.4m: No recovery, sampler tip includes orange-brown to adobe-red colored very fine sandy SILTSTONE (ML) damp, hard; some weak cementation (breaks with some finger-effort)	
				R-4	50/ 75mm					
135.2	25								Total Depth = 24.5m Ground water appears confined at 13-15m± Measured at 9.2m prior to backfill Backfilled with bentonite cement slurry on 9/18/07	
134.2	26									
133.2	27									
?.2	28									
131.2	29									
130.2	30									
129.2	31									
128.2	32									
127.2	33									
126.2	34									
125.2	35									
124.2	36									
123.2	37									
122.2	38									
121.2	39									
120.2	40									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

GEOTECHNICAL BORING LOG B-7

Date: 8-20-07 | Sheet 1 of 1
Project: SR125/905 Interchange | Project No.: 600158-905
Drilling Co.: Tri-County Drilling | Type of Rig: CME-75
Hole Diameter: 0.02m | Drive Weight: 63.5 kg | Drop: 0.76m
Borehole Elevation(m): 156.8 | Location: North Box Culvert

Logged By: BJO
Sampled By: BJO

Elevation Meter	Depth Meter	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
156.8	0							ARTIFICIAL FILL Light brownish-gray clayey to very fine sandy SILT; damp, medium stiff; dry and crumbly 0-0.2m from surface	
			B-1				ML		
155.8	1								
			R-1					OTAY FORMATION @ 1.5m: Light brown silty CLAYSTONE (CL-ML), moist, very stiff; slightly weathered with chalky/punky texture in upper sample @ 3.0m: Homogeneous light brown color, stuff to very stiff in sampler tip	AT,SA, H, CN
154.8	2								
153.8	3		S-1						
[illegible].8	4								
			R-2		16.05	24.9		@ 4.6m: Upper sample similar to above, with pinkish coloration locally; lower sample is light brownish gray clayey SILTSTONE, moist, very stiff	
151.8	5								
150.8	6		S-2					@ 6.1m: Olive-gray silty very fine SANDSTONE (SM), moist, dense; very fine grained; friable; somewhat micaceous	
149.8	7								
			R-3		13.84	24.2		@ 7.6m: Light brown clayey SILTSTONE (ML-CL) to silty CLAYSTONE, moist, very stiff; lower sample is clayier with slight pinkish coloration	
148.8	8							Total Depth 8.0m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/20/07	
147.8	9								
146.8	10								

SAMPLE TYPES:
- SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-8

Date 8-17-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.0 | Location Roadway, Central Portion

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
163.0	0							SC	ARTIFICIAL FILL Brown, silty clayey SAND, moist, medium dense, fine to medium-grained	
162.0	1									
				S-1					@ 1.5m: Becomes reddish-brown, medium-grained	
161.0	2							SM	@ 2.1m: Light brown silty SAND, dry to moist, medium dense	
160.0	3			R-1	17.06	21.40			@ 3.0m: Encountered a chunk of silty SANDSTONE, moist, dense	AT,SA,H, CN
).0	4									
				S-2					@ 4.6m: Light brown silty SAND, dry to moist, medium dense, shoe of sampler encounters chunk of hard clay topsoil	AT
158.0	5									
									OTAY FORMATION	
157.0	6			R-2	13.48	30.00			@ 6.1m: Light brown silty SANDSTONE (SM), moist, dense, friable, slightly micaceous, fine-grained	
156.0	7									
				S-3					@ 7.6m: Interbedded carbonate-rich layer approximately 4-5 cm thick, moist, decrease in grain-size borderline silt	
155.0	8									
154.0	9			R-3					@ 9.1m: Light brown SILTSTONE (ML), moist, hard, few thin subhorizontal FeO_2 infilled fractures, generally massive	
153.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-8

Date 8-17-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.0 | Location Roadway, Central Portion

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-4					@ 10.7m: Light brown to light reddish-brown at bottom of sample	
152.0	11									
									Total Depth = 11.1m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/17/07	
151.0	12									
150.0	13									
9.0	14									
148.0	15									
147.0	16									
146.0	17									
145.0	18									
144.0	19									
143.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-9

Date 8-17-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.0 | Location Roadway, Central Portion

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
163.0	0						CL	ARTIFICIAL FILL Olive-brown to dark brown silty CLAY, moist, stiff	
162.0	1								
			S-1					@ 1.5m: Olive-brown to dark brown, silty CLAY, dry to moist, stiff	
161.0	2								
160.0	3								
			R-1				ML	@ 3.0m: Light olive-brown, sandy SILT with trace clay, dry to moist, stiff	DS
			B-1 @ _-						RV
[illegible].0	4								
			S-2				SC	@ 4.6m: Brown clayey SAND, dry to moist, medium dense, fine to medium-grained	
158.0	5								
157.0	6								
			R-2				SC/CL	@ 6.1m: Light brown clayey SAND, with some interlayered, stiff to hard red-brown clays, a few rootlets in clay	DS
156.0	7								
								OTAY FORMATION @ 7.6-8.1m: Light brown mottled with red-brown SILTSTONE (ML), moist, hard	
			S-3						
155.0	8							@ 8.1m: Olive-brown SILTSTONE, dry to moist, hard, massive	
154.0	9								
			R-3		13.91	34.2		@ 9.1m: Brown CLAYSTONE (CL), moist, hard, mottled with light pink-brown, blocky fractures	
153.0	10								

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-9

Date 8-17-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.0 | Location Roadway, Central Portion

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By RCS Sampled By RCS	Type of Tests
152.0	11			S-4					@ 10.7m: Light brown to light gray-brown, SILTSTONE (ML) dry to moist, hard, massive, trace of orange-brown infill on some fracture surfaces	
151.0	12			R-4					@ 12.2m: Light brown to brown silty SANDSTONE (SM), wet, dense to very dense, friable, micaceous @ 12.5m: Perched water	
150.0	13								Total Depth = 12.7m No groundwater encountered at time of drilling Backfilled with bentonite-cement slurry on 8/17/07	
'9.0	14									
148.0	15									
147.0	16									
146.0	17									
145.0	18									
144.0	19									
143.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-10

Date 8-20-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 157.7 | Location Roadway, Central Portion

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
157.7	0							ML	TOPSOIL @ 0-1.0m: Brown clayey SILT; dry to damp, loose, scattered fine roots	
156.7	1								OTAY FORMATION	
				R-1					@ 1.5m: Upper sample is light brown silty to clayey SANDSTONE (SC); moist, loose; very fine-grained; lower sample is light brown clayey SILTSTONE (ML), damp, medium stiff, rare cream-white chalky clay (caliche) pocket	AT,SA,CN
155.7	2									
154.7	3			S-1					@ 3.0m: Light brownish-gray clayey to very fine sandy SILTSTONE (ML); damp, stiff to very stiff; very finely micaceous	
153.7	4									
152.7	5			R-2		14.01	34.2		@ 4.6m: Light brownish-gray clayey SILTSTONE (ML); moist, very stiff; lacks sand noted in above samples	
151.7	6			S-2					@ 6.1m: Light brownish gray silty very fine SANDSTONE (SM); moist, medium dense, siltier lower sample	
150.7	7									
149.7	8			R-3					@ 7.6m: Upper sample brownish-gray, very fine sandy SILTSTONE (ML), moist, stiff, as above; lower sampler tip includes pinkish-gray clayey SILTSTONE. Sample disturbed (dropped) during recovery ...some water on outside of sampler	
148.7	9			R-4					@ 9.1: Light gray-brown silty CLAYSTONE (CL), slightly moist, very stiff	
147.7	10								Total Depth = 9.5m	

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-10

Date 8-20-07

Sheet 2 **of** 2

Project SR125/905 Interchange

Project No. 600158-905

Drilling Co. Tri-County Drilling

Type of Rig CME-75

Hole Diameter 0.02m **Drive Weight** 63.5 kg **Drop** 0.76m

Borehole Elevation(m) 157.7 **Location** Roadway, Central Portion

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By BJO Sampled By BJO	Type of Tests
									Ground water measured at 5.2m prior to backfill Backfilled with bentonite cement slurry on 8/20/07	
146.7	11									
145.7	12									
144.7	13									
3.7	14									
142.7	15									
141.7	16									
140.7	17									
139.7	18									
138.7	19									
137.7	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-14

Date 8-17-07
Sheet 1 of 2
Project SR125/905 Interchange
Project No. 600158-905
Drilling Co. Tri-County Drilling
Type of Rig CME-75
Hole Diameter 0.02m
Drive Weight 63.5 kg
Drop 0.76m
Borehole Elevation(m) 160.0
Location SV1 Retaining Wall

Logged By RCS
Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.0	0			B-1 @0-4				CL	TOPSOIL Dark brown CLAY, dry, hard, abundant rootlets, scattered gravel, desiccation cracks present	EI,AT,SA H
159.0	1								OTAY FORMATION @ 1.5m: Light brown to white SILTSTONE (ML), dry, loose, weakly cemented, friable, abundant carbonates, highly weathered	
				S-1						
158.0	2									
157.0	3			R-1		14.70	28.7		@ 3.0m: Light brown to light gray-brown silty SANDSTONE (SM) to SILTSTONE (ML), dry to moist, dense to very stiff, fine-grained, friable to weakly indurated	CN
156.0	4									
				S-2					@ 4.6m: Moist	
155.0	5									
154.0	6			R-2		18.03	21.6		@ 6.1m: Brown to gray-brown, sandy SILTSTONE (ML), moist, very stiff to hard, trace fine-grained sand, trace mica	TR
153.0	7									
				S-3					@ 7.6m: Light brown to white carbonate cemented zone approximately 10cm thick SANDSTONE (SM)	
152.0	8									
151.0	9			R-3		16.66	20.7		@ 9.1m: Brown to light gray-brown silty SANDSTONE (SM), moist to wet, dense to very dense, friable, fine-grained, trace mica, a few light reddish-brown interbeds	TR
150.0	10									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-14

Date 8-17-07 **Sheet** 2 **of** 2

Project SR125/905 Interchange **Project No.** 600158-905

Drilling Co. Tri-County Drilling **Type of Rig** CME-75

Hole Diameter 0.02m **Drive Weight** 63.5 kg **Drop** 0.76m

Borehole Elevation(m) 160.0 **Location** SV1 Retaining Wall

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By RCS Sampled By RCS	Type of Tests
									Total Depth = 9.5m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/17/07	
149.0	11									
148.0	12									
147.0	13									
[1]6.0	14									
145.0	15									
144.0	16									
143.0	17									
142.0	18									
141.0	19									
140.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-15

Date 8-17-07 | Sheet 1 of 2

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri-County Drilling | Type of Rig CME-75

Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m

Borehole Elevation(m) 160.2 | Location SV1 Retaining Wall, Station 13+82m, SV1 Line

Logged By RCS

Sampled By RCS

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.2	0							CL	TOPSOIL Dark brown CLAY, dry, hard, abundant rootlets	
159.2	1			B-1 @0.6-2.0m					OTAY FORMATION @ 0.6m: Light brown to light pinkish-brown silty SANDSTONE (SM), dry to moist, fine-grained, friable, massive	
158.2	2			R-1	70	15.39	9.4			DS
157.2	3			S-1	34				@ 3.0m: Light brown, moist	SA
156.2	4									
155.2	5			R-2	84/ 280mm	16.46	22.9		@ 4.6m: Brown silty SANDSTONE (SM), moist, very dense, friable, massive, fine-grained	DS
154.2	6			S-2	66/ 250mm				@ 6.1m: Light brown to gray-brown SILTSTONE (ML), dry to moist, very stiff to hard, friable	
153.2	7									
152.2	8			R-3	80/ 250mm				@ 7.6m: Gray-brown silty SANDSTONE (SM), moist, very dense, fine-grained, friable, massive	
151.2	9			S-3	77/ 250mm				@ 9.1m: Light brown silty SANDSTONE (SM), dry to moist, very dense, moderately friable, slightly micaceous, fine-grained	
150.2	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-15

Date 8-17-07 | Sheet 2 of 2

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri-County Drilling | Type of Rig CME-75

Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m

Borehole Elevation(m) 160.2 | Location SV1 Retaining Wall, Station 13+82m, SV1 Line

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By RCS Sampled By RCS	Type of Tests
									Total Depth = 9.5m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/17/07	
149.2	11									
148.2	12									
147.2	13									
146.2	14									
145.2	15									
144.2	16									
143.2	17									
142.2	18									
141.2	19									
140.2	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-16

Date 8-16-07 **Sheet** 1 **of** 2

Project SR125/905 Interchange **Project No.** 600158-905

Drilling Co. Tri-County Drilling **Type of Rig** CME-75

Hole Diameter 200mm **Drive Weight** 63.5 kg **Drop** 0.76m

Borehole Elevation(m) 160.5 **Location** SV1 Retaining Wall, Station 13+20m, SV1 Line

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.5	0			B-1 @0-1.2m				CL	TOPSOIL @ 0-1.2m: Brown silty CLAY, damp, loose; blocky texture; scattered weeds and grass roots	
159.5	1								OTAY FORMATION @ 1.5m: Light pinkish-brown silty SANDSTONE (SM), damp, medium dense, very fine-grained	
				S-1	34					AT,SA,H
158.5	2									
157.5	3			R-1	58				@ 3.0m: Trace clay content	TR
6.5	4									
155.5	5			S-2	40				@ 4.6m: Moist sample, otherwise same as above, signs of perched ground water/seepage	
154.5	6			R-2	84/ 250mm				@ 6.1m: Light gray-brown SILTSTONE (ML), moist, medium stiff; trace clay and very fine sand, including some mica; upper sampler includes weathered zone with carbonates, ground water noted on sampler	TR
153.5	7									
152.5	8			S-3	56				@ 7.6m: Olive-gray silty SANDSTONE (SM), moist to wet, medium dense; very fine-grained; friable; massive with some faint localized pinkish/reddish mottles	
151.5	9			R-3	50/ 130mm	15.33	26.5		@ 9.1m: Moist to wet, slight increase in moisture content, very dense, similar to above	
150.5	10									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-16

Date 8-16-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.5 | Location SV1 Retaining Wall, Station 13+20m, SV1 Line

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By BJO Sampled By BJO	Type of Tests
									Total Depth = 9.6m Ground water measured at 5m prior to backfill Backfilled with bentonite cement slurry on 8/16/07	
149.5	11									
148.5	12									
147.5	13									
6.5	14									
145.5	15									
144.5	16									
143.5	17									
142.5	18									
141.5	19									
140.5	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-17

Date	8-20-07	**Sheet**	1 **of** 2
Project	SR125/905 Interchange	**Project No.**	600158-905
Drilling Co.	Tri-County Drilling	**Type of Rig**	CME-75/D-120
Hole Diameter	200mm	**Drive Weight**	63.5 kg
Drop	0.76m		
Borehole Elevation(m)	160.0	**Location**	SV1 Retaining Wall, Station 12+12m, SV1 Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Sample No.	Soil Class. (U.S.C.S.)	DESCRIPTION
160.0	0		ML	TOPSOIL @ 0-1.0m: Brown clayey SILT, dry to damp, loose, no sample recovery
159.0	1			OTAY FORMATION @ 1.0m: Light brown SILTSTONE (ML), damp, medium stiff, in thin interbeds; otherwise generally light brownish-gray silty SANDSTONE (SM), damp, medium dense; fine to very fine-grained; friable
158.0	2	C-1 NR		
157.0	3	C-2 NR		@ 2.4m: Light brownish-gray silty SANDSTONE (SM), slightly moist, loose to medium dense with depth; very fine-grained; friable; homogeneous color @ 3.4-3.7m: Light brown clayey SILTSTONE (ML), damp, stiff
156.0	4	C-3		@ 4-4.3m: Faint, near horizontal bands of darker colored, gray-brown sandy SILTSTONE (ML); minor clay and mica @ 4.6-5.8m: Light brownish-gray silty SANDSTONE (SM), moist, medium dense
155.0	5	C-4		@ 5.6m: Wet
154.0	6	C-5		@ 5.8m: Grades to fine sandy SILTSTONE (ML); moist, stiff @ 6.1-7.5m: Gray-brown clayey SILTSTONE (ML); moist to wet, firm; some blocky texture/weathering; sample disturbed/split in barrel
153.0	7	C-6		
152.0	8	C-7		@ 7.5-7.8m: Light brown to red-brown silty CLAYSTONE (CL), moist, stiff @ 7.9-8m: Grades to light gray-brown silty very fine SANDSTONE (SM), very moist; medium dense, friable. Sample disturbed/split in barrel; disturbed silty sand recovered through 9.1m; very moist to wet
151.0	9	C-8		@ 9.1-10.5m: Silty to very fine SANDSTONE (SM) wet at 9.1 to 9.3m, very moist below; dense, friable; micaceous
150.0	10			

Other columns: Graphic Log, Attitudes, Blows/300mm, Dry Density (kN/m^3), Moisture Content, %, Type of Tests.

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-17

Date 8-20-07 **Sheet** 2 **of** 2
Project SR125/905 Interchange **Project No.** 600158-905
Drilling Co. Tri-County Drilling **Type of Rig** CME-75/D-120
Hole Diameter 200mm **Drive Weight** 63.5 kg **Drop** 0.76m
Borehole Elevation(m) 160.0 **Location** SV1 Retaining Wall, Station 12+12m, SV1 Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				C-8						
149.0	11			C-9					@ 10.5 and 11.0m: Thin interbeds of gray-brown very fine sandy SILTSTONE (ML), intact sample segments, moist, firm to stiff; trace clay; horizontal orientation for gradational contacts	
148.0	12			R-1	50/ 130mm				@ 11.9m: Sampler tip is light gray silty very fine SANDSTONE (SM), damp, very dense with some weak cementation; very fine-grained. End continuous core sampling at 12.0m @ 12.2m: Light gray-brown silty very fine SANDSTONE (SM), moist, very dense; very finely micaceous	
147.0	13									
6.0	14			S-1	50/ 130mm				@ 13.7m: Light gray-brown clayey SILTSTONE (ML), moist, very stiff; red-brown coloraton mid-sample	
145.0	15			R-2	50/ 130mm				@ 15.2m: Light brownish-gray silty very fine SANDSTONE (SM); moist, very dense; friable, massive	
144.0	16									
143.0	17			S-2	71/ 230mm				@ 16.7m: Light brown clayey SILTSTONE (ML), moist, stiff to very stiff; minor very fine sand in upper sample	
142.0	18			R-3	50/ 130mm				@ 18.2m: Light brown silty CLAYSTONE (CL), moist, very stiff; less silty in lower sample	TR
141.0	19								Total Depth = 18.6m Ground water measured at 7.9m prior to backfill Backfilled with bentonite cement slurry on 8/22/07 Note: continuously sampled at 1.5 to 12.0m	
140.0	20									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-18

Date 8-15-07 | Sheet 1 of 1

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri-County Drilling | Type of Rig CME-75

Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m

Borehole Elevation(m) 160.0 | Location Roadway, Southeast Portion

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.0	0							TOPSOIL @ 0-1.0m: Brown silty CLAY, moist, soft; medium plasticity; minor fine roots	EI,AT,SA
			B-1				CL-ML		
159.0	1							OTAY FORMATION	
			S-1					@ 1.5m: Light gray silty SANDSTONE (SM); damp, medium dense; very fine-grained; homogeneous; only slightly weathered	
158.0	2								
157.0	3		R-1		16.00	25.0		@ 3.1m: Light gray-brown silty SANDSTONE (SM), moist medium dense; very fine-grained; local pocket of cream-colored caliche and sand in upper sampler	
156.0	4								
			S-2					@ 4.6m: Light gray very fine sandy SILTSTONE to silty SANDSTONE (MC/SM); moist, medium dense; generally finer-grained than above	
155.0	5								
154.0	6		R-2					@ 6.1m: Light pinkish-brown silty CLAYSTONE (CL); moist, very stiff, medium to high toughness, with somewhat waxy texture. Siltier upper sample	
								Total Depth 6.5m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/15/07	
153.0	7								
152.0	8								
151.0	9								
150.0	10								

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-19

Date 8-16-07 | Sheet 1 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.0 | Location SB Connector Flyover, Station 14+04m, Left 9m of S Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
160.0	0							SM	TOPSOIL Dark brown silty CLAY, dry, firm, blocky, dessicated, with open cracks, scattered rootlets	
159.0	1								OTAY FORMATION	
				R-1	95/ 230mm				@ 1.5m: Light brown silty SANDSTONE (SM), dry to moist, medium to very dense; very fine-grained; massive	SA,TR
158.0	2									
157.0	3			S-1	46				@ 3.0m: Becomes moist, medium dense	SA
156.0	4									
				R-2	90/ 280mm	15.29	25.6		@ 4.6m: Some moisture on outer sampler, otherwise same as above; faint bedding/lamination with 5°-7° dip in sampler tip	DS
155.0	5									
154.0	6			S-2	78				@ 6.1m: Light brown clayey SILTSTONE (ML), moist, very stiff	SA
153.0	7									
				S-3	76				@ 7.6m: Light gray-brown silty SANDSTONE (SM), very moist, dense; very fine-grained; faint red-brown stained zone in upper sample	
152.0	8									
151.0	9			R-3	50/ 130mm	15.73	23.5		@ 9.0m: Water accumulating in boring @ 9.1m: Slightly coarser-grained (very fine- to fine-grained); moist to wet, very dense	CR
150.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-19

Date 8-16-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.0 | Location SB Connector Flyover, Station 14+04m, Left 9m of S Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-4	50/ 130mm				@ 10.7m: Silty SANDSTONE (SM), moist, very dense; friable, very fine-grained	SA
149.0	11									
148.0	12			R-4	50/ 76mm	16.46	22.0		@ 12.2m: Massive	
147.0	13									
				S-5	50/ 250mm				@ 13.7m: Light brown clayey SILTSTONE (ML) to silty CLAYSTONE (CL), moist, very stiff; generally massive, with pinkish coloration locally	
6.0	14									
145.0	15			R-5	50/ 76mm	16.48	22.3		@ 15.2m: Light brownish-gray very fine sandy SILTSTONE (ML), moist, very stiff to hard; very fine miaca; trace clay content	
144.0	16									
				S-6	50/ 130mm				@ 16.7m: Light brown silty CLAYSTONE (CL), moist, very stiff	
143.0	17									
142.0	18			R-6	85/ 280mm	101.90	59.4		@ 18.2m: Upper sample is light brown silty CLAYSTONE (CL), lower sample is pinkish-gray CLAYSTONE (CH), moist, very stiff; very waxy/bentonite continuous through sampler tip	TR
141.0	19									
140.0	20			S-7	50/				@ 19.8m: Light brownish-gray very fine sandy SILTSTONE (ML),	

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-19

Date 8-16-07 | Sheet 3 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.0 | Location SB Connector Flyover, Station 14+04m, Left 9m of S Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
					130mm				moist, very stiff; friable	
139.0	21								@ 21m: Water noted in boring	
				R-7	50/ 100mm	15.78	22.5		@ 21.3m: Light brown silty CLAYSTONE (CL), moist, very stiff to hard; well indurated; massive, weakly fissile along planes of 4°-6°	TR
138.0	22									
137.0	23			S-8	88/ 280mm				@ 22.9m: Light brown silty CLAYSTONE (CL) to clayey SILTSTONE (ML), moist; very stiff; generally more clay content in upper sample; local red-brown stained zone; generally not as waxy as above	CR
'6.0	24									
				S-9	70				@ 24.4m: Light brown and light red-brown silty CLAYSTONE (CL); moist, very stiff to hard	CR
135.0	25								Total Depth = 24.8m Ground water measured at 4.6m prior to backfill Backfilled with bentonite cement slurry on 8/16/07	
134.0	26									
133.0	27									
132.0	28									
131.0	29									
130.0	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-20

Date 8-15-07 **Sheet** 1 **of** 1

Project SR125/905 Interchange **Project No.** 600158-905

Drilling Co. Tri-County Drilling **Type of Rig** CME-75

Hole Diameter 0.02m **Drive Weight** 63.5 kg **Drop** 0.76m

Borehole Elevation(m) 161.0 **Location** Flyover Retaining Wall

Logged By BJO

Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
161.0	0							CL	TOPSOIL @ 0-1.0m: Brown silty CLAY, moist, soft; evidently plowed/disturbed in upper 0.5m; color gradually lightens with depth	
160.0	1								OTAY FORMATION	
159.0	2			R-1		14.31	29.5		@ 1.5m: Light brown silty SANDSTONE (SM) and sandy SILTSTONE (ML) with CLAY (ML); moist, medium dense/stiff; some weathering with threads/pockets of cream colored caliche/silt throughout	CN
158.0	3			S-1					@ 3.0m: Light olive-gray sandy SILTSTONE; damp, stiff to very stiff; micaceous; minor clay locally	
7.0	4									
156.0	5			R-2		16.86	20.6		@ 4.6m: Brownish-gray SANDSTONE, moist to wet, medium dense; silty and very fine-grained upper sample, fine- to medium-grained in lower sample/tip	DS
155.0	6			S-2					...ground water noted, likely perched @ 6.1m: Light olive-gray clayey SILTSTONE (ML), very moist; very stiff; some diffuse, subhorizontal lamination with mica and very fine sand	
154.0	7									
153.0	8			S-3					@ 7.6m: Sandier than above, wet sample @ 9.1m: Light olive-gray silty SANDSTONE (SM), moist (not wet), very dense; very fine-grained; micaceous; weak cementation locally	
152.0	9			R-3					Total Depth = 9.5m Ground water noted at approximately 5-8m Measured at 3.7m prior to backfill Backfilled with bentonite cement slurry on 8/15/07	CN
151.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-21

Date: 8-15-07 | Sheet 1 of 1

Project: SR125/905 Interchange | Project No.: 600158-905

Drilling Co.: Tri-County Drilling | Type of Rig: CME-75

Hole Diameter: 0.02m | Drive Weight: 63.5 kg | Drop: 0.76m

Borehole Elevation(m): 162.0 | Location: Flyover Retaining Wall

Logged By: BJO

Sampled By: BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
162.0	0							SC	TOPSOIL Brown silty to sandy CLAY, dry to damp, firm; some grass roots	
									OTAY FORMATION	
161.0	1									
				R-1		16.86	16.0		@ 1.5m: Light brown silty SANDSTONE (SM), moist, very dense; very fine-grained; weathered with some light gray and pinkish coloration locally; some threads of sandy caliche	EI,RV,DS, AT,SA,CR
160.0	2			B-1 @ -						
159.0	3			S-1					@ 3.1m: Gray silty SANDSTONE (SM), moist, very dense, very fine-grained; friable; less weathered than above	
158.0	4									
				R-2		16.85	18.9		@ 4.6m: Very dense to hard; friable with some local weak cementation	
157.0	5									
156.0	6			S-2					@ 6.1m: Light gray SANDSTONE (SM), moist, very dense; very fine-grained; minor silt and clay content; pinkish stain to individual grains	
155.0	7									
									@ 7.6m: Light pinkish-gray silty to clayey SANDSTONE (SC), moist, very dense; very fine-grained as above; micaceous	
154.0	8			R-3						
									@ 9.1m: Grades to very fine sandy SILTSTONE (ML); clayier towards sampler tip; otherwise as above	
153.0	9			S-3						
									Total Depth = 9.5m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/15/07	
152.0	10									

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-22

Date 8-22-07 | Sheet 1 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.5 | Location Airway Road Ramp Undercrossing, Station 11+94m, Left 4m of SV2 Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
163.5	0							SM	TOPSOIL @ 0-1.0m: Brown sandy to clayey SILT, dry to damp, loose to firm locally; some scattered subangular gravel (road base?) near surface	
162.5	1								OTAY FORMATION @ 1.5-2.0m: Sample includes brown sandy SILTSTONE, dry to damp, loose/soft (very weathered)	
				NR					@ 2.1m: Light gray silty to clayey fine-grain SANDSTONE (SM); damp, loose to medium dense; highly weathered with abundant carbonate to 3.5 depth	
161.5	2									
				C-1						
160.5	3									
				C-2					@ 3.6m: Light gray-brown very fine sandy to clayey SILTSTONE (ML), moist, firm; increase induration below 4.4m	
9.5	4									
				NR						
158.5	5									
				C-3					@ 4.9-6.1m: Light brown very fine sandy SILTSTONE (ML) to silty fine SANDSTONE (SM), damp, medium dense/stiff; sample disturbed; scattered fine white sand grains noted in upper sample; generally sandy (similar) through 7.2m; generally disturbed in sampler	
157.5	6									
				C-4						
156.5	7								@ 7.2-8.5m: Near horizontal thin layers (varves) of light brown clayey SILTSTONE (ML); otherwise light brownish-gray silty SANDSTONE (SM); damp, medium dense; very fine-grained	
				NR						
155.5	8									
				C-5					@ 8.5-9.8m: Light gray-brown sandy SILTSTONE (ML); moist, firm; weakly indurated	
154.5	9									
				C-6					@ 9.2-10.2m: Carbonate SILTSTONE, damp, firm; crumbly texture to	
153.5	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-22

Date 8-22-07 | Sheet 2 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.5 | Location Airway Road Ramp Undercrossing, Station 11+94m, Left 4m of SV2 Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				C-6					sample, highly weathered @ 10.2m: Varved very fine sandy to clayey SILTSTONE, damp to moist, stiff, similar appearance to strata at 8.0m	
152.5	11			C-7					@ 10.7m-12.2m: Light gray-brown silty very fine SANDSTONE, damp to moist; medium dense; locally clayey along diffuse horizontal bands in lower sample	
151.5 ▽	12								End continuous core sampling at 12.2m. Resume drilling 8/23, note water accumulated in boring overnight	
150.5	13									
9.5	14			S-1	30				@ 13.7m: Gray silty to very fine sandy CLAYSTONE (CH), moist, very stiff; includes white, waxy (bentonite) zone in 6-8 cm wide band, through middle of sample	
148.5	15			R-1	94/ 250mm	16.74	21.4		@ 15.2m: Olive-gray very fine sandy CLAYSTONE (CH) with silt; moist, very stiff to hard	
147.5	16									
146.5	17			S-2	50/ 130mm				@ 16.7m: Grades to clayey very fine-grained SANDSTONE (SC) to clayey SILTSTONE (ML) with sand, moist, hard; appears to coarsen slightly with depth	
145.5	18			R-2	50/ 130/mm	15.11	18.2		@ 18.2m: Light olive-gray silty SANDSTONE (SM), moist, very dense to hard; very fine-grained with minor clay; friable with weak cementation	
144.5	19				280mm					
143.5	20								@ 19.8m: Slight increase in clay content in tip	

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-22

Date 8-22-07 | Sheet 3 of 3
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig CME-75
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.5 | Location Airway Road Ramp Undercrossing, Station 11+94m, Left 4m of SV2 Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-3	90/					
				S-3	90/					
142.5	21									
				R-3	50/ 150mm	15.65	25.2		@ 21.3m: Light brown silty CLAYSTONE (CL), moist, very stiff to hard; medium plasticity; trace silt and very fine-grained sand locally	
141.5	22									
140.5	23			S-4	40				@ 22.9m: Gray CLAYSTONE (CH), moist, stiff; whitish zone, 4-5 cm wide, of bentonite material through center of sample; light pinkish-brown in upper sample	
139.5	24								@ 24.4m: Light brown clayey SILTSTONE (ML), moist very stiff to hard; massive	
				R-4	50/ 130mm					
138.5	25								Total Depth = 24.8m Ground water measured at 12.1m prior to backfill Backfilled with bentonite cement slurry on 8/23/07	
137.5	26									
136.5	27									
135.5	28									
134.5	29									
133.5	30									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-26

Date 8-23-07 | Sheet 1 of 1
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri-County Drilling | Type of Rig D-120
Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 163.0 | Location Roadway North of Otay Mesa Road

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m^3)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
163.0	0							ML	0-0.2m: Reworked fills and topsoil, related to nearby road construction in progress; damp, firm; scattered road base gravel	
									OTAY FORMATION @ 0.6m: Light gray clayey to very fine sandy SILTSTONE; damp, medium stiff; very weathered with caliche threads and pockets throughout	
162.0	1			S-1						
				R-1		15.43	14.7		@ 1.5m: Light gray very fine sandy SILTSTONE; damp, medium dense; still slightly weathered with minor clay and caliche locally; micaceous	
161.0	2									
160.0	3			S-2					@ 3.0m: Light gray-brown SILTSTONE with minor clay and very fine sand; stiff to very stiff but crumbles easily, as above	
159.0	4									
				R-2		15.12	14.4		@ 4.6m: Light gray to light gray-brown SILTSTONE and very fine sandy SILTSTONE; damp, very stiff; somewhat fissile along horizontal planes; well indurated with some cementation; light brown band/varve? in sampler tip	
158.0	5									
157.0	6			S-3					@ 6.1m: Light gray-brown clayey SILTSTONE, damp, very stiff; clayier upper sample; very finely micaceous	
									Total Depth = 6.5m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/23/07	
156.0	7									
155.0	8									
154.0	9									
153.0	10									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

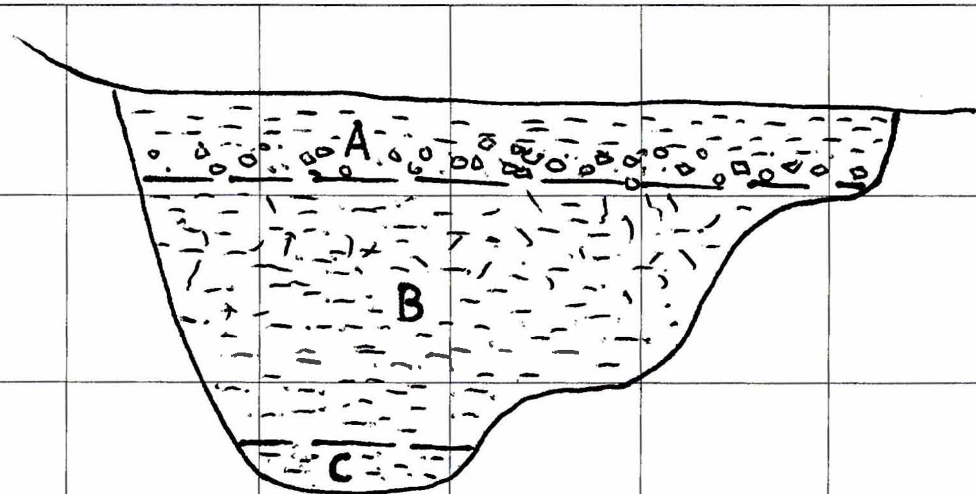
LEIGHTON

LOG OF TRENCH: TP-1

Project Name: SR125/905 Interchange	Logged by: BJO	ENGINEERING PROPERTIES			
Project Number: 600158-905	Elevation: ±159.0m				
Equipment: Backhoe	Location/Grid:				

ATTITUDES	DATE: 8/24/07 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL - undocumented	Afu		CL/ML		
	A @ 0-0.2m: Brown Silty CLAY, damp, firm @ 0.2m-0.4m: Layer of subangular gravel, 2-5cm maximum; little or no fines; road gravel					
	TOPSOIL/COLLUVIUM	To				
	B @ 0.4-1.9m: Dark brown Silty CLAY, grades to orange-brown with depth; moist; soft, becoming firm below approximately 1.0m					
	OTAY FORMATION					
	C @ 1.9-2.2m: Grades light pinkish brown to gray Clayey SILTSTONE (ML) with minor sand, moist, firm; scattered caliche threads/pockets. Bulk sample taken at 1.8-2.0m			B-1		

GRAPHICAL REPRESENTATION: West Wall SCALE: 1"=1.0 meter SURFACE SLOPE: 0° TREND: N05E



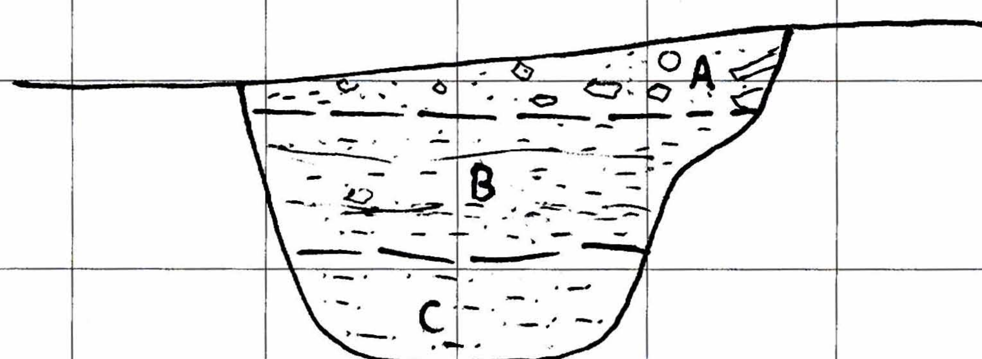
Total Depth = 2.2 Meters
No Ground Water Encountered
Backfilled: 8/24/07

LOG OF TRENCH: T[illegible]

Project Name: SR125/905 Interchange	Logged by: BJO	ENGINEERING PROPERTIES
Project Number: 600158-905	Elevation: ±164.0m	
Equipment: Backhoe	Location/Grid: Roadway-Northern Portion	

GEOLOGIC ATTITUDES	DATE: 8/24/07 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu	ML			
	A @ 0-0.4m: Uncompacted surficial lift(s) of gray SILT with some sand and clay; dry to damp, soft/loose; unprocessed; includes occasional construction debris, wood plank, PVC fragment, concrete clast					
	B @ 0.4m-1.0m: Generally light gray and light gray-brown Sandy and Clayey SILT, moist, firm; lifts generally 10-20cm thick. Bulk sample B-1 taken at 0.8-1.0m			B-1		
	C @ 1.0-1.5m: Generally light brownish-gray and olive-gray clayey SILT, moist, firm; appears more homogeneous than above					

GRAPHICAL REPRESENTATION: Northwest Wall SCALE: 1"=1.0 meter SURFACE SLOPE: 5° TREND: N45W



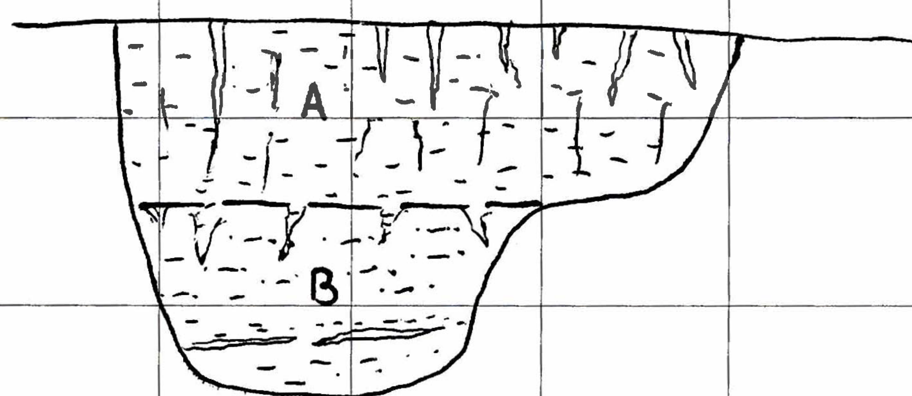
Total Depth = 1.5 Meters
No Ground Water Encountered
Backfilled: 8/24/07

LOG OF TRENCH: TP-4

Project Name: SR125/905 Interchange	Logged by: BIO	ENGINEERING PROPERTIES
Project Number: 600158-905	Elevation: ±159.0m	
Equipment: Backhoe	Location/Grid: Roadway-Central Portion	

GEOLOGIC ATTITUDES	DATE: 8/24/07 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	To	CL			
	A @ 0-1.1m: Dark brown Silty CLAY, dry to damp, loose/soft with open surface cracks to 0.5m; moist and tighter below 0.5m					
	OTAY FORMATION					
@1.7m GB: N20W 5-10SW	B @1.1-2.0m: Light olive-gray very fine Sandy SILTSTONE to silty SANDSTONE (SM), moist, generally medium dense/firm; some soft weathered pockets, generally vertically oriented, through 1.6m; some discontinuous wavy layers of rust-colored clayey sand bone-white caliche generally dip southwest; digs stiff at 1.8-2.0m. Bulk sample B-1 taken at 1.1-1.3m			B-1		

GRAPHICAL REPRESENTATION: Northwest Wall SCALE: 1"=1 meter SURFACE SLOPE: 0° TREND: N45W



Total Depth = 2.0 Meters
No Ground Water Encountered
Backfilled: 8/24/07

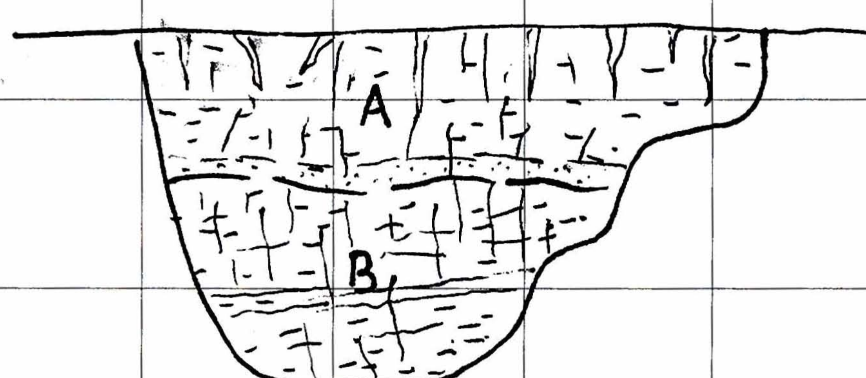
LOG OF TRENCH: TP-

Project Name: SR125/905 Interchange | Logged by: BJO
Project Number: 600158-905 | Elevation: ±160.0m
Equipment: Backhoe | Location/Grid: SV1 Retaining Wall

ENGINEERING PROPERTIES

GEOLOGIC ATTITUDES	DATE: 8/24/07 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	To				
	A @ 0-0.6m: Dark brown Silty CLAY (CL), dry to damp, loose; desiccated with open cracks through 0.4m; scattered fine root hairs throughout. Bulk sample taken at 0-0.5m		B-1			
	@ 0.6-0.7m: Irregular layer of light brown Silty CLAY, damp, loose; continuous around trench; abundant caliche throughout layer					
	OTAY FORMATION					
	B @ 0.7-1.8m: Generally light gray Clayey SILTSTONE(ML-CL), damp, firm; weathered with abundant fractures through 1.5m; thin bed/layer of light pinkish brown silt and caliche is continuous across trench, dipping southwest					

GRAPHICAL REPRESENTATION: Northeast Wall SCALE: 1"=1 meter SURFACE SLOPE: 0° TREND: N65W



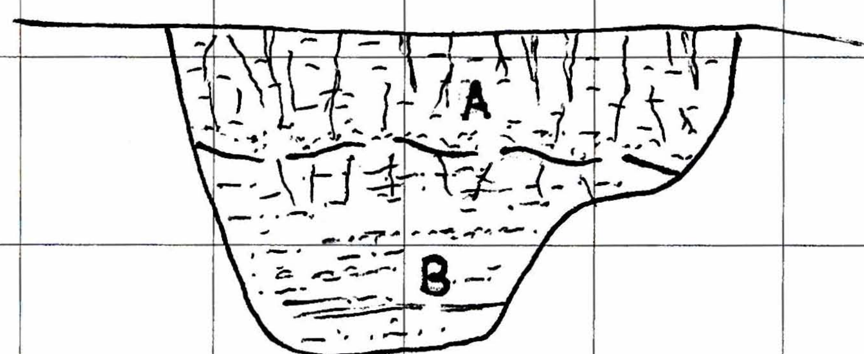
Total Depth =1.9 Meters
No Ground Water Encountered
Backfilled: 8/24/07

LOG OF TRENCH: TP-

Project Name: SR125/905 Interchange	Logged by: BJO	ENGINEERING PROPERTIES	
Project Number: 600158-905	Elevation: ±159.5m		
Equipment: Backhoe	Location/Grid: SB Flyover		

ATTITUDES	DATE: 8/24/07 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	To				
	A @ 0-0.7m: Dark brown Silty CLAY, dry to damp, becoming moist below 0.4m; firm; open fractures and fine roots throughout; caliche pockets along lower contact, as in TP-5					
	OTAY FORMATION					
@1.3m GB: M30-40W 5-10SW	B @ 0.7-1.6m: Green-gray clayey to very fine Sandy SILTSTONE (SM), damp, stiff; some weathering and fracturing through 1.0m; tight and indurated (weakly cemented) below; some thin bedding dip gently southwest, with red-brown (rust) and light brown (caliche) lining, irregular and wavy. Bulk sample taken at 0.8-1.0m			B-1		

GRAPHICAL REPRESENTATION: North Wall SCALE: 1"=1 meter SURFACE SLOPE: 0° TREND: N70W

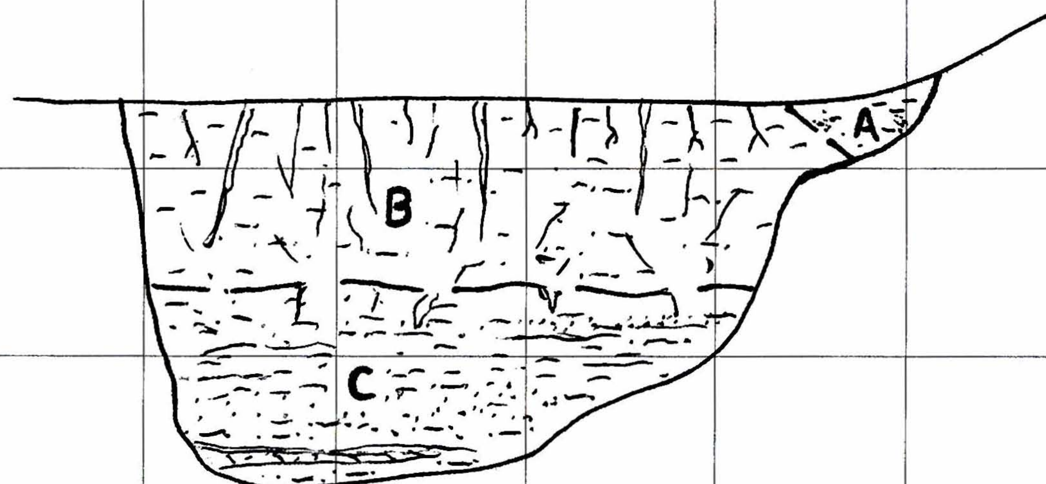


Total Depth = 1.6 Meters
No Ground Water Encountered
Backfilled: 8/24/07

LOG OF TRENCH: TI-

Project Name: SR125/905 Interchange		Logged by: BJO		ENGINEERING PROPERTIES			
Project Number: 600158-905		Elevation: ±162.5m					
Equipment: Backhoe		Location/Grid: Flyover Retaining Wall					
GEOLOGIC ATTITUDES	DATE: 8/24/07 DESCRIPTION:		GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL - undocumented A @ 0.2m (at far upper-right end of trench), dark brown Silty CLAY, moist, firm; reworked topsoil, with scattered light gray silt clasts/pockets		Afu	CL			
	TOPSOIL B @ 0-1.0m: Dark brown silty CLAY (CL); damp to moist, firm; open fractures and root hairs to 0.3m; scattered small white (caliche) specs at 0.5-1.0m. Bulk sample taken at 0.8-1.2m (topsoil and weathered bedrock mixture)		To		B-1		
	OTAY FORMATION C @ 1.0-2.1m: Yellow-brown sandy SILTSTONE (ML layered with light green- gray silty SANDSTONE (SM), moist, soft; crumbles easily; generally subtle west dip to layers 5 degrees or flatter; generally sandier with depth, with some weak cementation locally @ 1.9m: Near horizontal lense of bone-white caliche and clayey SILT, thickens to west. Bulk sample B-2 taken at 1.9-2.0m				B-2		

GRAPHICAL REPRESENTATION: North Wall SCALE: 1"=1 meter SURFACE SLOPE: 0° TREND: N80E



Total Depth = 2.0 Meters
No Ground Water Encountered
Backfilled: 8/24/07

APPENDIX C

Laboratory Test Results and Procedures

Dry Density and Moisture Content

The dry density and moisture content of selected rings samples was determined in accordance with ASTM Test Methods D 2216 and D 2937. The results of these tests are presented summarized on the boring logs.

"R"-Value (Caltrans CT301):

The resistance "R"-value was determined by the California Materials Method CT301 for 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.

Location/Sample	Depth (m)	Sample Description	R-Value
B-9, B-1	3.4-4.6	Pale Gray Lean CLAY	9
B-21, B-1	1.8-3.0	Light Olive Brown Sandy Lean CLAY	20
TP-3, B-1	0.8-1.0	Light Brown Clayey SAND with Gravel	43

Maximum Density Tests: The maximum density and optimum moisture content of typical materials were determined in accordance with CT 216 and CT 226. The results of these tests are presented in the table below:

Location/ Sample	Depth (m)	Maximum Dry Density (kN/m^3)	Optimum Moisture Content (%)
B-2, B-1	1.5-3.0	17.8	16.9
B-4, B-1	0.3-1.5m	16.6	19.7

APPENDIX C (Continued)

Particle Size Analysis

Particle size analysis was performed by mechanical sieving or by sieve and hydrometer methods according to ASTM D422 and CT202. The percent fine particles from these analyses are summarized below. Plots of the sieve and hydrometer results are provided on the particle-size curves in this appendix.

Location / Sample	Depth (m)	% Passing No. 200 Sieve
B-1, B-1	0.3-1.5	89
B-1, S-1	3.0-3.4	64
B-1, S-3	9.1-9.4	75
B-2, S-4	10.7-11.1	100
B-2, S-6	16.8-17.2	99
B-2, S-8	22.9-23.2	64
B-3, S-1	4.6-5.0	36
B-3, S-3	10.7-11.1	55
B-4, B-1	0.3-1.5	85
B-4, S-1	3.0-3.4	99
B-4, S-3	7.6-7.9	68
B-5, B-1	1.5-3.0	64
B-7, R-1	1.5	80
B-10, R-1	1.5	52
B-14, B-1	0-1.2	76
B-15, S-1	3.0	28
B-16, S-1	1.5	31
B-18, B-1	0-1.0	68
B-19, R-1	1.5	27
B-19, S-1	3.0	44
B-19, S-2	6.1	84
B-19, S-4	10.7	36
B-21, B-1	1.8-3.0	56
TP-1, B-1	0.6-1.0	74
TP-3, B-1	0.8-1.0	45
TP-5, B-1	0-0.5	66

APPENDIX C (Continued)

Atterberg Limits

Atterberg Limits of selected samples were determined in accordance with ASTM Test Method D4318 and CT 204 for engineering classification of the fine-grained materials and presented on the table below. The results are also incorporated in the particle-size results for classification purposes.

Location/ Sample	Depth (m)	Plasticity Index	Liquid Limit (%)	Plastic Limit (%)	USCS Soil Classification
B-1, S-1	3.0-3.4	-	-	NP	ML
B-1, S-3	9.1-9.4	16	46	30	ML
B-2, S-4	10.7-11.1	45	79	34	CH
B-4, B-1	0.3-1.5	13	36	23	CL
B-7, R-1	1.5	15	41	26	CL
B-8, S-2	4.6	11	41	30	ML
B-10, R-1	1.5	23	41	18	CL
B-14, B-1	0-1.2	22	42	20	CL
B-16, S-1	1.5	5	31	26	ML
B-18, B-1	0-1.0	29	49	20	CL
B-21, B-1	1.8-3.0	15	36	21	CL
TP-1, B-1	0.6-1.0	35	56	21	CHs
TP-1, B-2	1.8-2.0	32	43	11	CL
TP-3, B-1	0.8-1.0	9	34	25	ML
TP-5, B-1	0-0.5	29	14	14	CL

APPENDIX C (Continued)

Consolidation Tests

Consolidation tests were performed on selected, relatively undisturbed ring samples in accordance with Modified ASTM Test Method D2435. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented on the attached figures. Where applicable, time-rates of consolidation were recorded and presented below:

Location / Sample	Depth (m)	Coefficient of Compression Index Cc	Coefficient of Recompression Index Cr
B-1, R-1	1.5-1.8	0.14	0.04
B-2, R-2	6.1-6.3	0.07	0.02
B-3, R-1	3.0-3.4	0.06	0.02
B-3, R-2	6.1-6.4	0.06	0.02
B-4, R-3	9.1-9.4	0.07	0.02
B-4, R-5	16.8-17.1	0.08	0.03
B-7, R-1	1.5	0.08	0.02
B-10, R-1	1.5	0.12	0.01
B-14, R-1	3.0	0.11	0.04
B-20, R-1	1.5	0.06	0.01
B-20, R-3	9.1	0.05	0.02

APPENDIX C (Continued)

Expansion Index

The expansion potential of selected materials was evaluated by the Expansion Index Test ASTM D 4829. Specimens are molded under a given compactive energy near 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.

Location / Sample	Depth (m)	Expansion Index	Expansion Potential
B-1, B-1	1.0-5.0	92	High
B-4, B-1	0.3-1.5	107	High
B-14, B-1	0.0-1.2	154	Very High
B-18, B-1	0.0-1.0	167	Very High
B-21, B-1	1.8-3.0	107	High
TP-1, B-1	0.6-1.0	174	Very High
TP-1, B-2	1.8-2.0	62	Medium
TP-3, B-1	0.8-1.0	64	Medium
TP-5, B-1	0.0-0.5	47	Low
TP-6, B-1	0.8-1.0	18	Very Low

APPENDIX C (Continued)

pH and Resistivity

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

Location / Sample	Depth (m)	pH	Minimum Resistivity (ohm-cm)
B-1, B-1	0.3-1.5	7.9	1850
B-1, R-4	10.7-11.0	7.9	1507
B-2, R-8	24.4-24.5	8.2	2672
B-4, B-1	0.3-1.5	7.9	2603
B-19, R-3	9.1	8.1	2398
B-19, S8&S9	22.9-24.4	8.1	3151
B-21, B-1	1.8-3.0	7.5	2398
TP-1, B-1	0.6-1.0	8.0	3151
TP-3, B-1	0.8-1.0	7.7	2398

APPENDIX C (Continued)

Soluble Sulfate

The soluble sulfate contents contained within selected samples of soil were determined by California Test Method 417. The test results are presented in the table below:

Location / Sample	Depth (m)	Soluble Sulfates (ppm)
B-1, B-1	0.3-1.5	600
B-1, R-4	10.7-11.0	<150
B-2, R-8	24.4-24.5	150
B-4, B-1	0.3-1.5	180
B-19, R-3	9.1	<150
B-19, S8&S9	22.9-24.4	<150
B-21, B-1	1.8-3.0	450
TP-1, B-1	0.6-1.0	300
TP-3, B-1	0.8-1.0	270

APPENDIX C (Continued)

Chloride Content

Chloride content within selected samples was determined by California Test Method 422. The test results are presented in the table below:

Location / Sample	Depth (m)	Chloride Content (ppm)
B-1, B-1	0.3-1.5	1980
B-1, R-4	10.7-11.0	642
B-2, R-8	24.4-24.5	647
B-4, B-1	0.3-1.5	120
B-19, R-3	9.1	1510
B-19, S8&S9	22.9-24.4	435
B-21	1.8-3.0	680
TP-1, B-1	0.6-1.0	200
TP-3, B-1	0.8-1.0	1730

Collapse Potential

Collapse testing of undisturbed and remolded samples was performed in accordance with ASTM D5333 at the load indicated in the table below on select samples to assess collapse potential.

Location / Sample	Depth (m)	Sample Type	Test Load (kPa)	Degree of Specimen Collapse
B-2, B-1	1.5-3.0	Remolded 95% of CT 216	117	None
B-4, R-1	1.5-1.8	Ring	151	None
B-4, R-2	4.6-4.9	Ring	201	None

APPENDIX C (Continued)

Swell

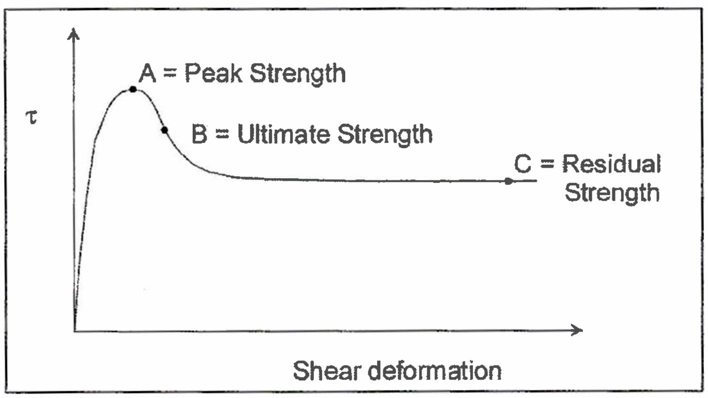
Swell testing of undisturbed and remolded samples was performed in accordance with ASTM D4546 on select samples to assess swell.

Location / Sample	Depth (m)	Sample Type	Vertical Pressure (kPa)	Swell (%)
B-1, R-1	1.5-1.8	Ring	52.2	0.19
B-2, R-2	6.1-6.3	Ring	52.2	-0.07
B-3, R-1	3.0-3.4	Ring	52.2	0.00
B-3, R-2	6.1-6.4	Ring	52.2	0.20
B-4, R-3	9.1-9.4	Ring	52.2	0.74
B-4, R-5	16.8-17.1	Ring	52.2	0.29
B-7, R-1	1.5	Ring	33.5	0.05
B-10, R-1	1.5	Ring	29.4	0.42
B-14. R-1	3.0	Ring	57.5	-0.60
B-20. R-1	1.5	Ring	33.5	0.11

APPENDIX C (Continued)

Direct Shear

Direct shear tests were performed in accordance with ASTM D3080 on selected samples that were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus. The rate of shearing used for the tests was between 0.0043 cm/min and 0.0084 cm/min, depending on material type. Plots of the individual test results are provided within this appendix along with composite summary plots of the tests. Strength envelopes are provided on each of the individual plots. Those envelopes correspond to the peak shear resistance and the shear resistance at the end of the test. The graphic below illustrates the summarized points.



APPENDIX C (Continued)

Consolidated Undrained Triaxial

Consolidated undrained triaxial compression tests were performed in accordance with ASTM D4767. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The samples were then saturated by applying a back pressure. The axial load and chamber pressure were increased in small increments until the change in chamber pressure was within tolerance to the measured change in sample pore fluid pressure, indicating that the sample was fully saturated. Once the sample was fully saturated and had completed primary consolidation, the samples were loaded axially strain rates between 0.15 and 0.23 cm/min. Total and effective strength Mohr cycles are provided on the plot summaries in this appendix. The coefficient of consolidation is summarized below.

Location / Sample	Depth (m)	Coefficient of Consolidation (m2/yr)
B-2, R-1	3.0-3.4	1044
B-2, R-3	9.1-9.3	451
B-2, R-5	15.2-15.4	179
B-4, R-6	19.8-20.1	725
B-4, R-7	24.4-24.7	1586
B-19, R-6	18.3	58
B-19, R-7	21.3	331

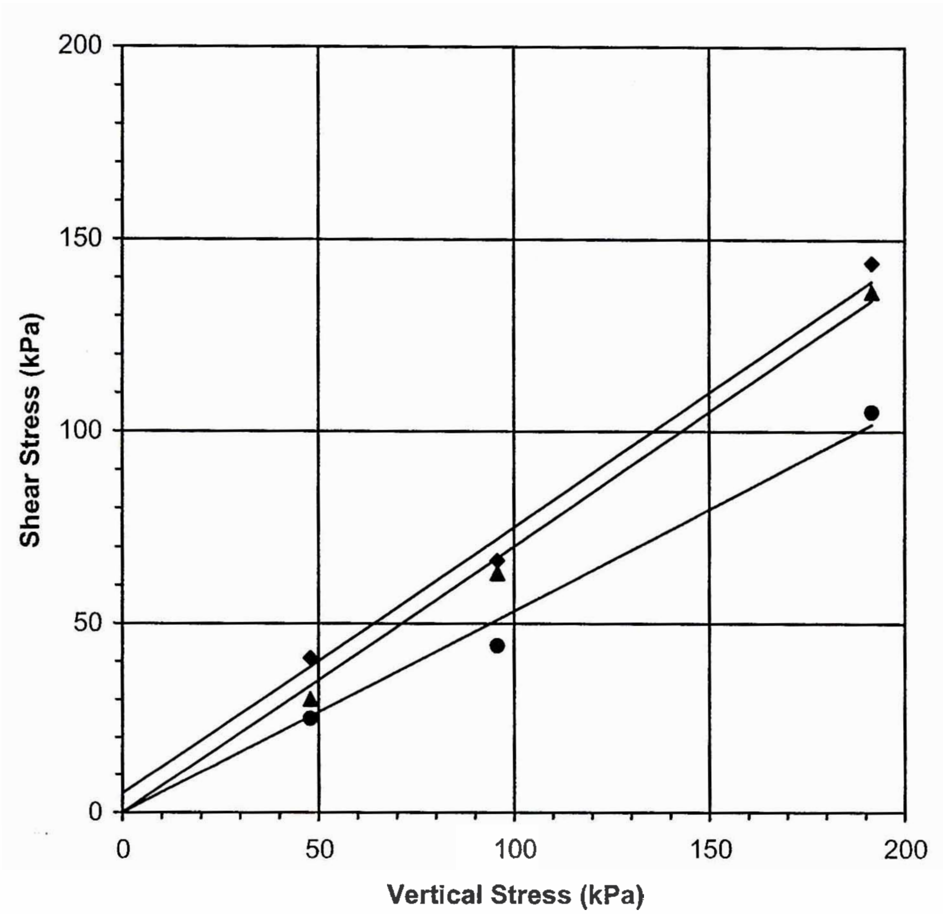
Unconsolidated Undrained Triaxial

Unconsolidated undrained triaxial compression tests were performed in accordance with ASTM D2850. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The samples were then saturated by applying a back pressure. The axial load and chamber pressure were increased in small increments until the change in chamber pressure was within tolerance to the measured change in sample pore fluid pressure, indicating that the sample was fully saturated. Once the sample was fully saturated, the samples were loaded axially strain rates between 0.15 and 0.23 cm/min.

APPENDIX C (Continued)

Unconfined Compressive Strength

Unconfined compressive tests were performed in accordance with ASTM D2166. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The axial load was then increased in small increments with associated strain rates between 1/2 and 2.0 %/min.



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-1	**R-2**	**4.6 - 4.9**	**ML**	**5**	**35**	**0**	**35**	**0**	**28**
Sample Description: Gray-brown clayey siltstone									

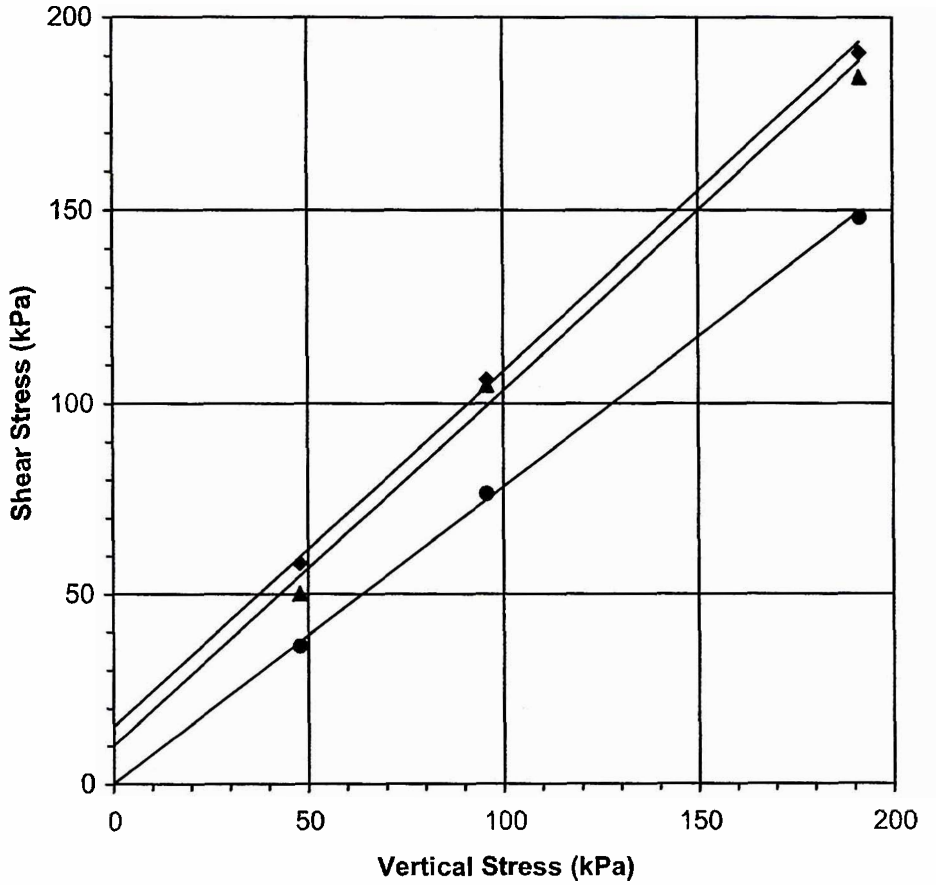
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Location	Sample No.	Depth (m)	USCS	Interpreted Shear Strength: Peak – Cohesion (kPa)	Peak – Friction Angle (deg)	Ultimate – Cohesion (kPa)	Ultimate – Friction Angle (deg)	Residual @ 7.6mm – Cohesion (kPa)	Residual @ 7.6mm – Friction Angle (deg)
B-1	**R-3**	**7.6 - 7.9**	**ML**	**15**	**43**	**10**	**43**	**0**	**38**

Sample Description:
Light Brownish gray, fine sandy siltstone

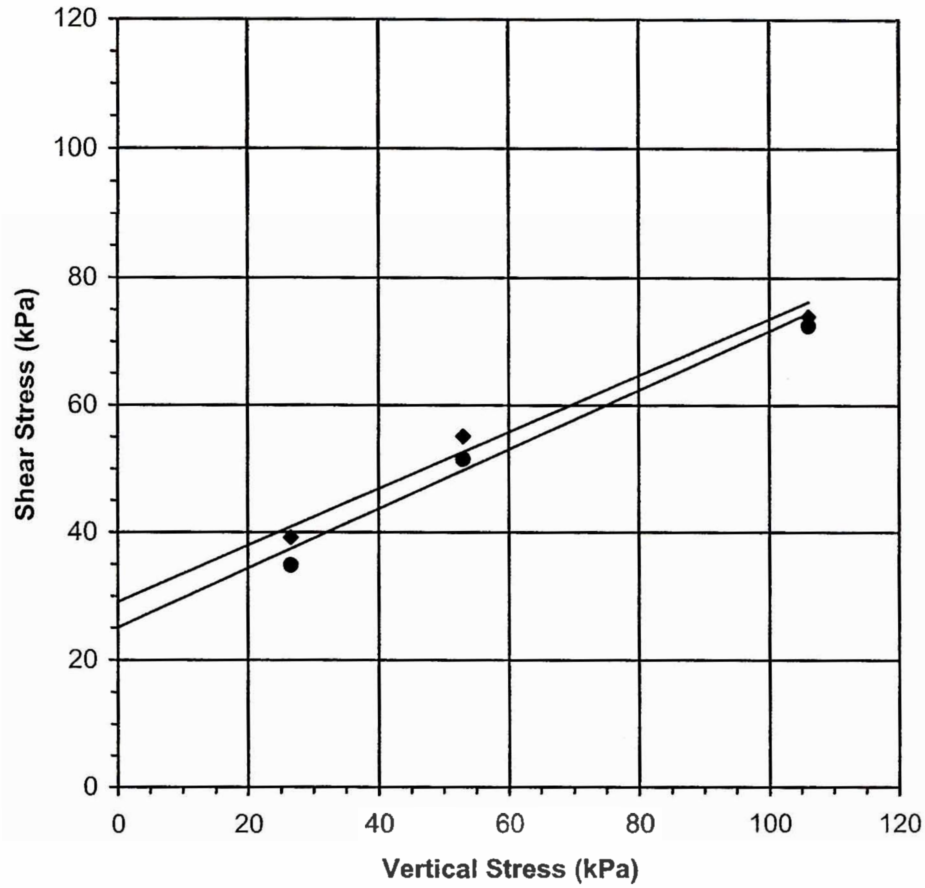
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**B-1**	**1.5 - 3.0**	**CL**	**29**	**24**	**-**	**-**	**25**	**25**
Sample Description: Brown lean clay w/ sand (Remolded 90%)									

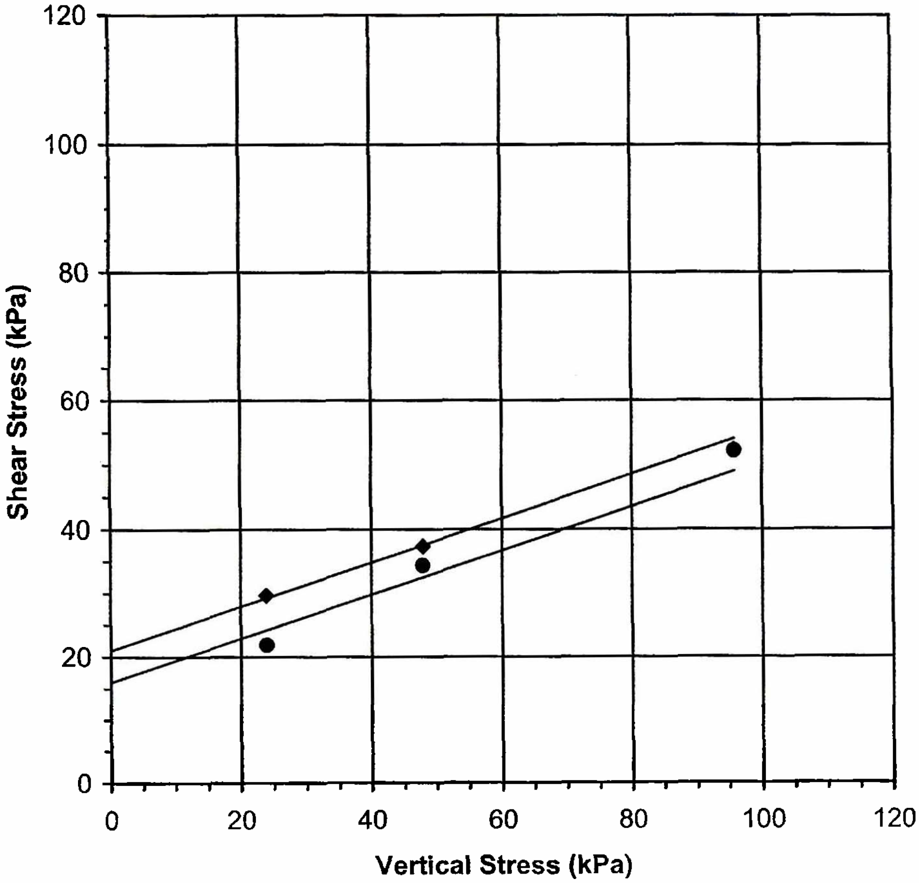
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Location	Sample No.	Depth (m)	USCS	Interpreted Shear Strength: Peak Cohesion (kPa)	Peak Friction Angle (deg)	Ultimate Cohesion (kPa)	Ultimate Friction Angle (deg)	Residual @ 7.7mm Cohesion (kPa)	Residual @ 7.7mm Friction Angle (deg)
B-2	**B-1**	**5.0 - 10.0**	**CL**	**21**	**19**			**16**	**19**

Sample Description:
Brown lean clay (Remolded 90%)

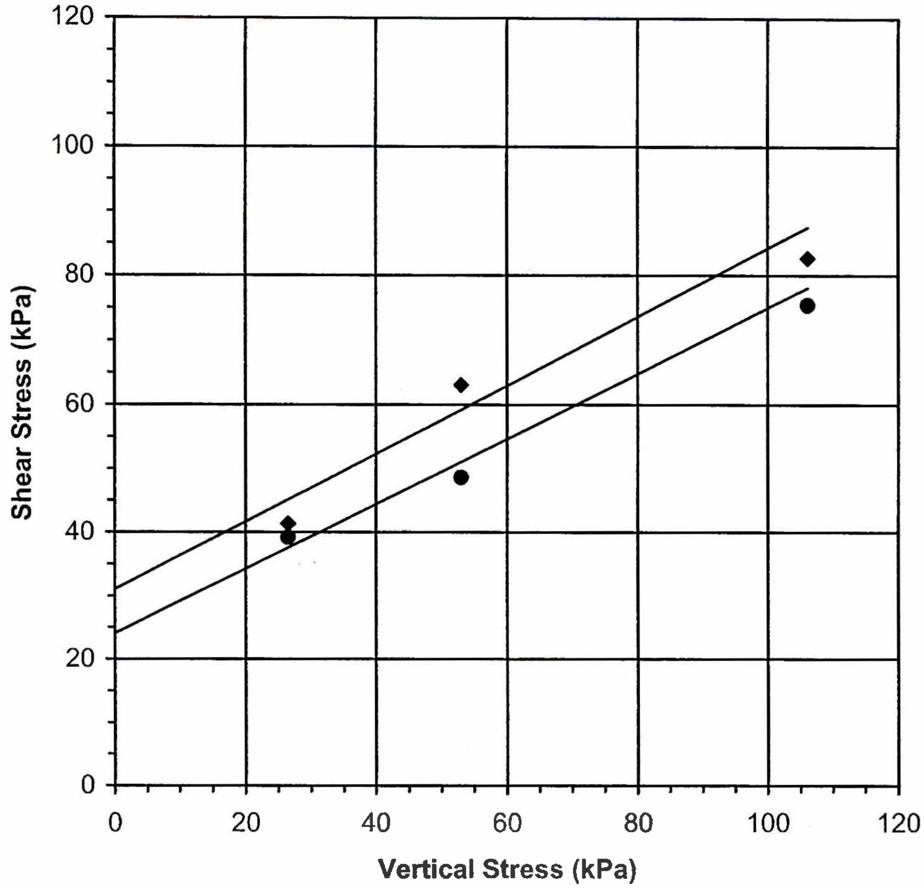
Strain Rate = 0.0043 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



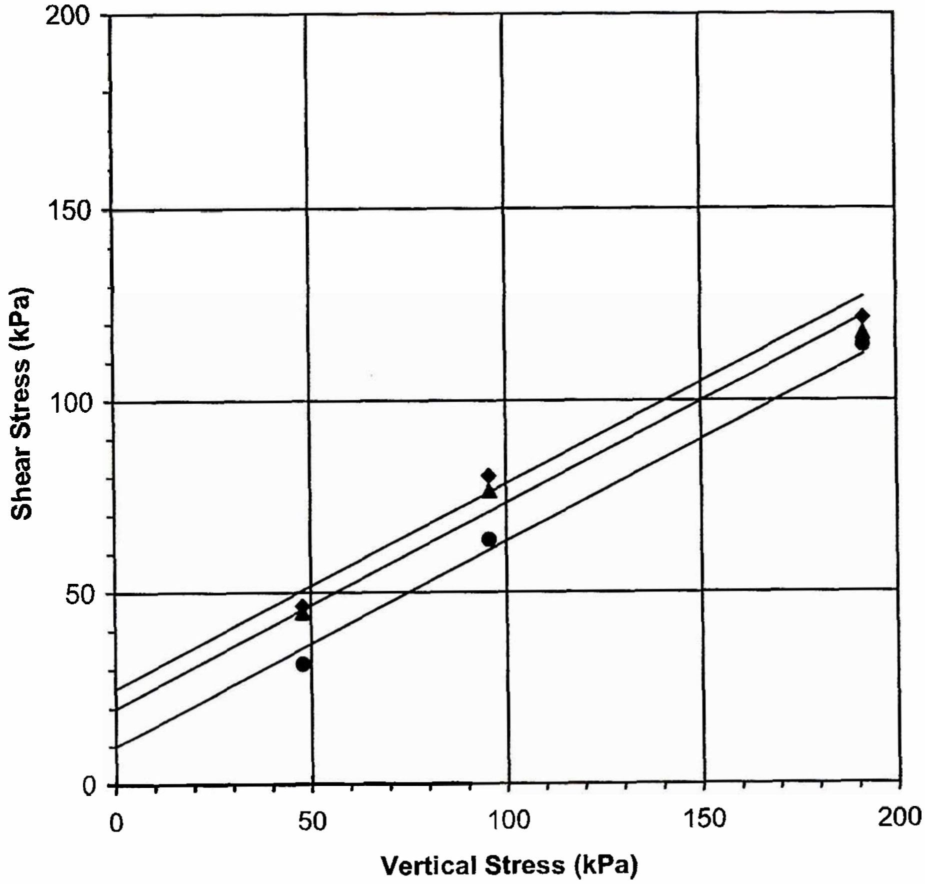
				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**B-1**	**1.5 - 3.0**	**CL**	**31**	**28**			**24**	**27**
Sample Description: Brown lean clay w sand (Remolded 95%)									

Strain Rate = 0.0254 cm/min
Sample Type: Bulk
ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**R-7**	**21.3 - 21.6**	**SM**	**25**	**28**	**20**	**28**	**10**	**28**
Sample Description: Olive-brown to light brown, silty sandstone									

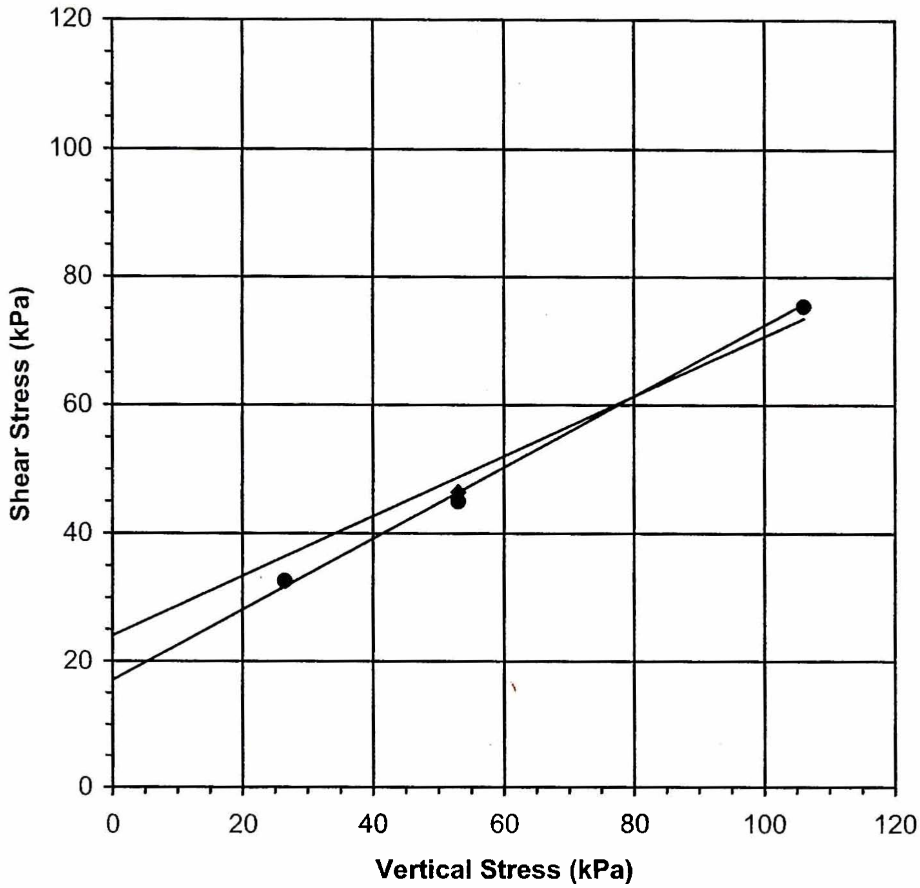
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Location	Sample No.	Depth (m)	USCS	Interpreted Shear Strength: Peak Cohesion (kPa)	Peak Friction Angle (deg)	Ultimate Cohesion (kPa)	Ultimate Friction Angle (deg)	Residual @ 5.1mm Cohesion (kPa)	Residual @ 5.1mm Friction Angle (deg)
B-4	**B-1**	**0.3 - 1.5**	**ML**	**24**	**25**			**17**	**29**
Sample Description: Light gray-brown, clayey silt (Remolded 90%)									

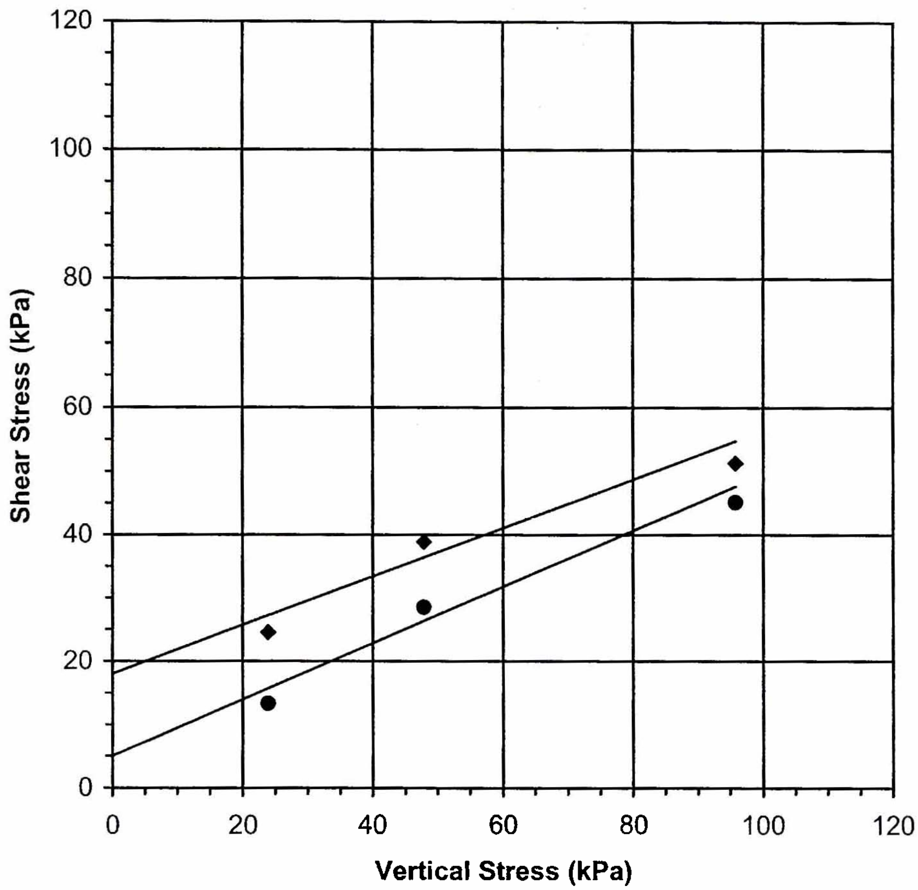
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.7mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-4	**B-1**	**1.0 - 5.0**	**CL**	**18**	**21**			**5**	**24**

Sample Description:
Brown lean clay (Remolded 90%)

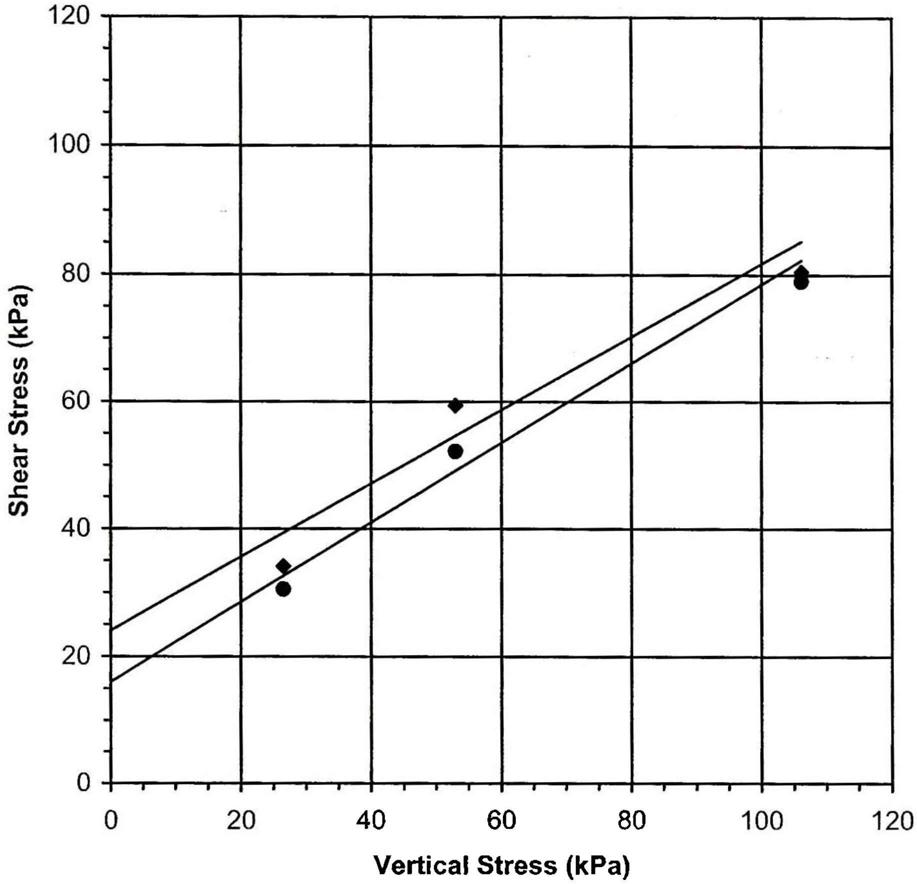
Strain Rate = 0.0043 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-4	**B-1**	**0.3 - 1.5**	**ML**	**24**	**30**		**-**	**16**	**32**
Sample Description: Light gray-brown, clayey silt (Remolded 95%)									

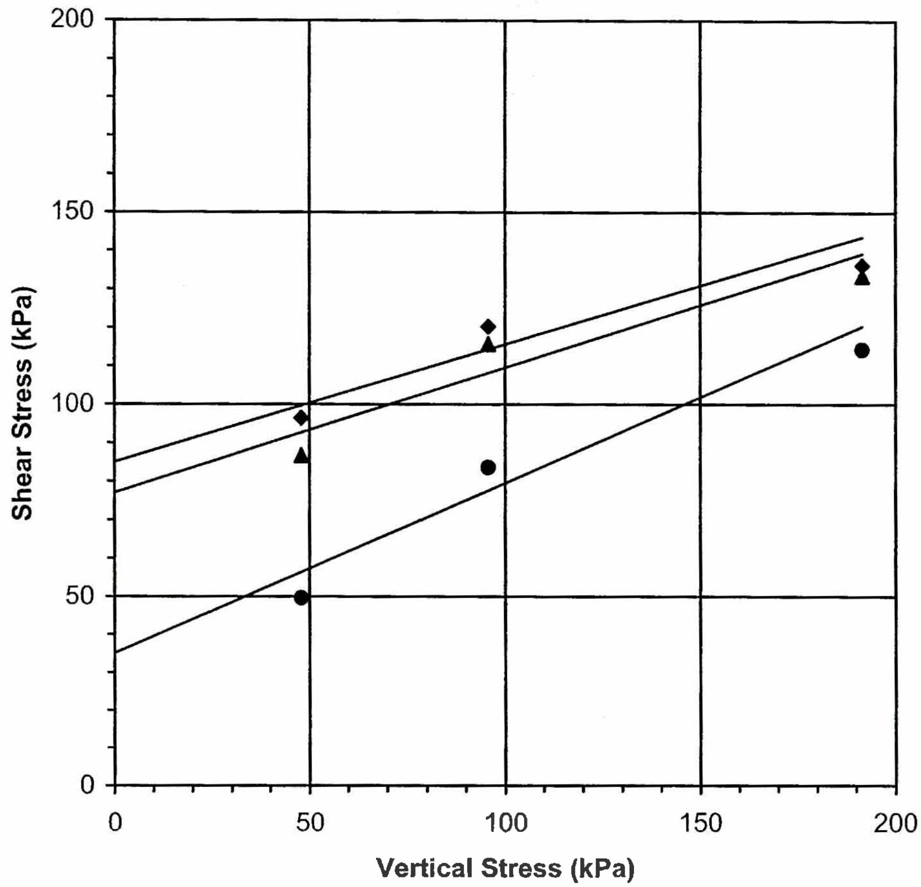
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-1**	**3.1 - 3.5**	**SM**	**85**	**17**	**77**	**18**	**35**	**24**
Sample Description: Light brown to light olive-brown, silty sandstone									

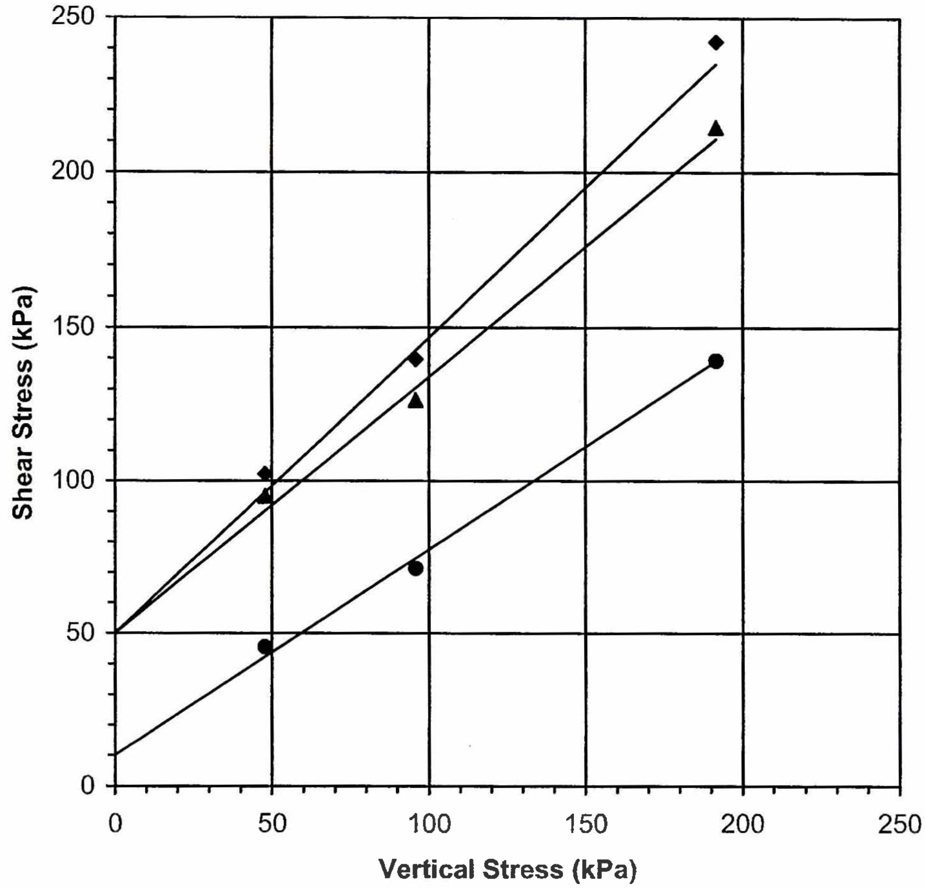
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-2**	**6.1 - 6.4**	**SC**	**50**	**44**	**50**	**40**	**10**	**34**
Sample Description: Light brownish-gray silty to clayey sandstone									

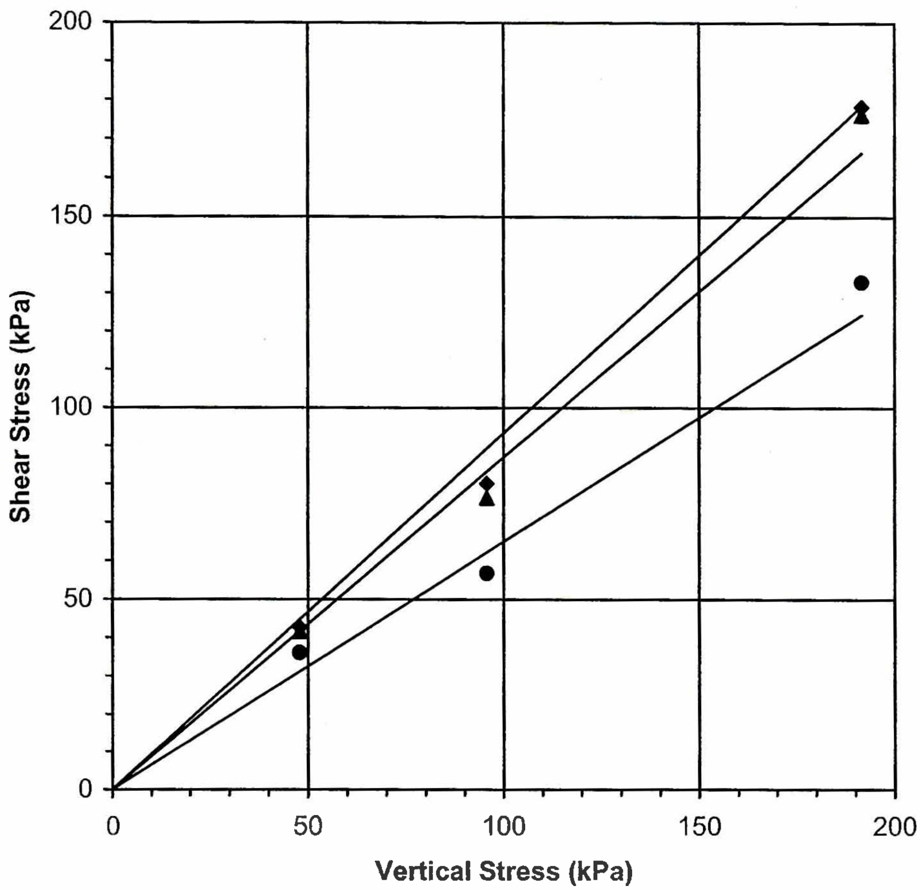
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-5**	**15.2 - 15.4**	**SC**	**0**	**43**	**0**	**41**	**0**	**33**
Sample Description: Light gray-brown, very fine sandy siltstone									

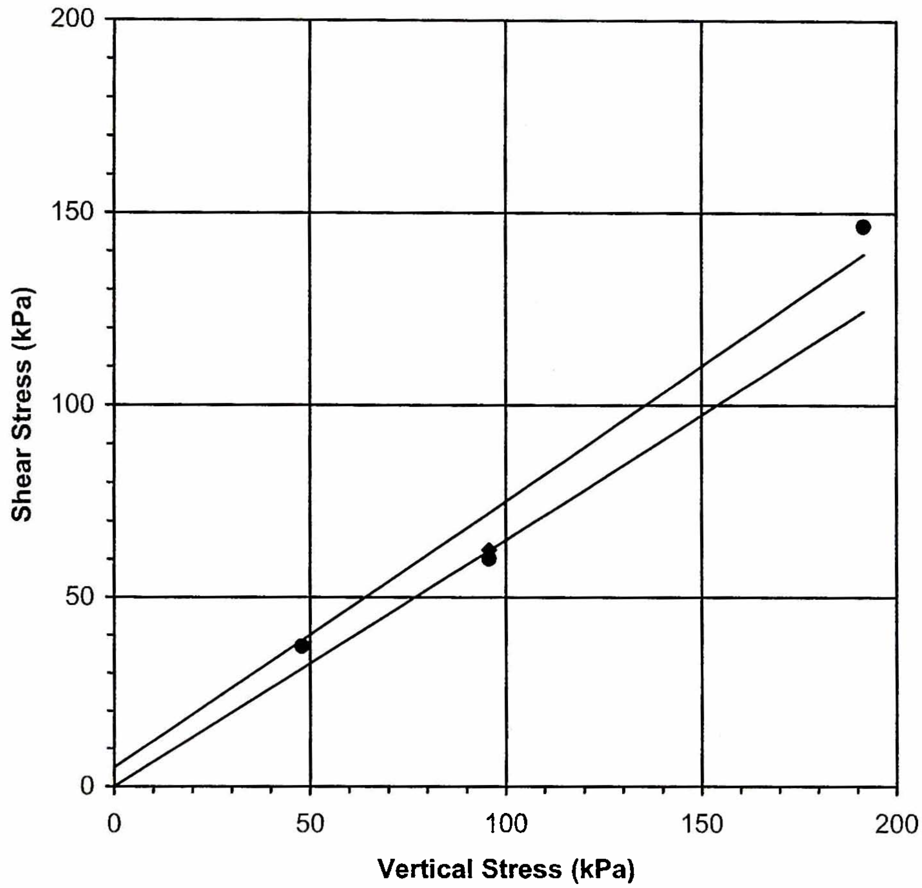
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-9	**R-1**	**3**	**ML**	**5**	**35**	**-**		**0**	**33**
Sample Description: Light olive-brown sandy silt									

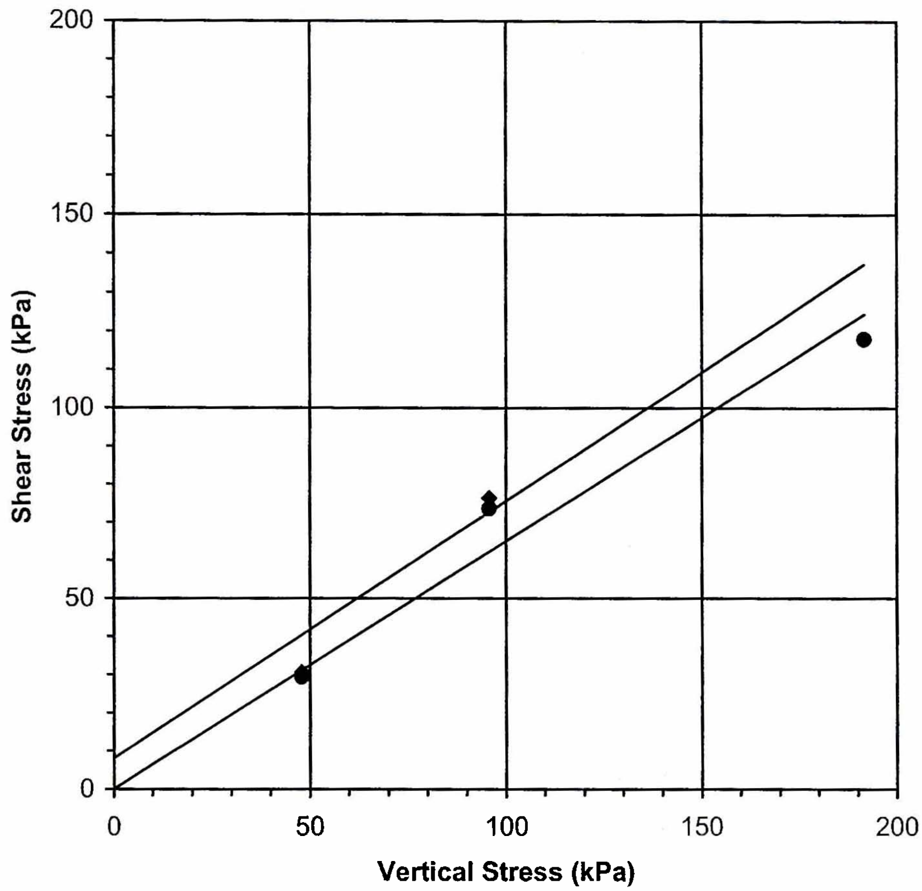
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-9	**R-2**	**6.1**	**SC/CL**	**8**	**34**			**0**	**33**
Sample Description: Light brown clayey sand, with some interlayered, red-brown clays									

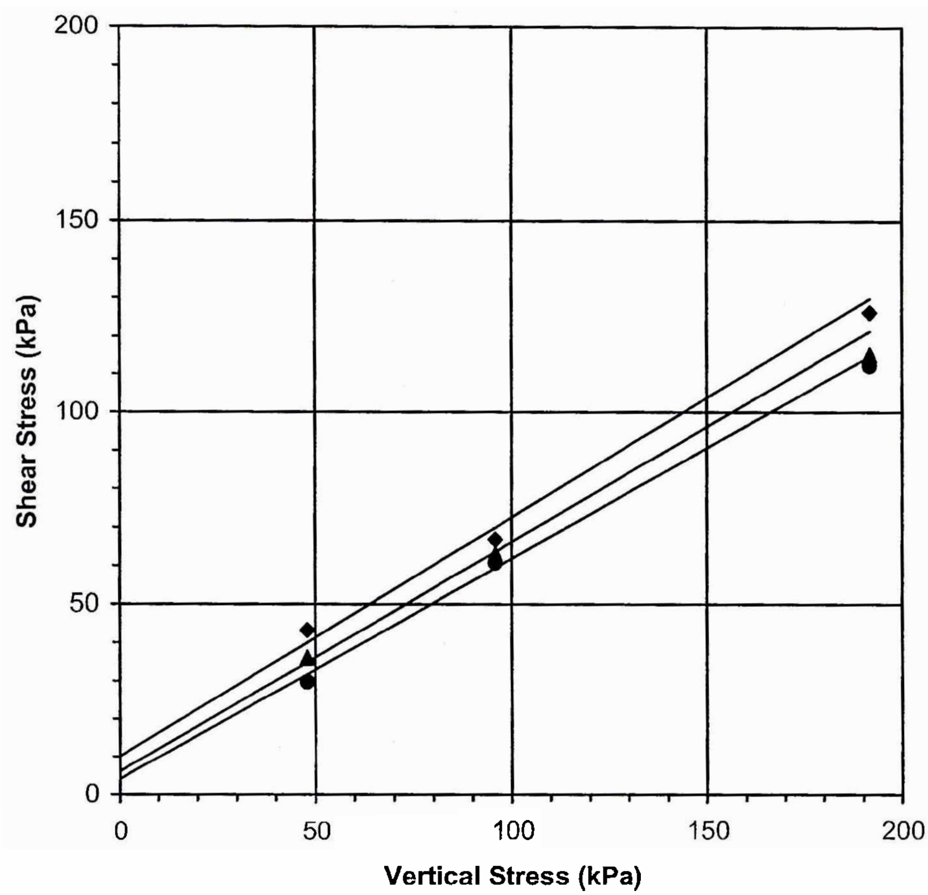
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-15	**R-1**	**1.5**	**SM**	**10**	**32**	**6**	**31**	**4**	**30**
Sample Description: Light brown to light pinkish-brown silty sandstone									

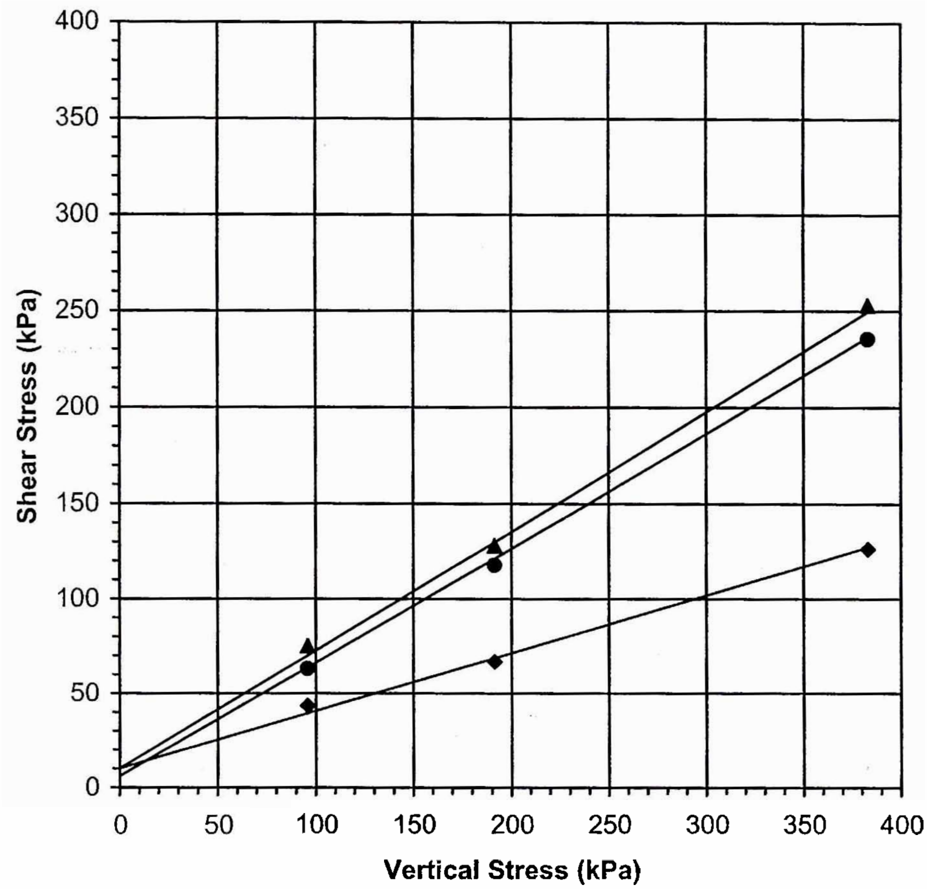
Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-15	**R-2**	**4.6**	**SM**	**10**	**32**	**6**	**31**	**10**	**17**
Sample Description: Brown silty sandstone									

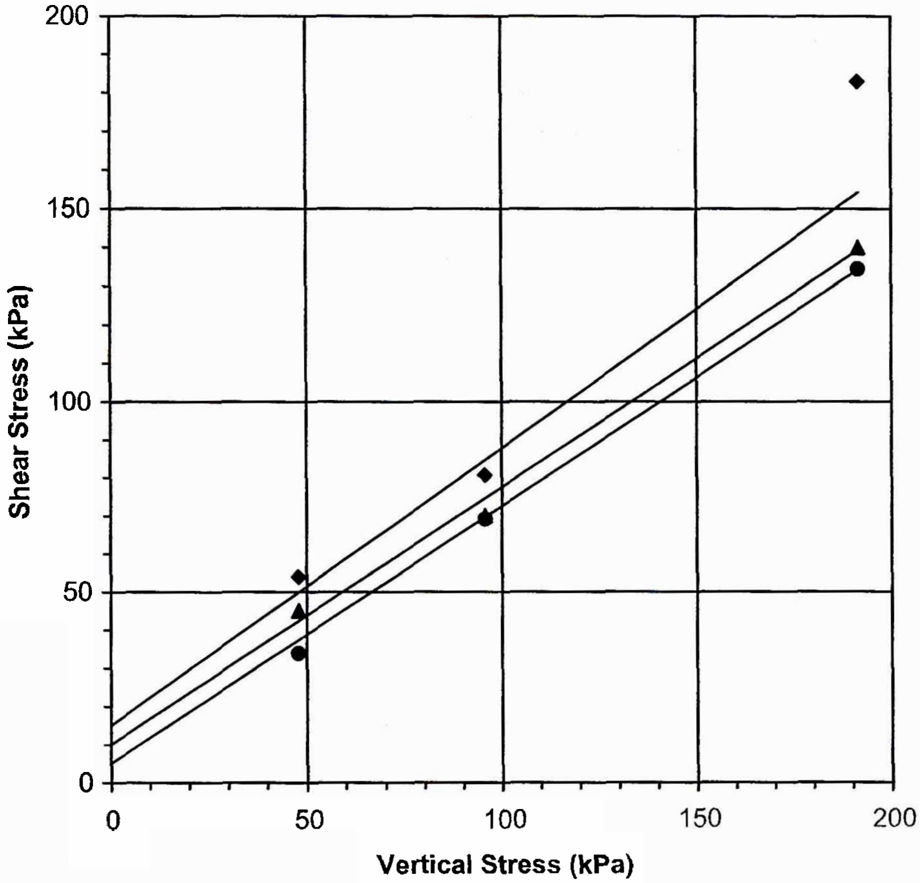
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-19	**R-2**	**4.6**	**SM**	**15**	**36**	**10**	**34**	**5**	**34**

Sample Description:
Light brown silty sandstone

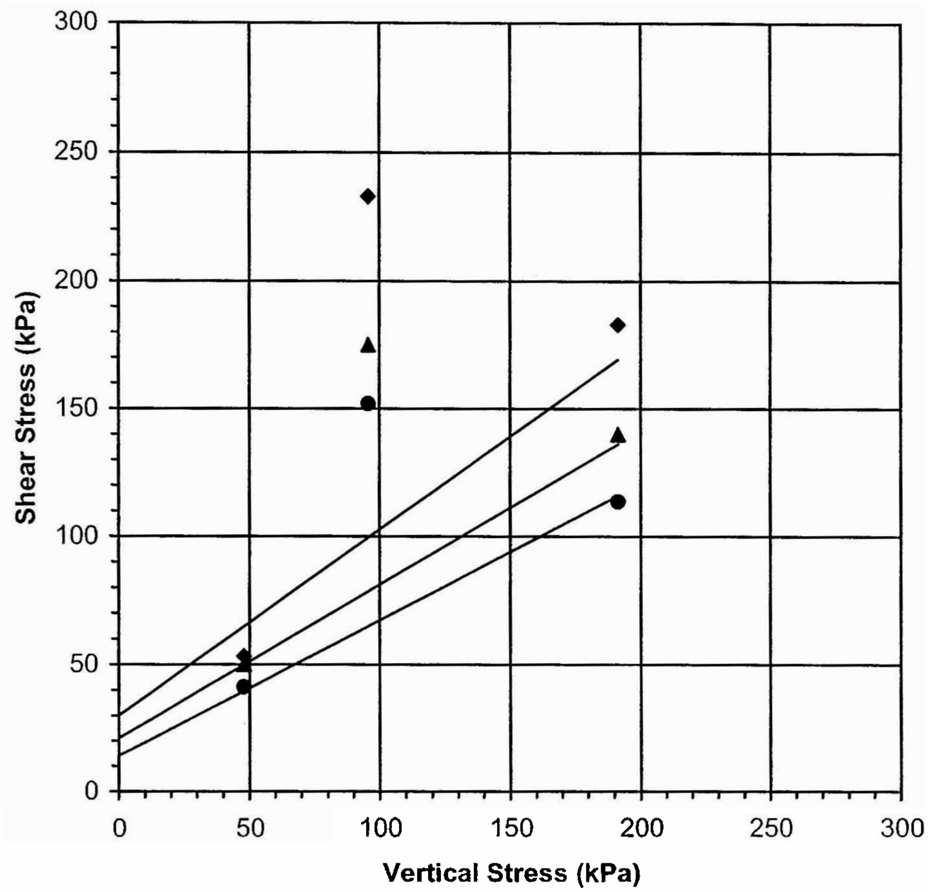
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-21	**R-1**	**1.5**	**SM**	**30**	**36**	**21**	**31**	**14**	**28**
Sample Description: Light brown silty sandstone									

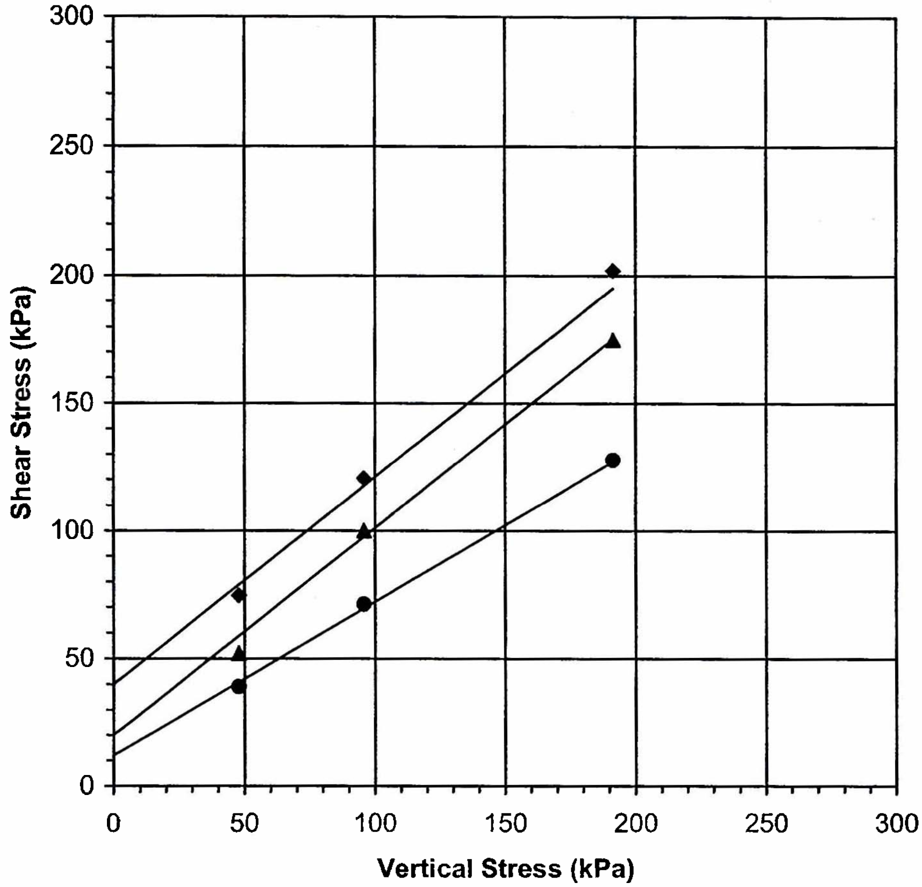
Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



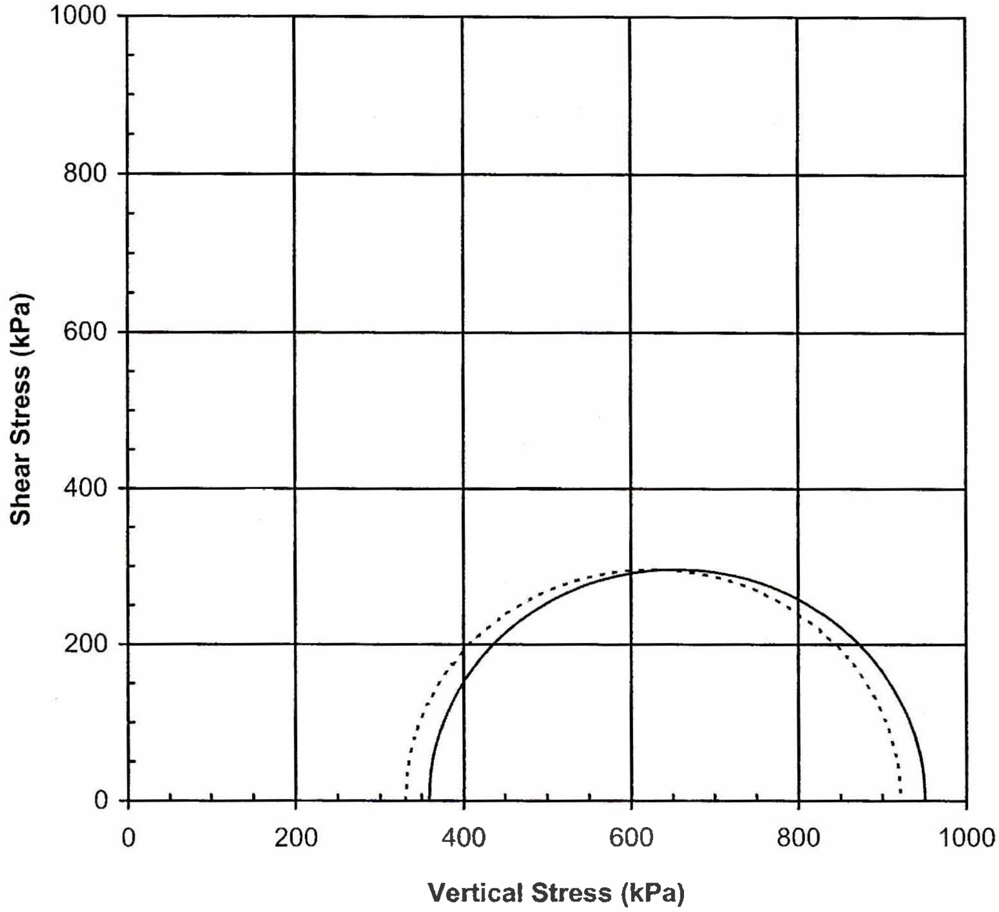
				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-20	**R-2**	**4.6**	**SM**	**40**	**39**	**20**	**39**	**12**	**31**
Sample Description: Brownish-gray sandstone									

Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring
ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Boring Location	**B-19, R-6**
Sample Depth	**18.3m**

Consolidated Undrained Strength Test Data

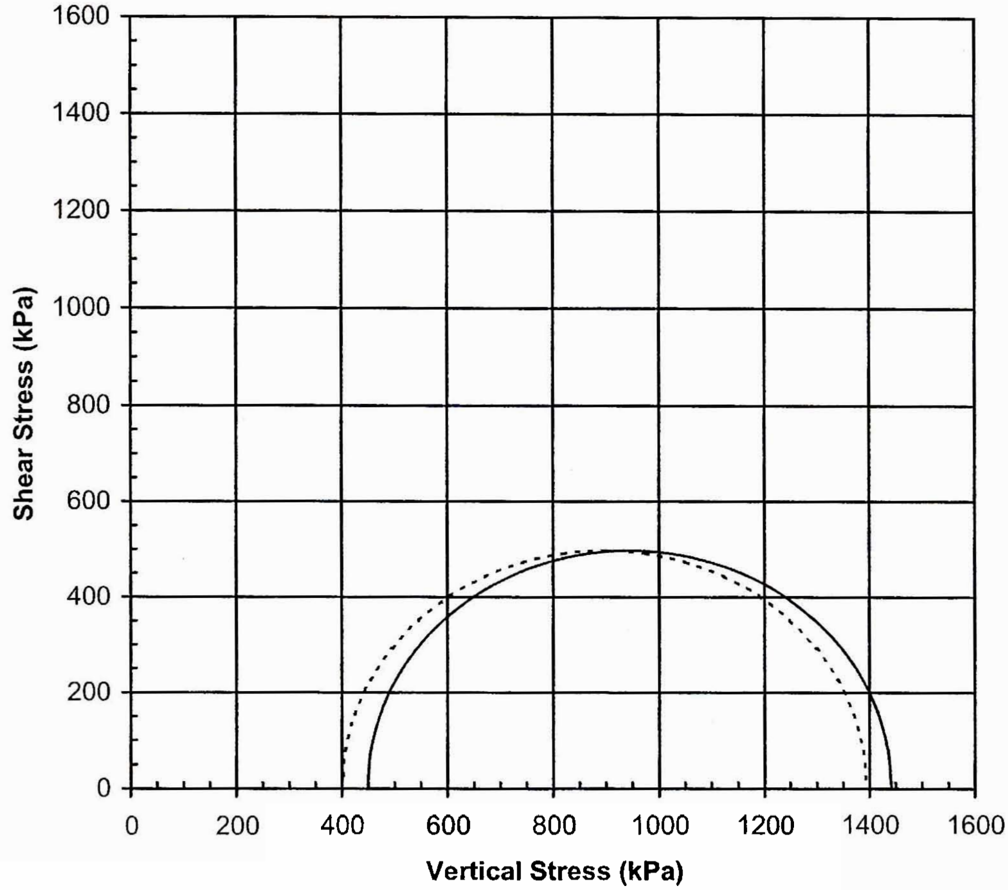
Vertical Stress (kPa)	**922**
Shear Stress (kPa)	**296**
Confining Pressure (kPa)	**359**

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-19, R-7**
Sample Depth	**21.3m**

Consolidated Undrained Strength Test Data

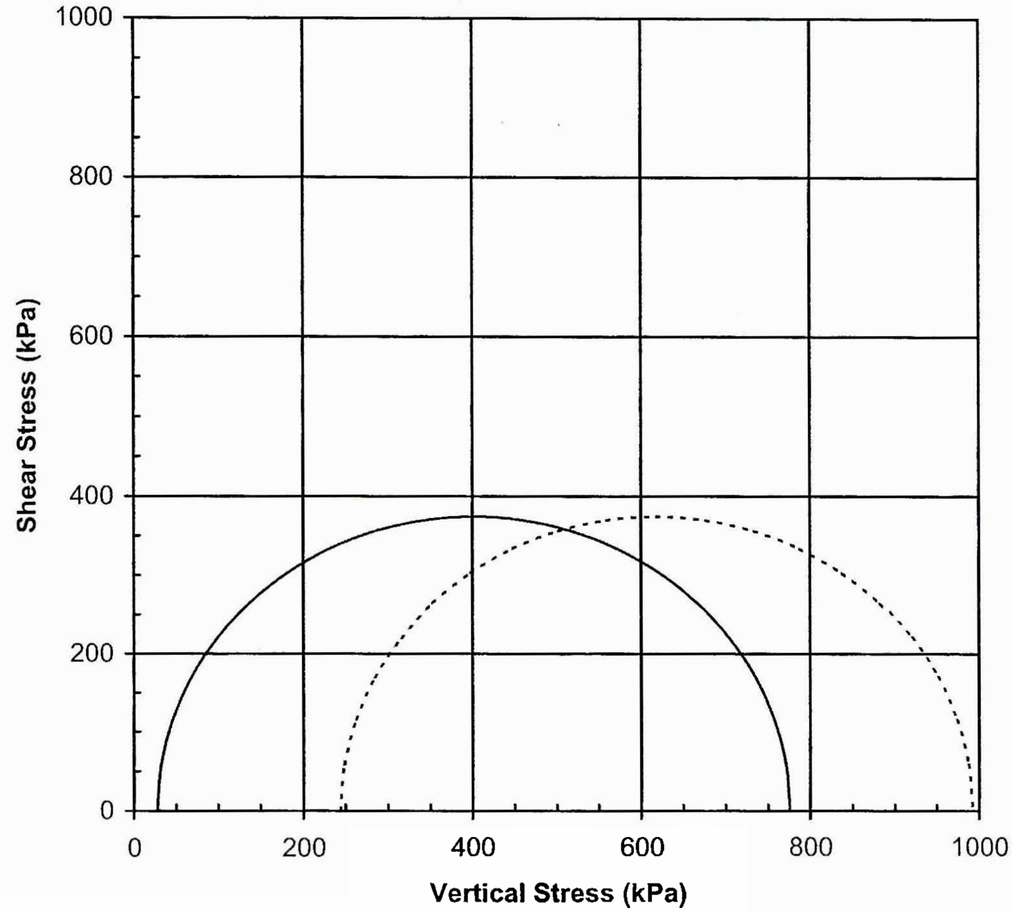
Vertical Stress (kPa)	**1395**
Shear Stress (kPa)	**497**
Confining Pressure (kPa)	**448**

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-2, R-1**
Sample Depth	**3.0m - 3.4m**

Consolidated Undrained Strength Test Data

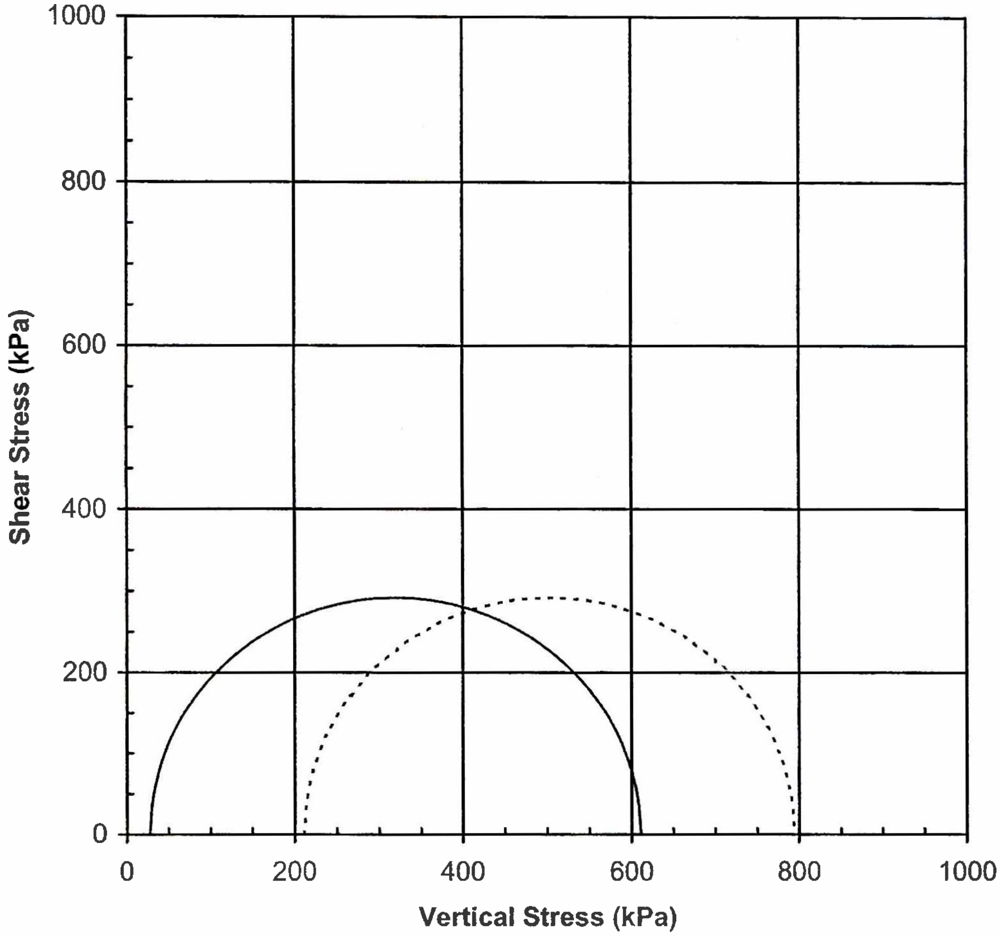
Vertical Stress (kPa)	**993**
Shear Stress (kPa)	**374**
Confining Pressure (kPa)	**28**

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-2, R-3**
Sample Depth	**9.1m - 9.3m**

Consolidated Undrained Strength Test Data

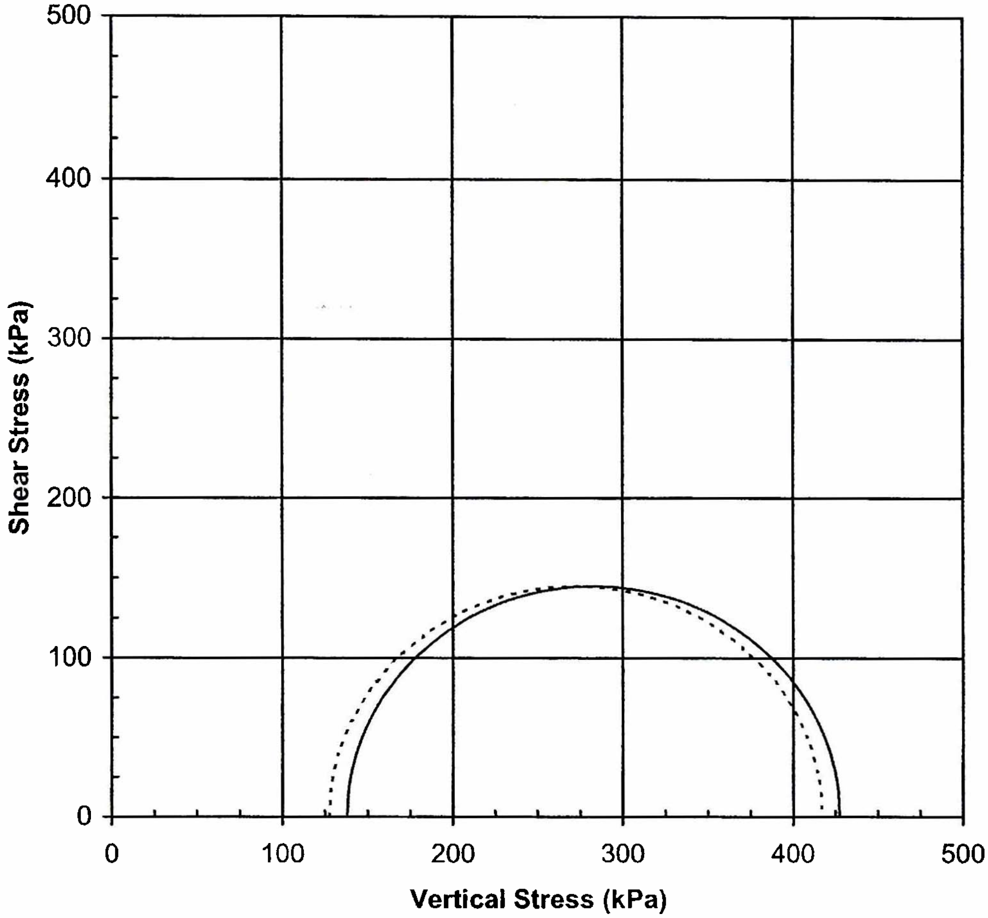
Vertical Stress (kPa)	**795**
Shear Stress (kPa)	**292**
Confining Pressure (kPa)	**28**

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-2, R-5
Sample Depth	15.2m - 15.4m

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	417
Shear Stress (kPa)	145
Confining Pressure (kPa)	138

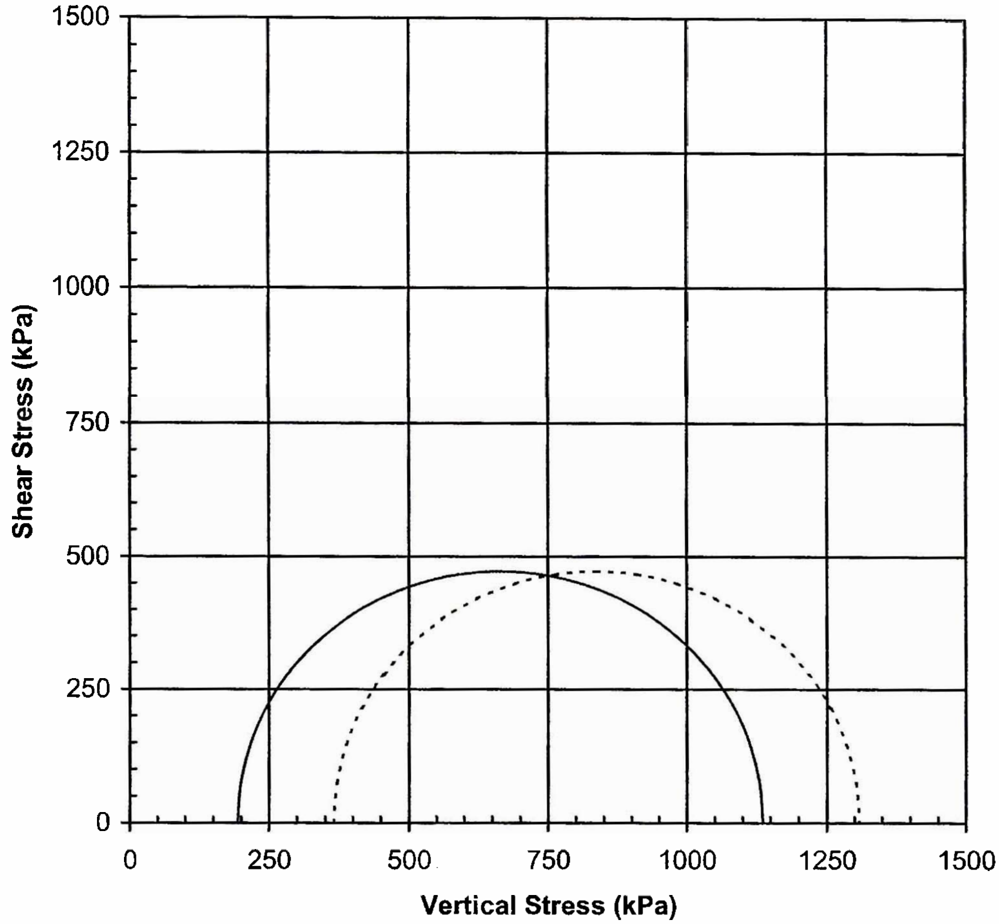
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-4, R-6**
Sample Depth	**18.3m - 20.1m**

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	**1309**
Shear Stress (kPa)	**472**
Confining Pressure (kPa)	**172**

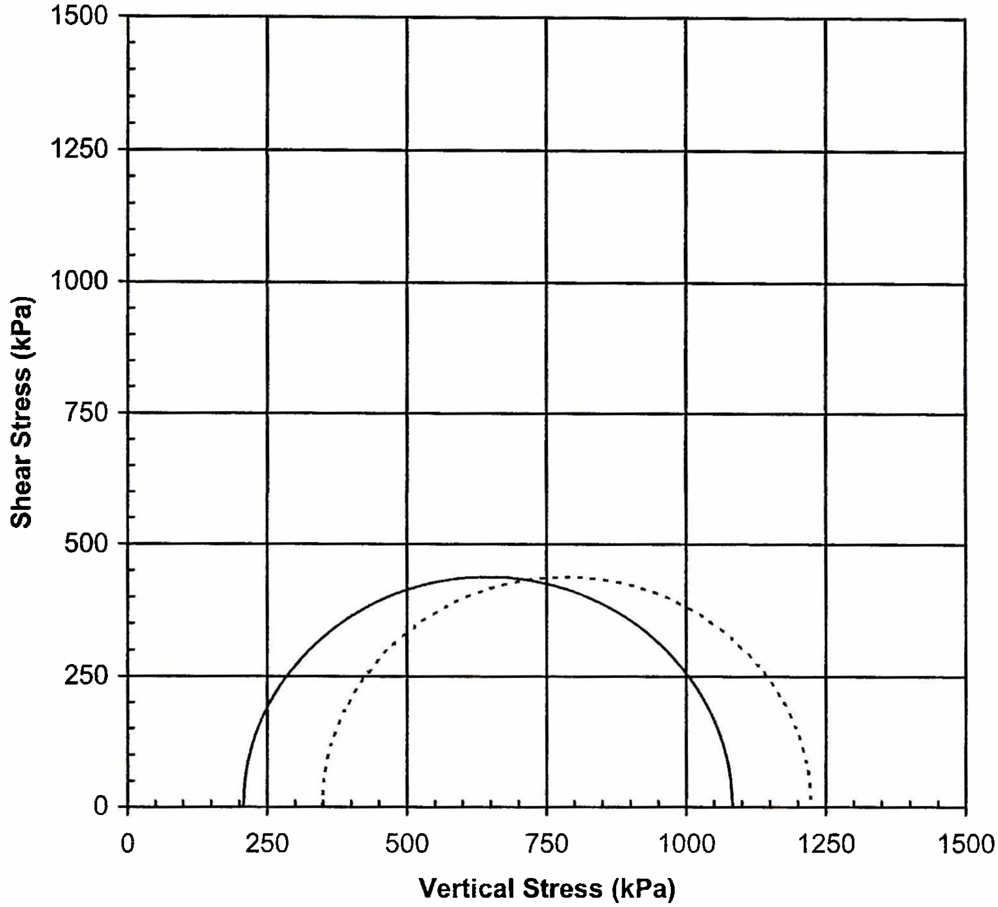
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-4, R-7**
Sample Depth	**24.4m - 24.7m**

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	**1224**
Shear Stress (kPa)	**438**
Confining Pressure (kPa)	**207**

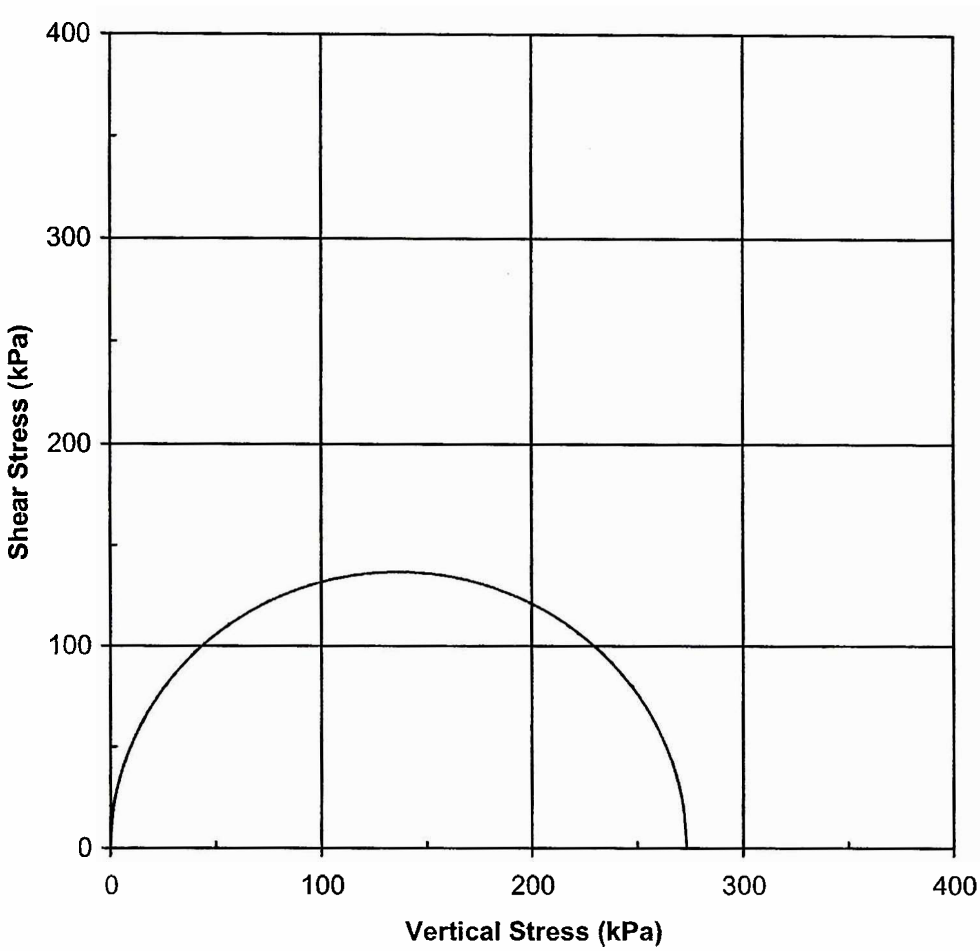
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-16, R-1
Sample Depth	3.0m

Unconfined Compression Strength Test Data

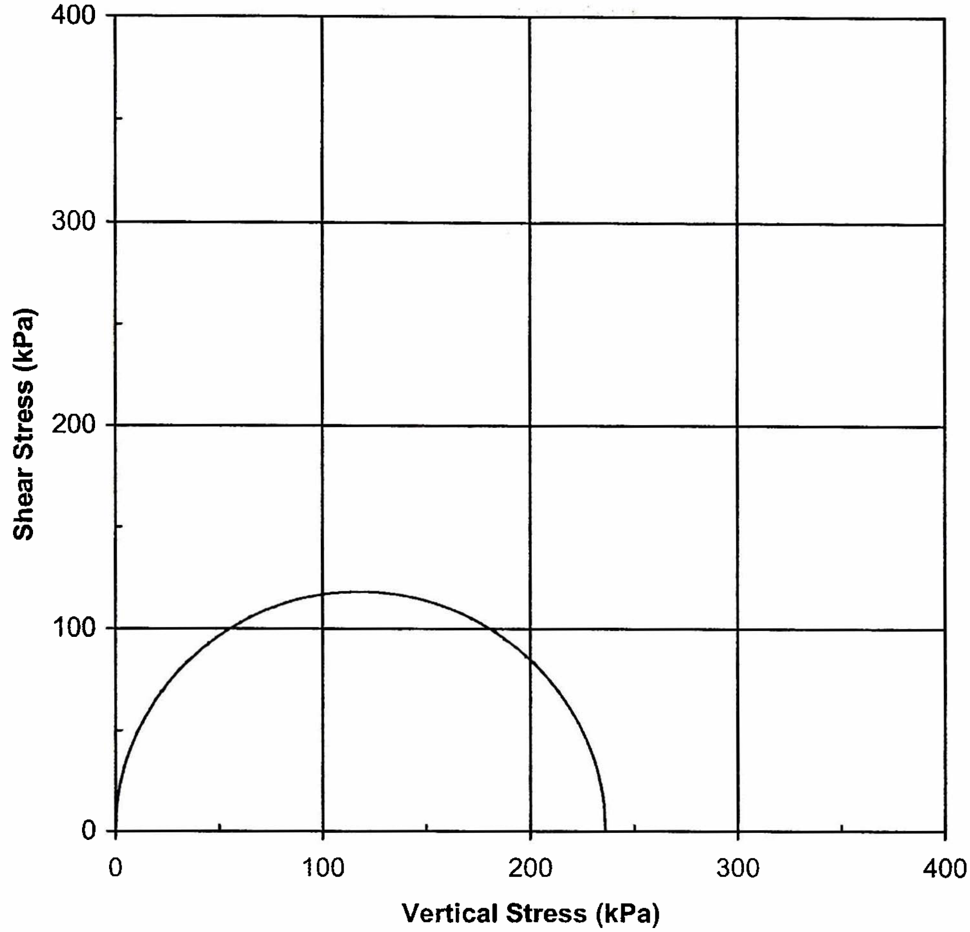
Vertical Stress (kPa)	273
Shear Stress (kPa)	137
Confining Pressure (kPa)	0

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location: B-16, R-2

Sample Depth: 6.1m

Unconfined Compression Strength Test Data

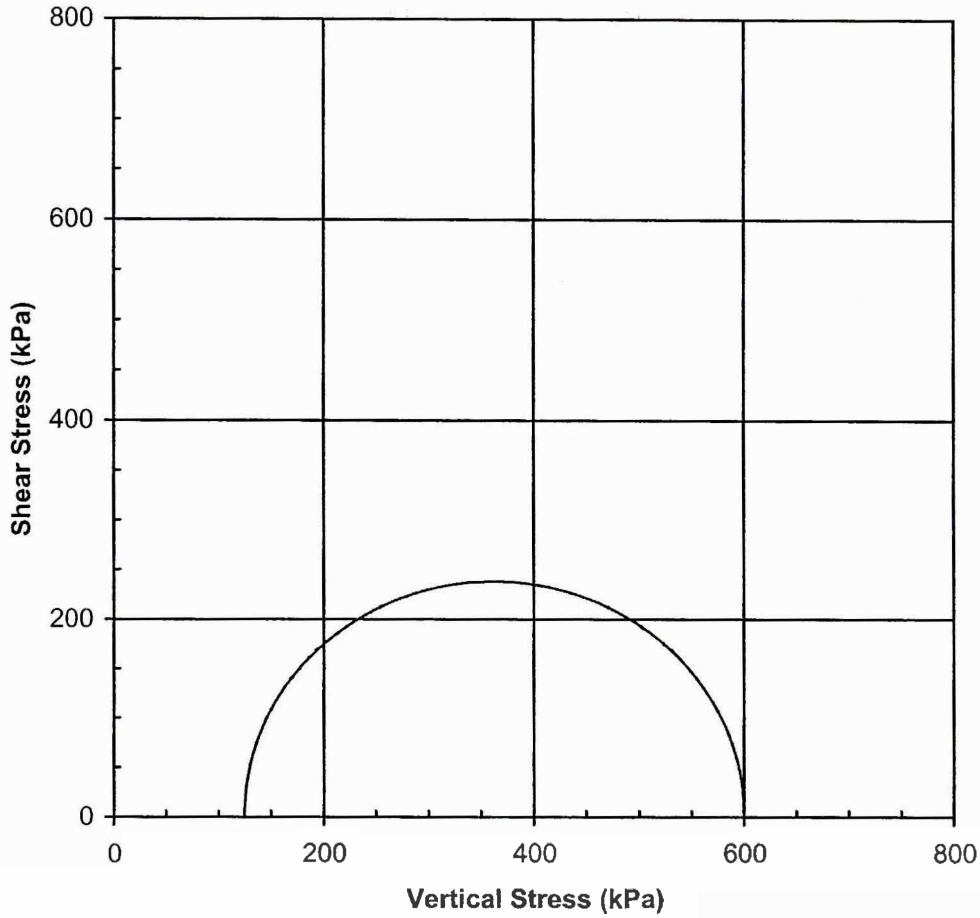
Vertical Stress (kPa)	**236**
Shear Stress (kPa)	**118**
Confining Pressure (kPa)	**0**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Boring Location	**B-14, R-2**
Sample Depth	**6.0m**

Unconsolidated Undrained Strength Test Data

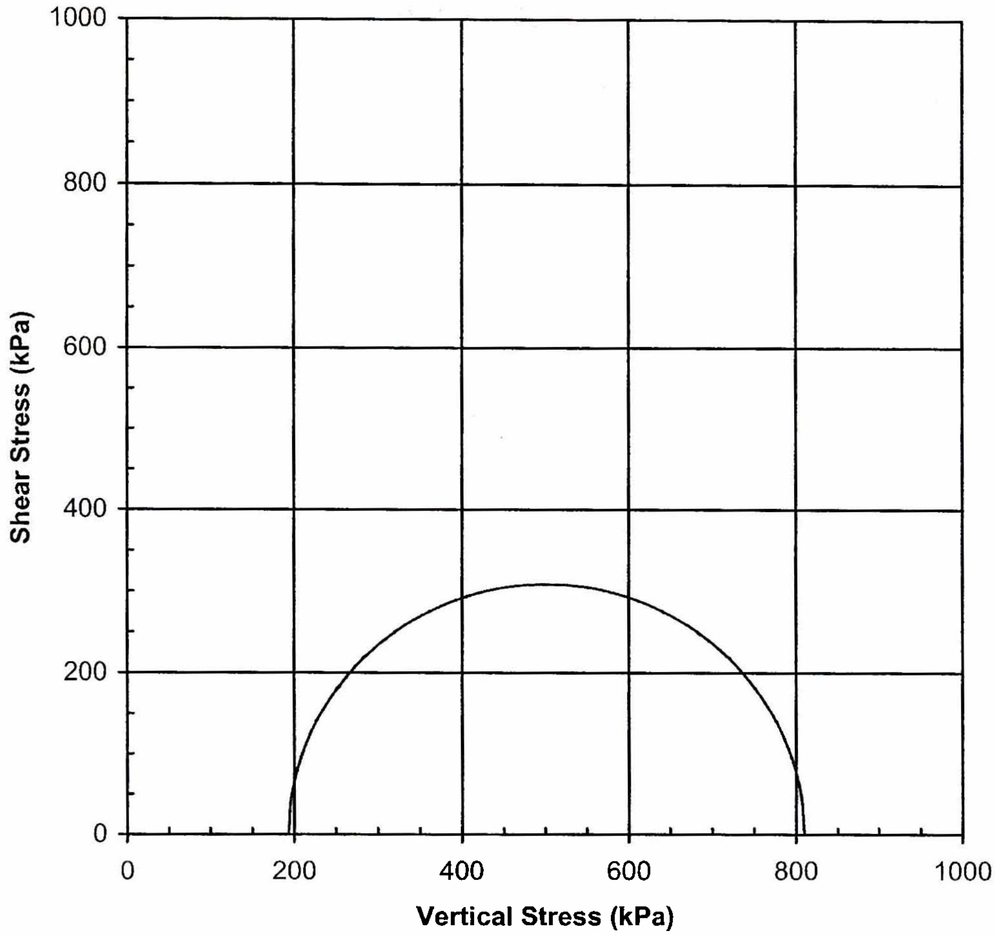
Vertical Stress (kPa)	**600**
Shear Stress (kPa)	**238**
Confining Pressure (kPa)	**124**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-14, R-3**
Sample Depth	**9.1m**

Unconsolidated Undrained Strength Test Data

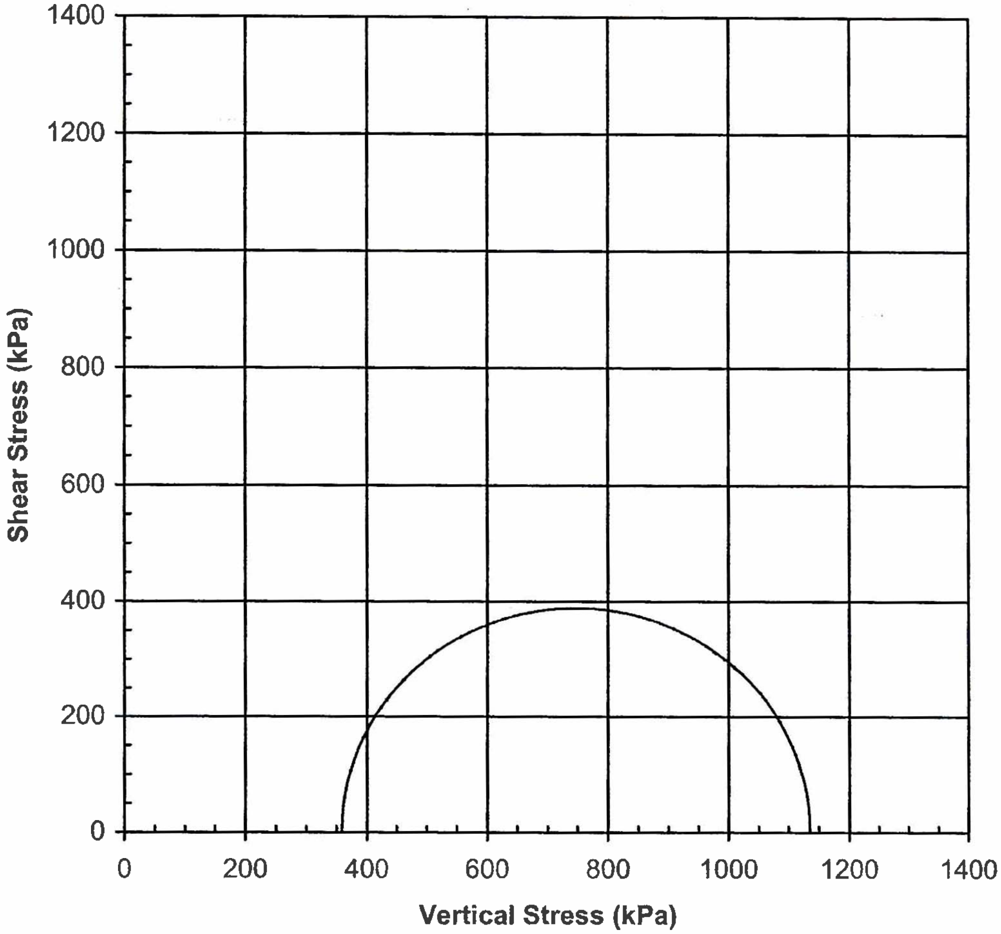
Vertical Stress (kPa)	**810**
Shear Stress (kPa)	**308**
Confining Pressure (kPa)	**193**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-17, R-3**
Sample Depth	**18.2m**

Unconsolidated Undrained Strength Test Data

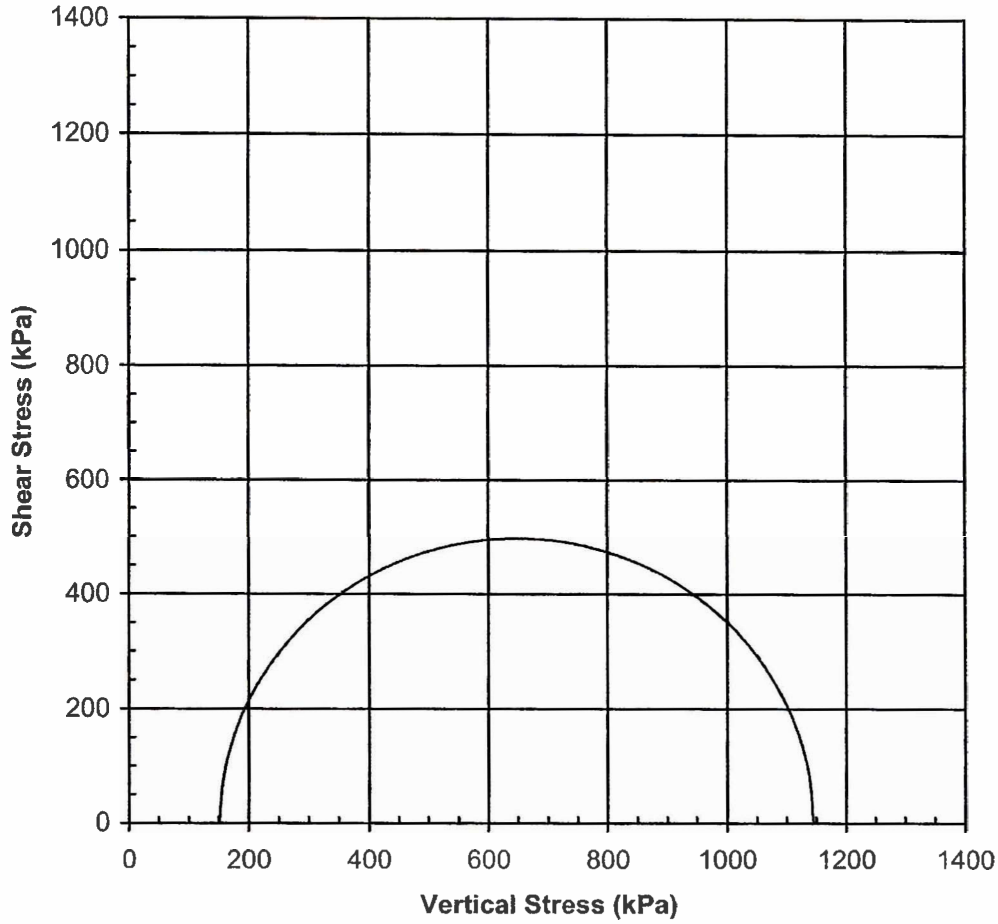
Vertical Stress (kPa)	**1136**
Shear Stress (kPa)	**388**
Confining Pressure (kPa)	**359**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-19, R-1**
Sample Depth	**1.5m**

Unconsolidated Undrained Strength Test Data

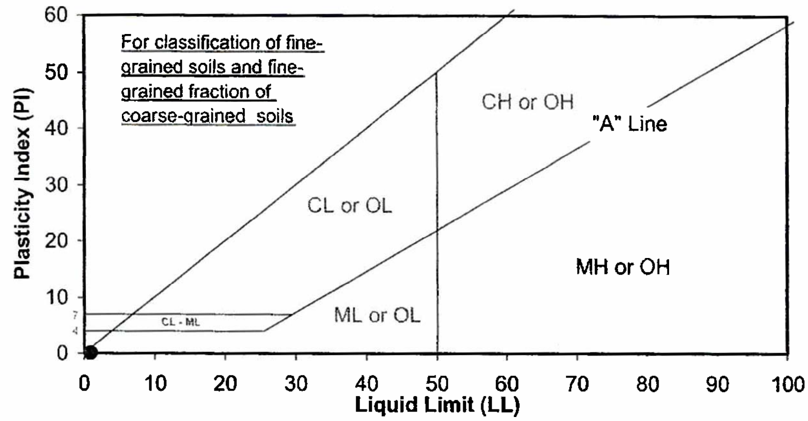
Vertical Stress (kPa)	**1145**
Shear Stress (kPa)	**497**
Confining Pressure (kPa)	**152**

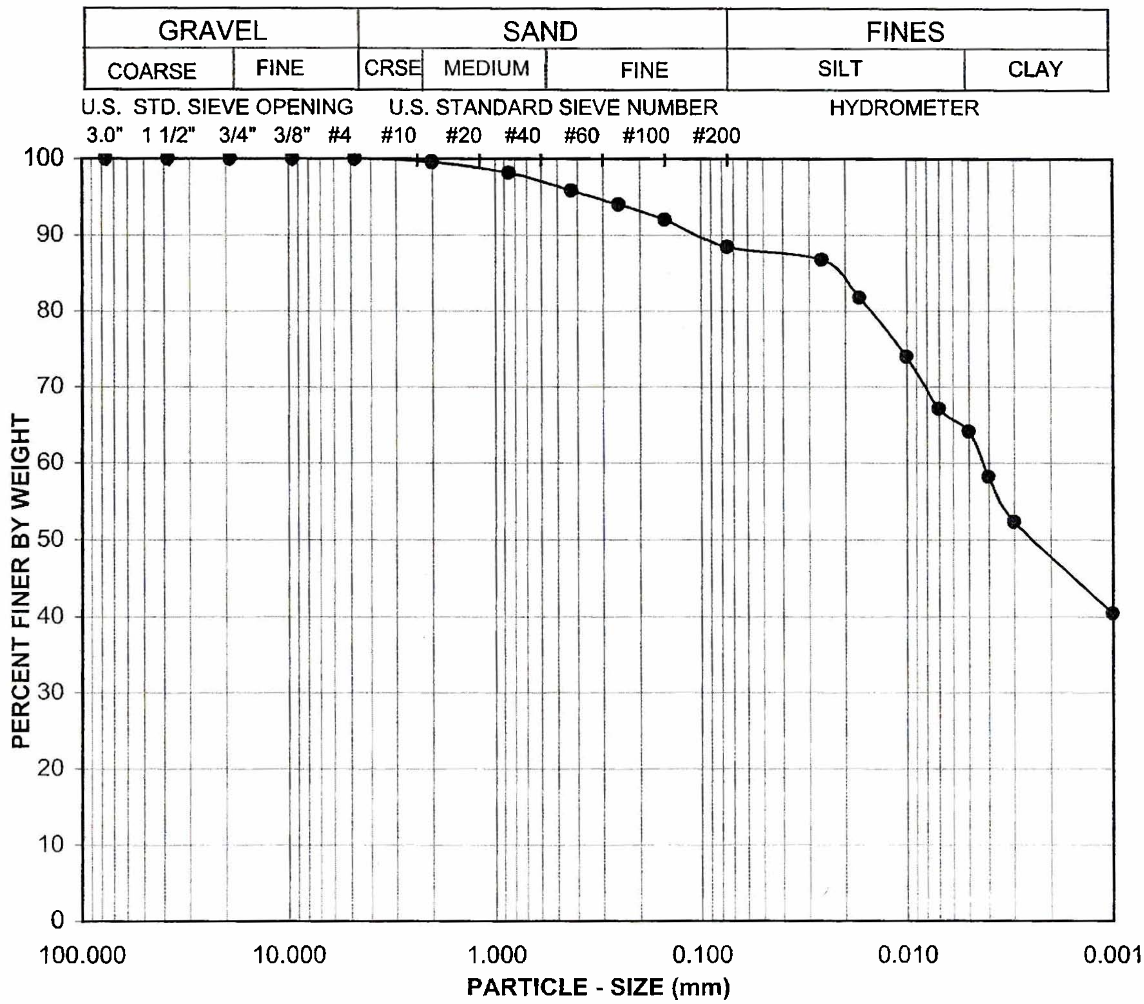
Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-1	B-1	0.3-1.5	(CL-ML)	0:12:88	**

Sample Description:
(CL-ML), PALE BROWN SILTY LEAN CLAY WITH FEW TO LITTLE SAND.

Leighton

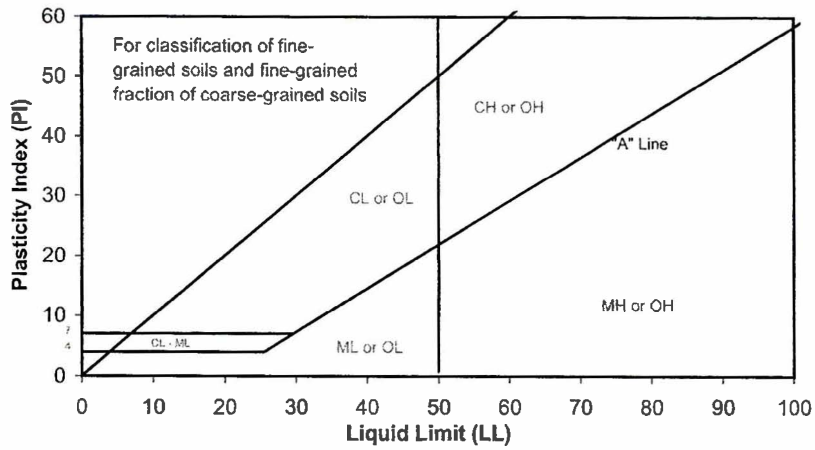
Project No.: 600158-905

SR-125 / 905

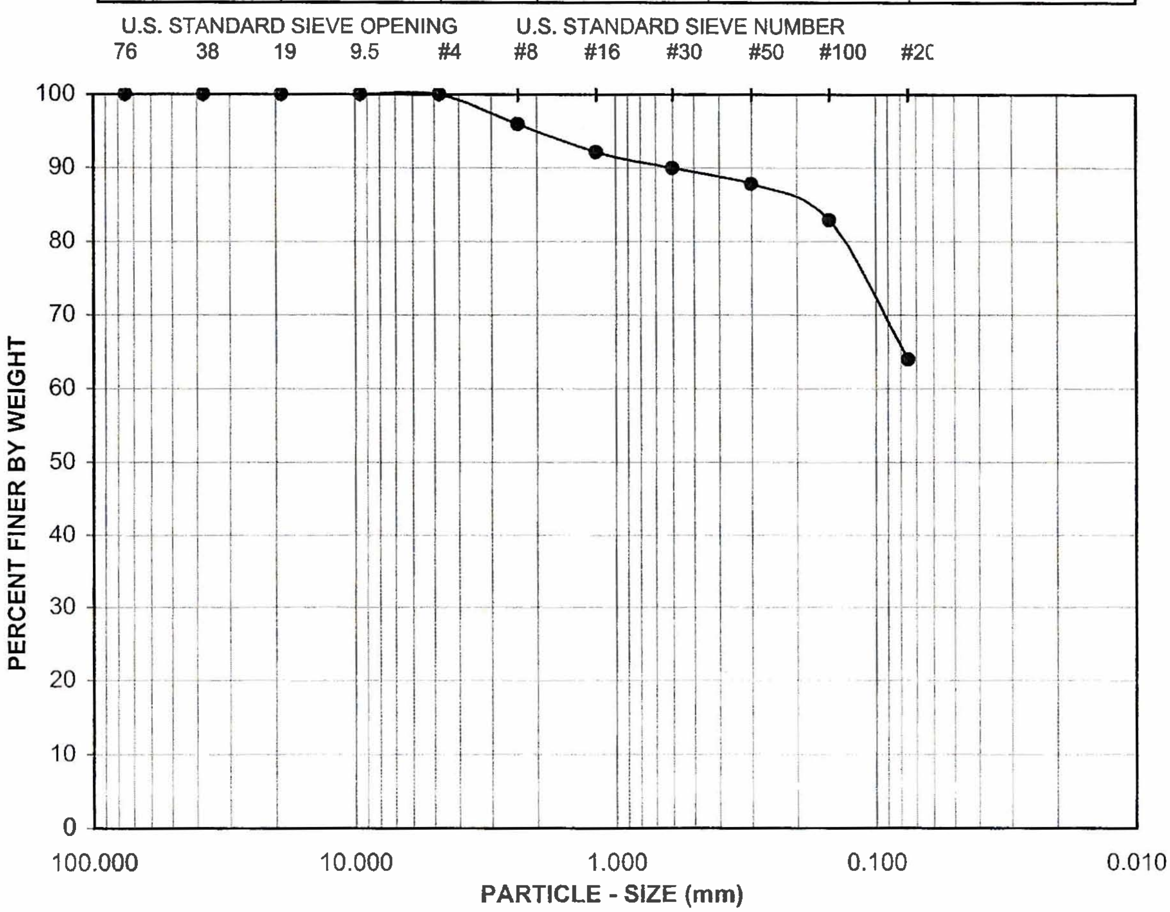
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S1	3.0-3.4	s(ML)	0 : 36 : 64	NP

Project No.: 600158-905

SR-125 / 905

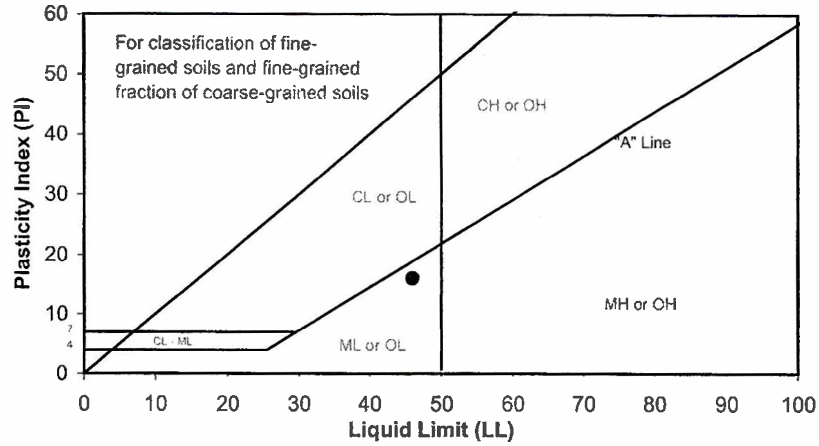
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

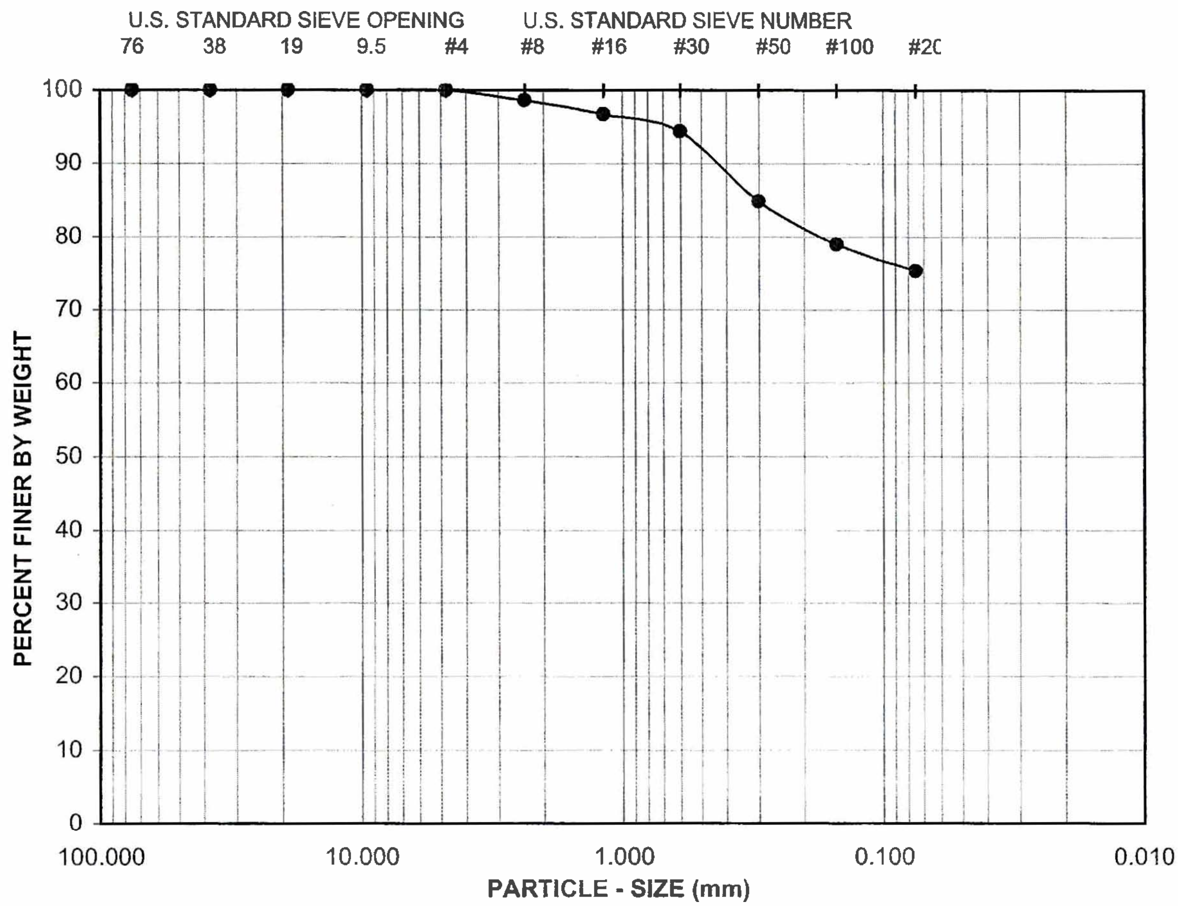
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Rev. 8-07

SIEVE B-1,S1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S3	9.1-9.4	(ML)s	0 : 25 : 75	N/A

Visual Sample Description:
(ML)s: PALE BROWN LEAN SILT WITH SAND

Leighton

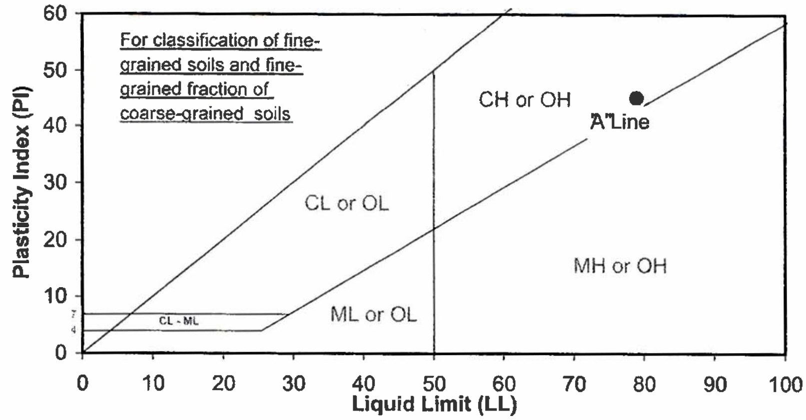
Project No.: 600158-905

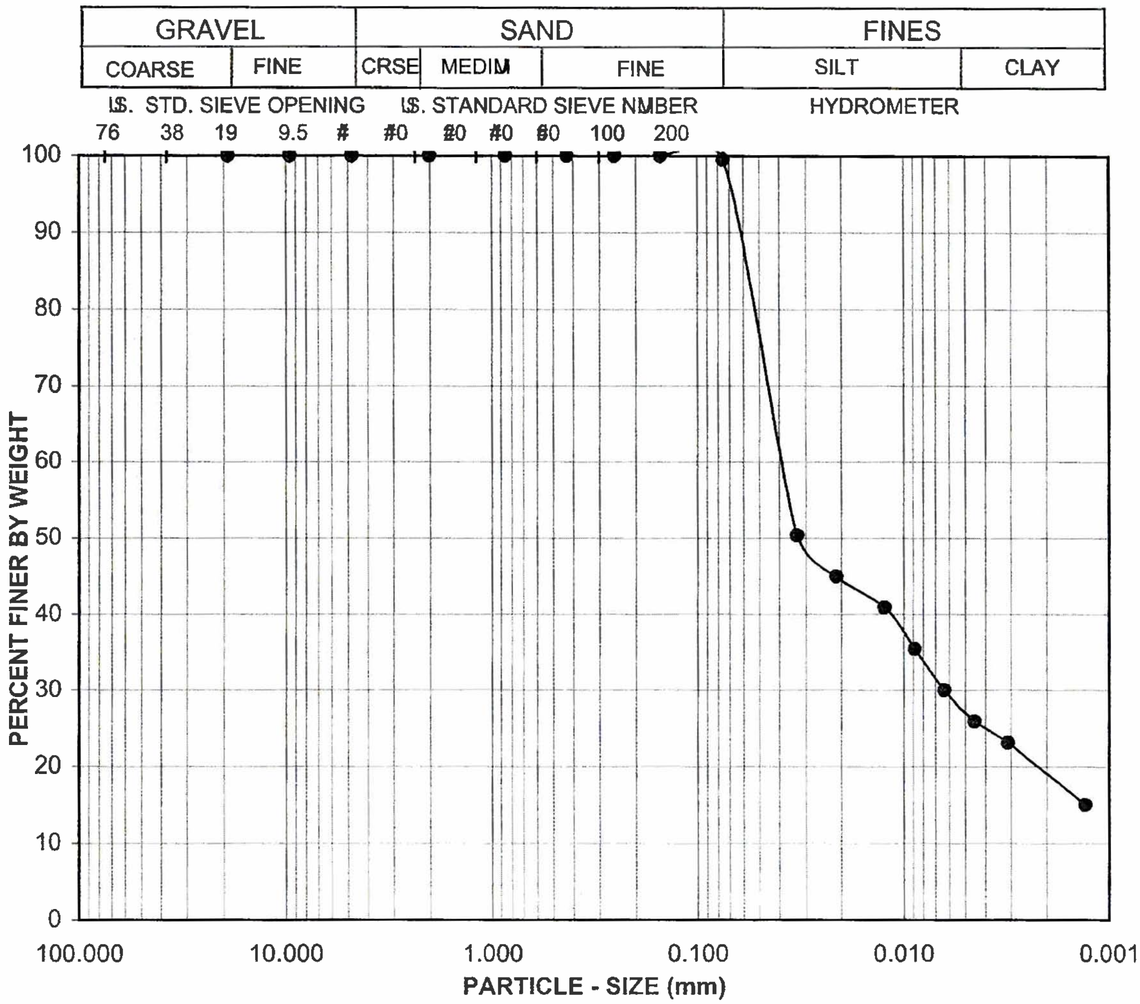
SR-125 / 905

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

Rev. 8-07

SIEVE B-1,S3





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S4	10.7-11.1	CH	0:0:100	79:34:45

Sample Description:
CH: PALE BROWN HEAVY CLAY

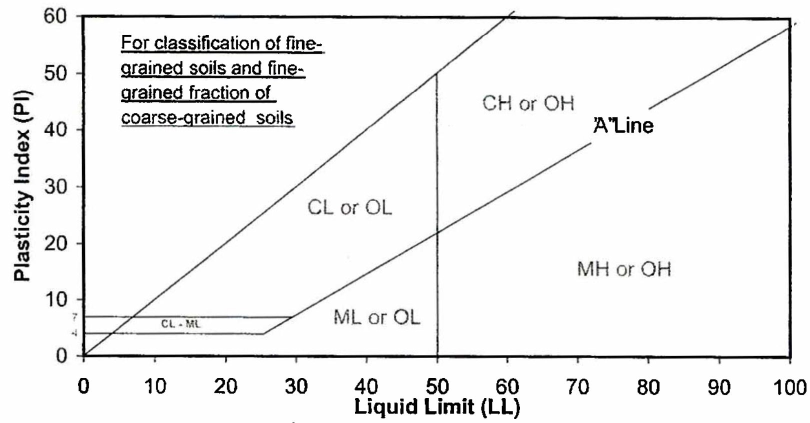
Leighton

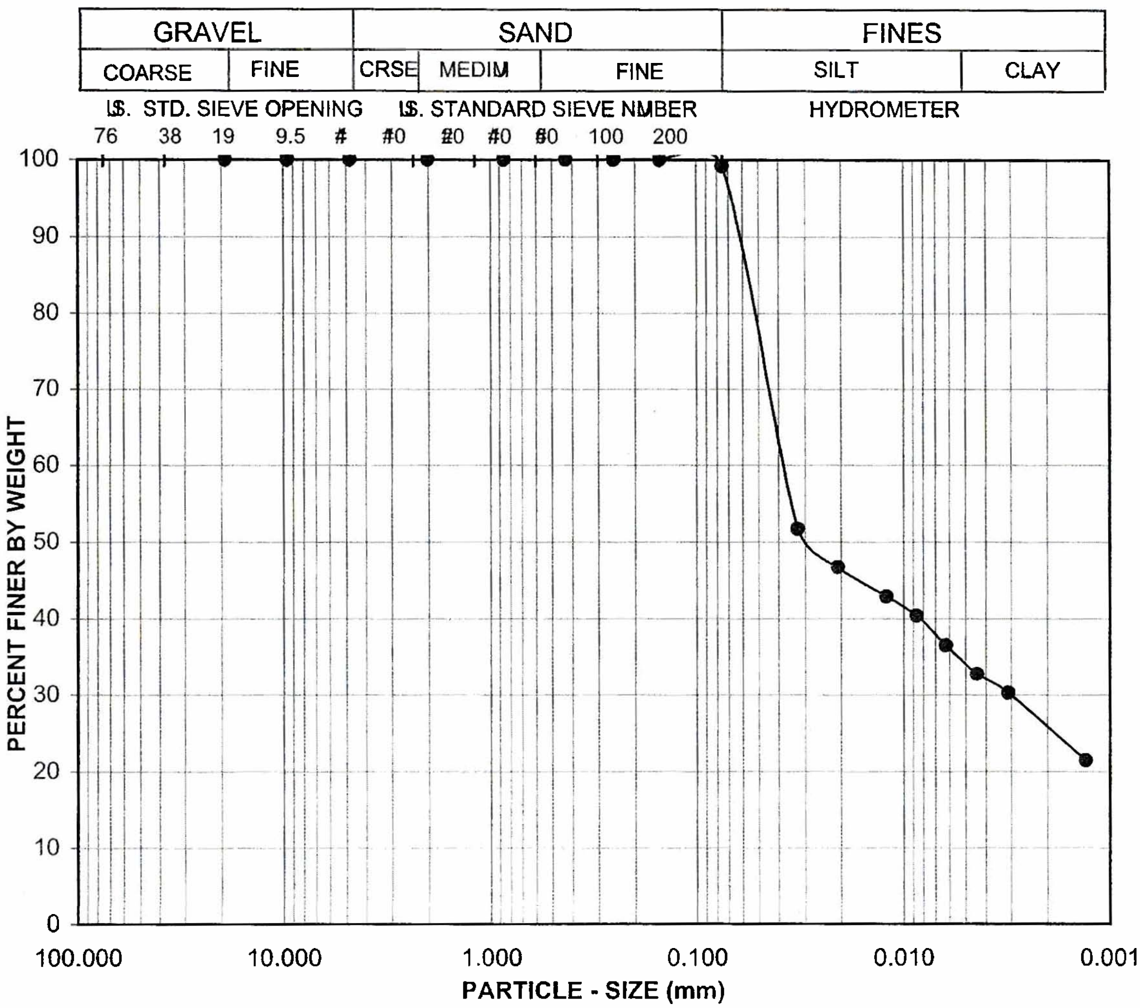
Project No.: 600158-905

SR-125 / 905

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

Rev. 8-07





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S6	16.8-17.2	CL	0:0:100	N/A

Sample Description:
CL: PALE RED-BROWN LEAN CLAY

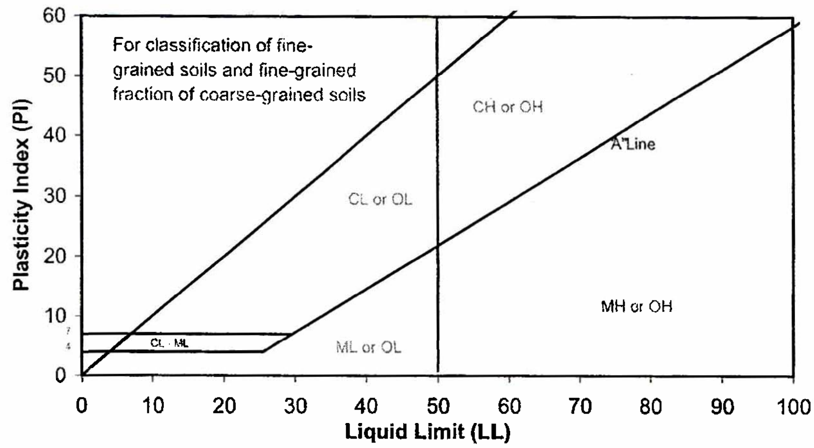
Project No.: 600158-905

SR-125 / 905

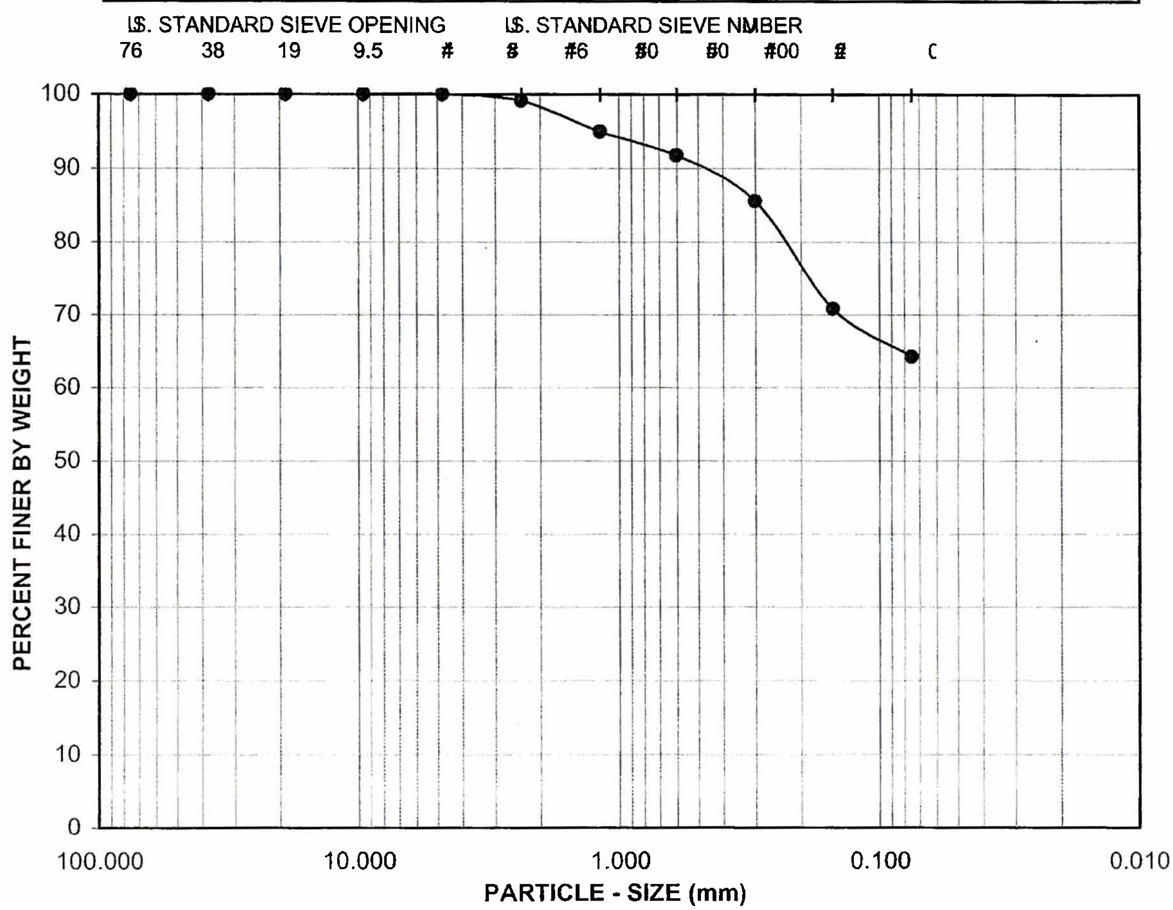
Leighton

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

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-2	S8	22.9-23.2	s(ML)	0 : 36 : 64	N/A

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

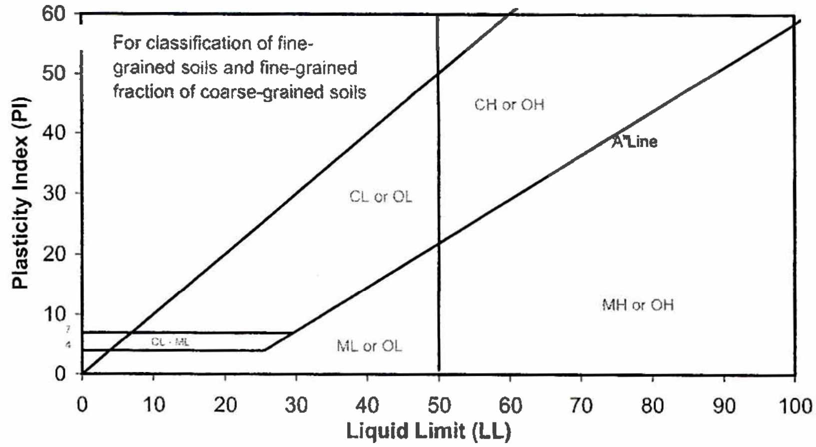
Project No.: 600158-905

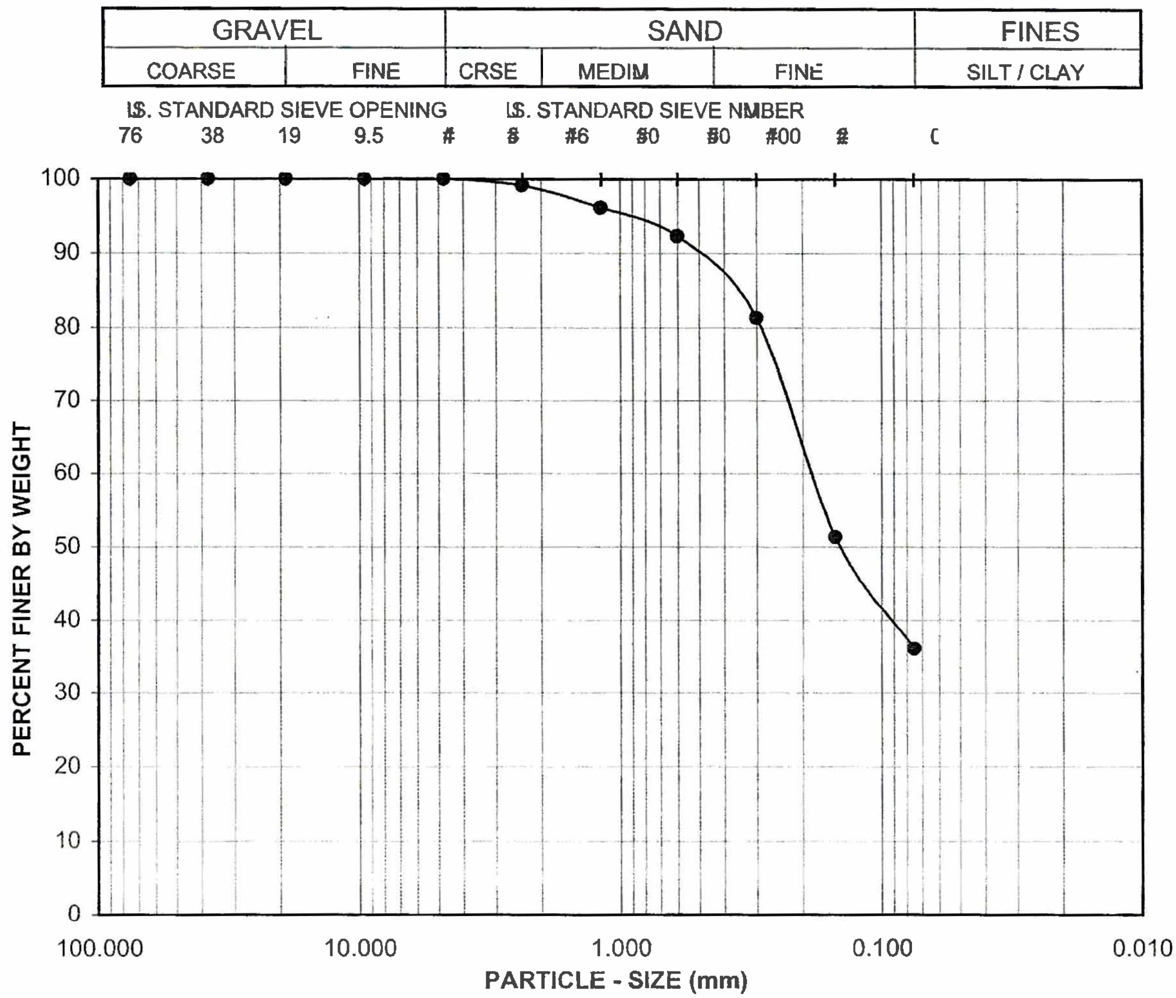
SR-125 / 905

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

Rev. 8-07

SIEVE B-2,S8





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S1	4.6-5.0	SM	0 : 64 : 36	N/A

Project No.: 600158-905

SR-125 / 905

Visual Sample Description:
SM: PALE BROWN SILTY SAND

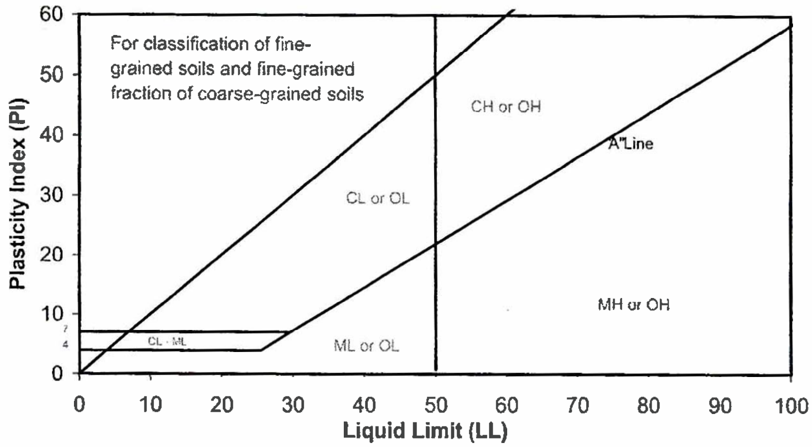
Leighton

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

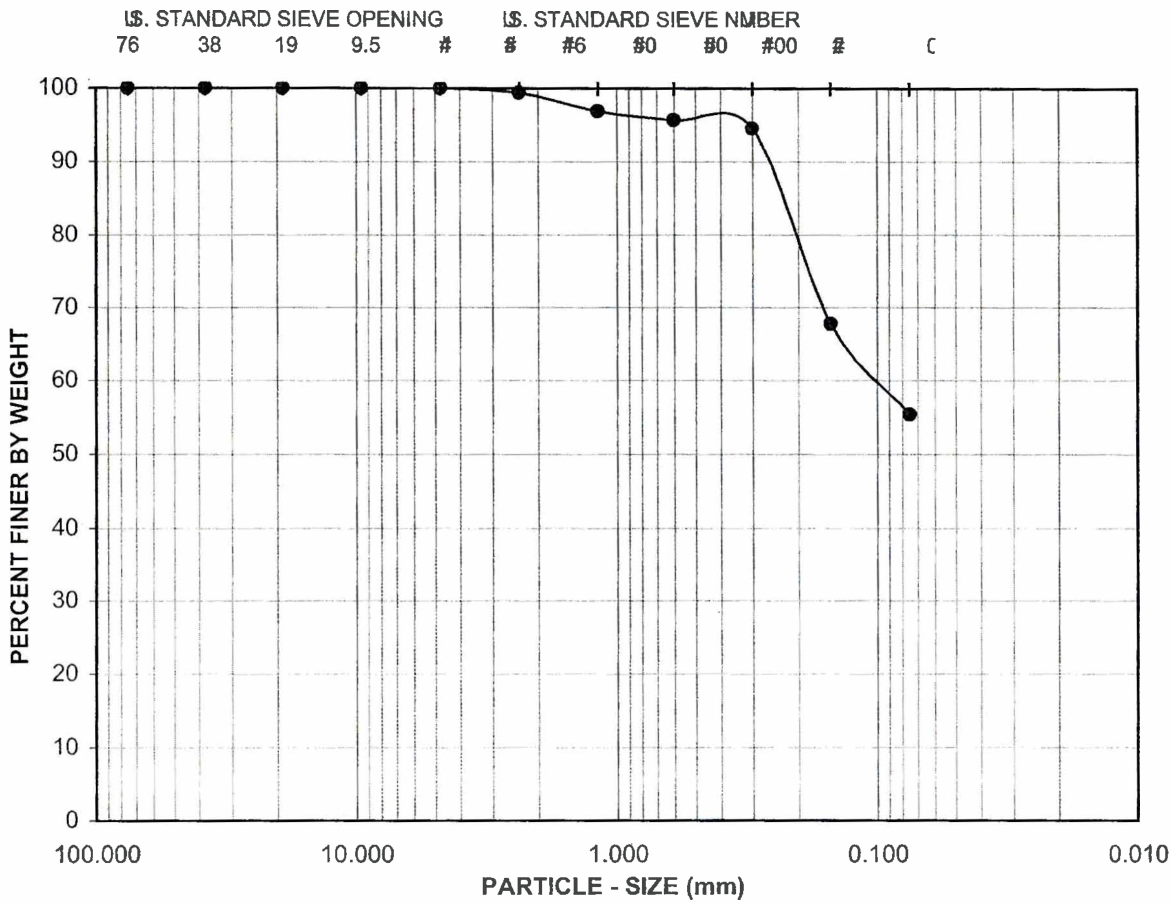
ASTM D 4318, D 422

Rev. 8-07

SIEVE B-3,S1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S3	10.7-11.1	s(ML)	0 : 45 : 55	N/A

Project No.: 600158-905

SR-125 / 905

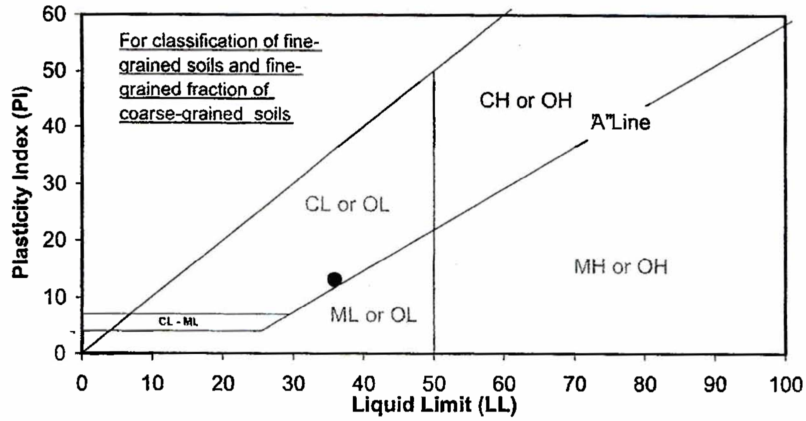
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

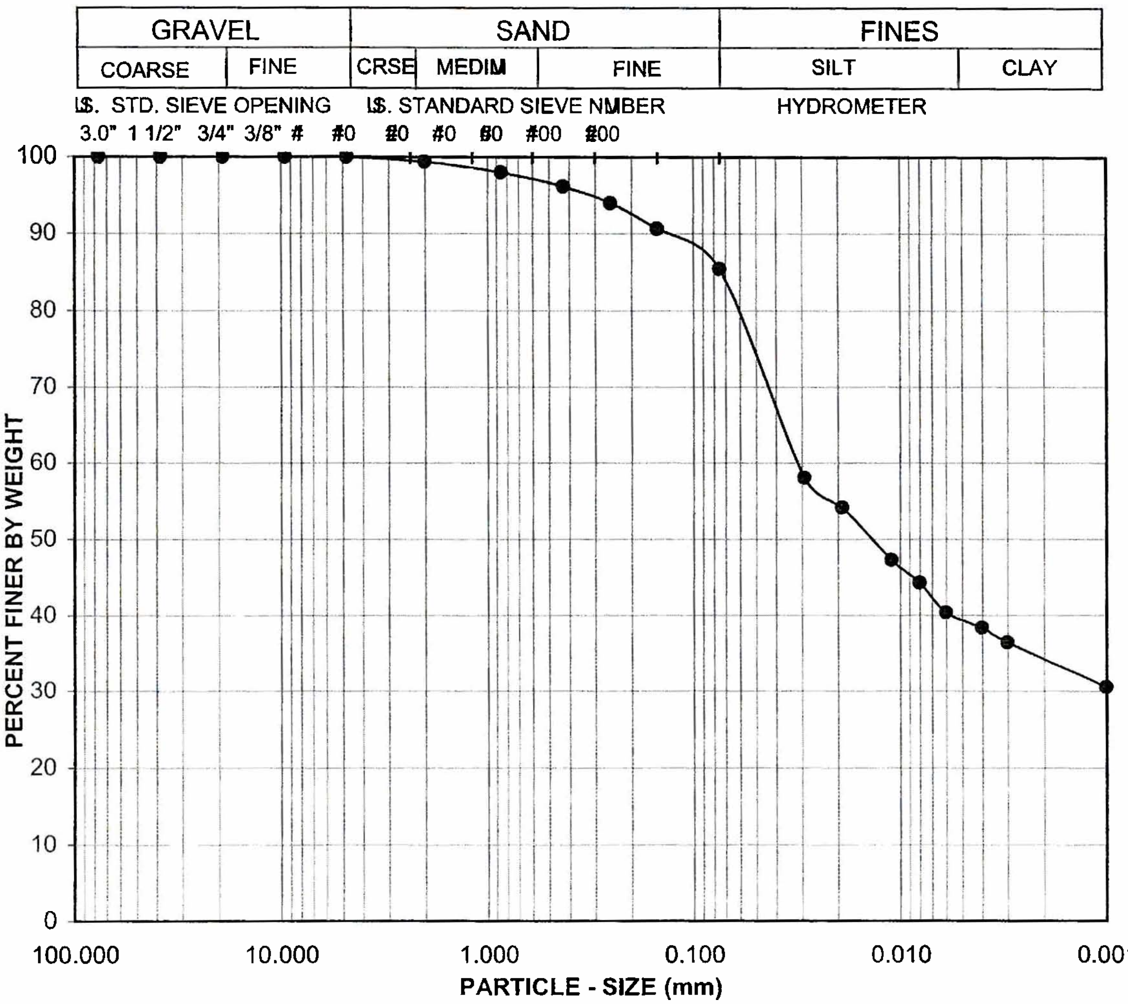
Leighton

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

Rev. 8-07

SIEVE B-3,S3





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	B-1	0.3-1.5	(ML-CL)s	0:15:85	36:23:13

Sample Description:
(ML-CL)s, DARK OLIVE BROWN CLAYEY SILT WITH SAND.

Leighton

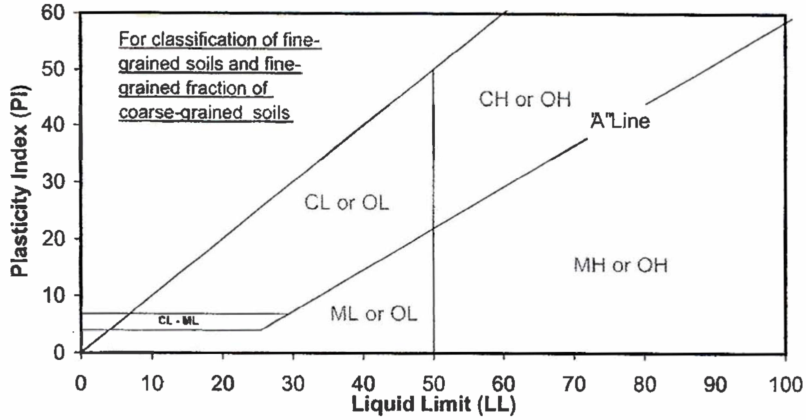
Project No.: 600158-905

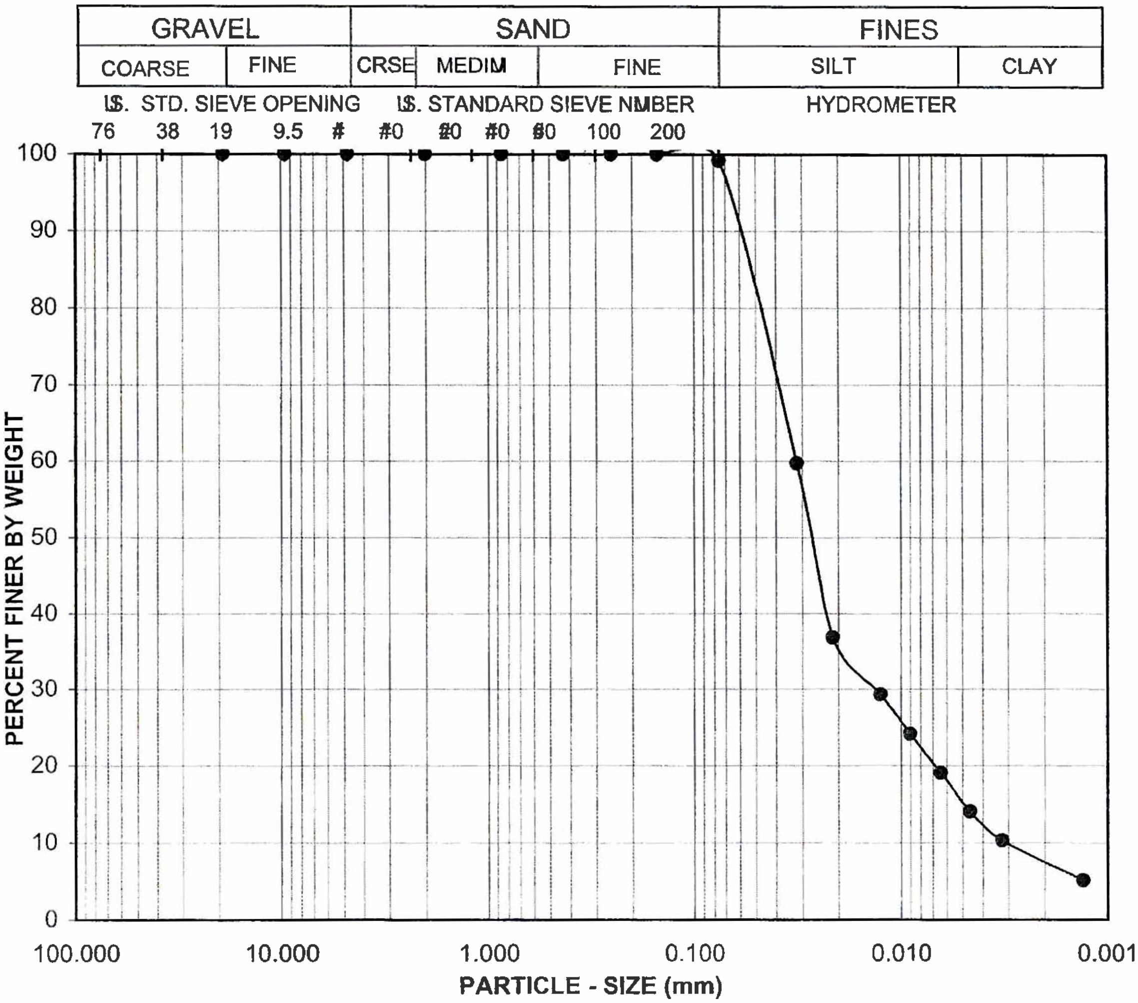
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	S1	3.0-3.4	ML-CL	0:0:100	N/A

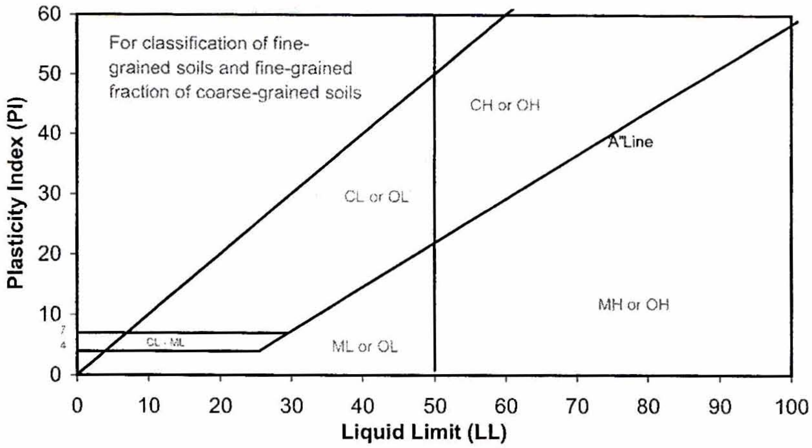
Sample Description:
ML-CL: PALE BROWN CLAYEY LEAN SILT

Leighton

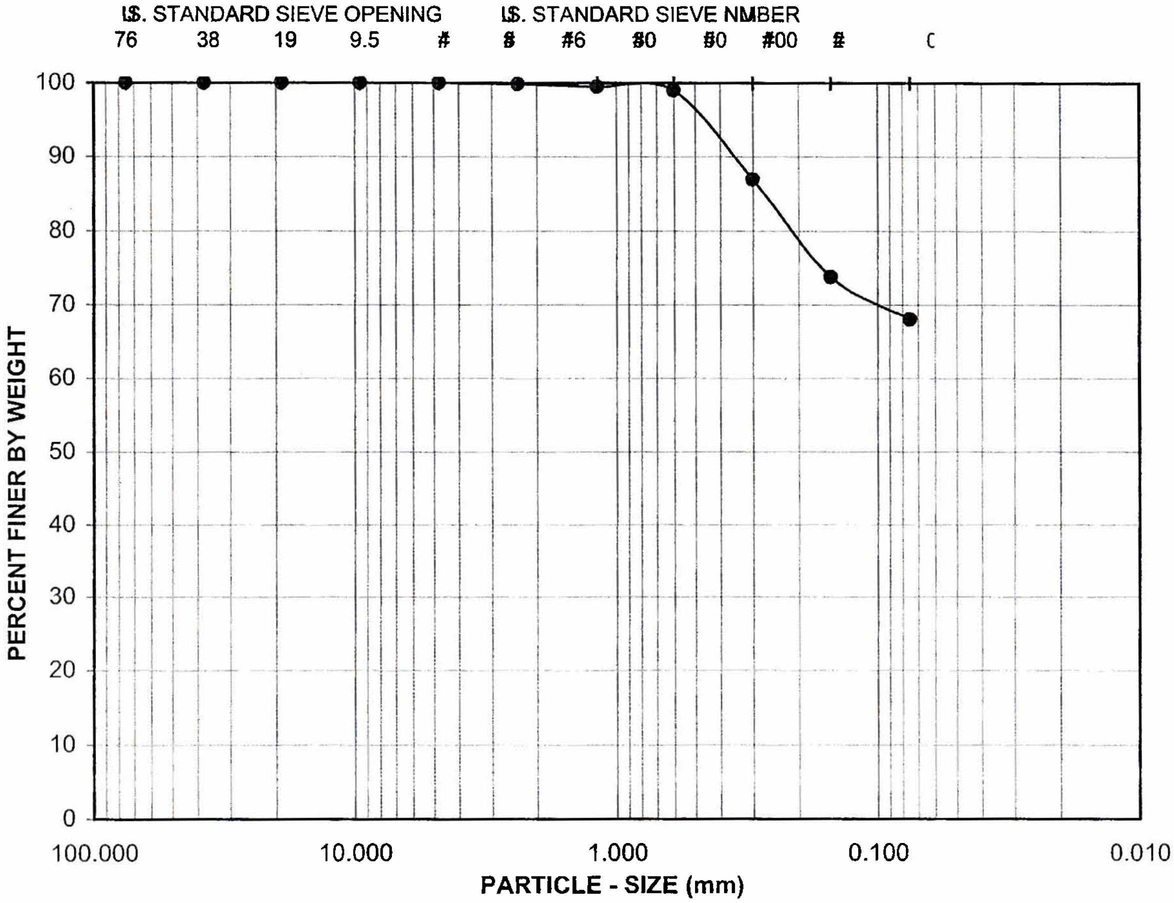
Project No.: 600158-905
SR-125 / 905

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

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-4	S3	7.6-7.9	s(ML)	0 : 32 : 68	N/A

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

Project No.: 600158-905

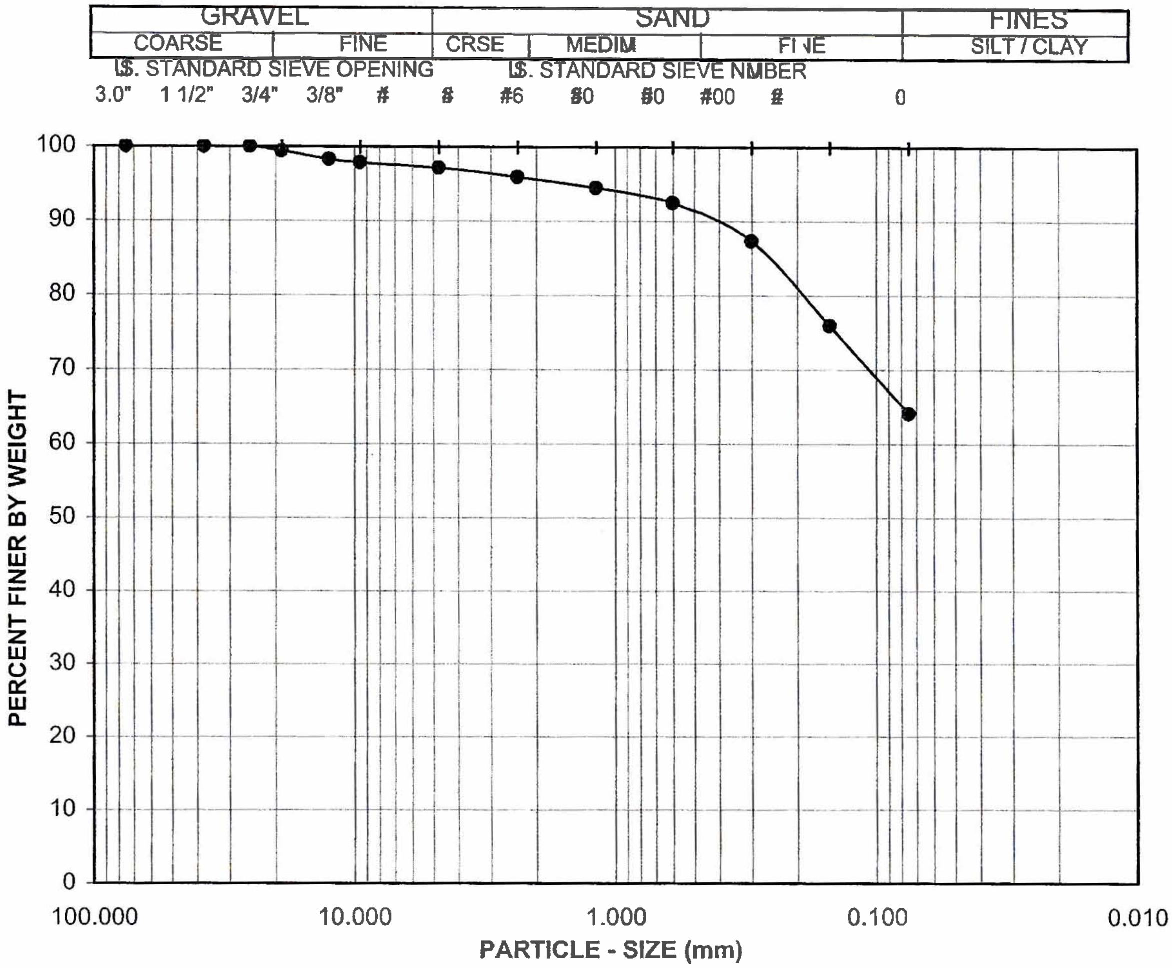
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-4,S3



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI
B-5	B-1	5-10.0	s(CL)	3 : 33 : 64

Visual Sample Description:
s(CL), DARK BROWN SANDY LEAN CLAY WITH TRACE GRAVEL.

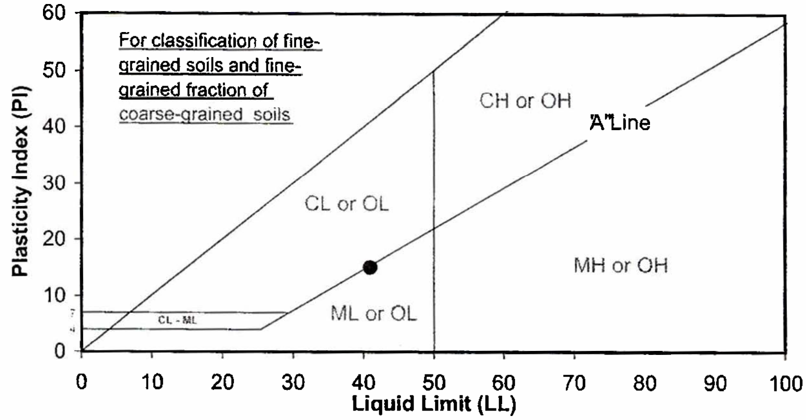
Leighton

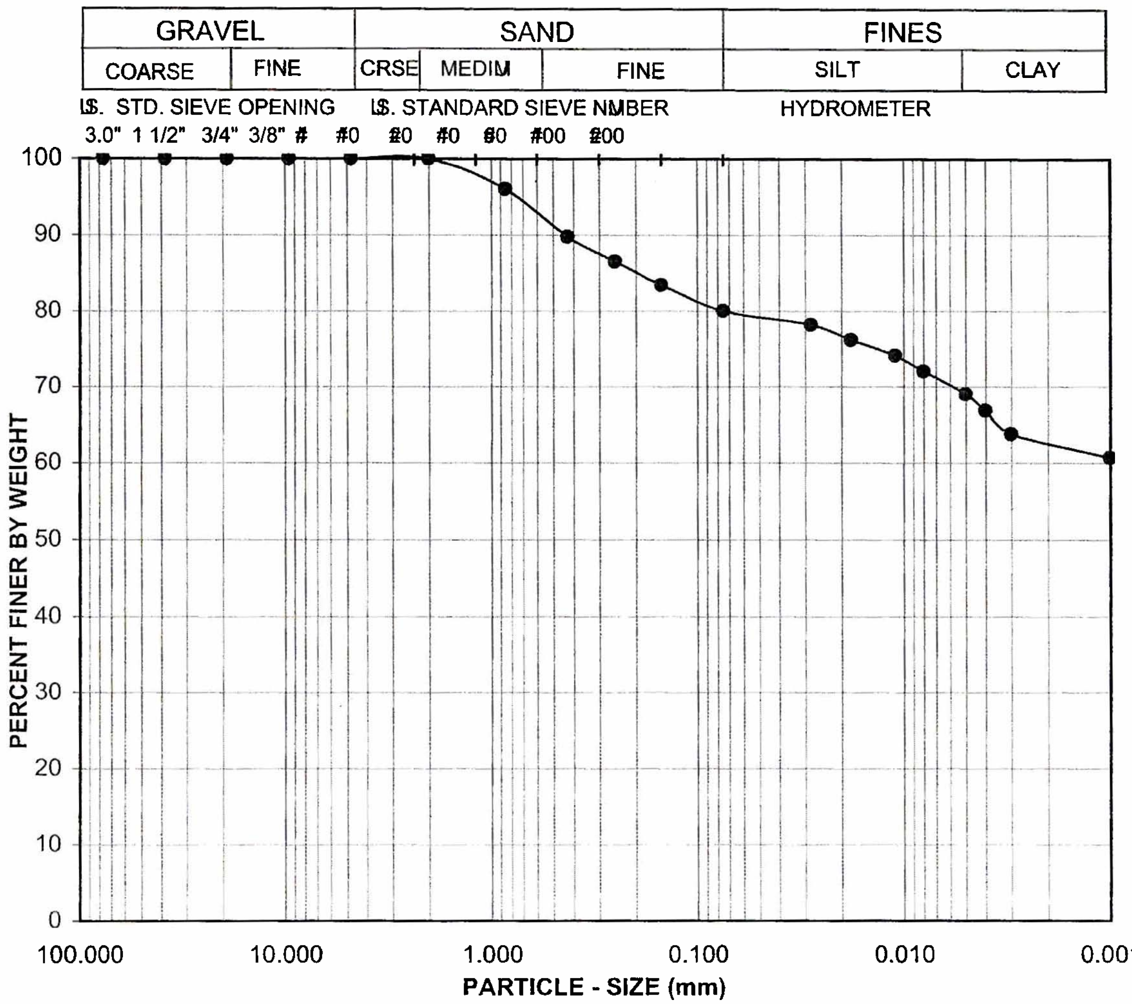
Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-5;B-1





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7	R-1	1.5	(CL)s	0:20:80	41:26:15

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

Leighton

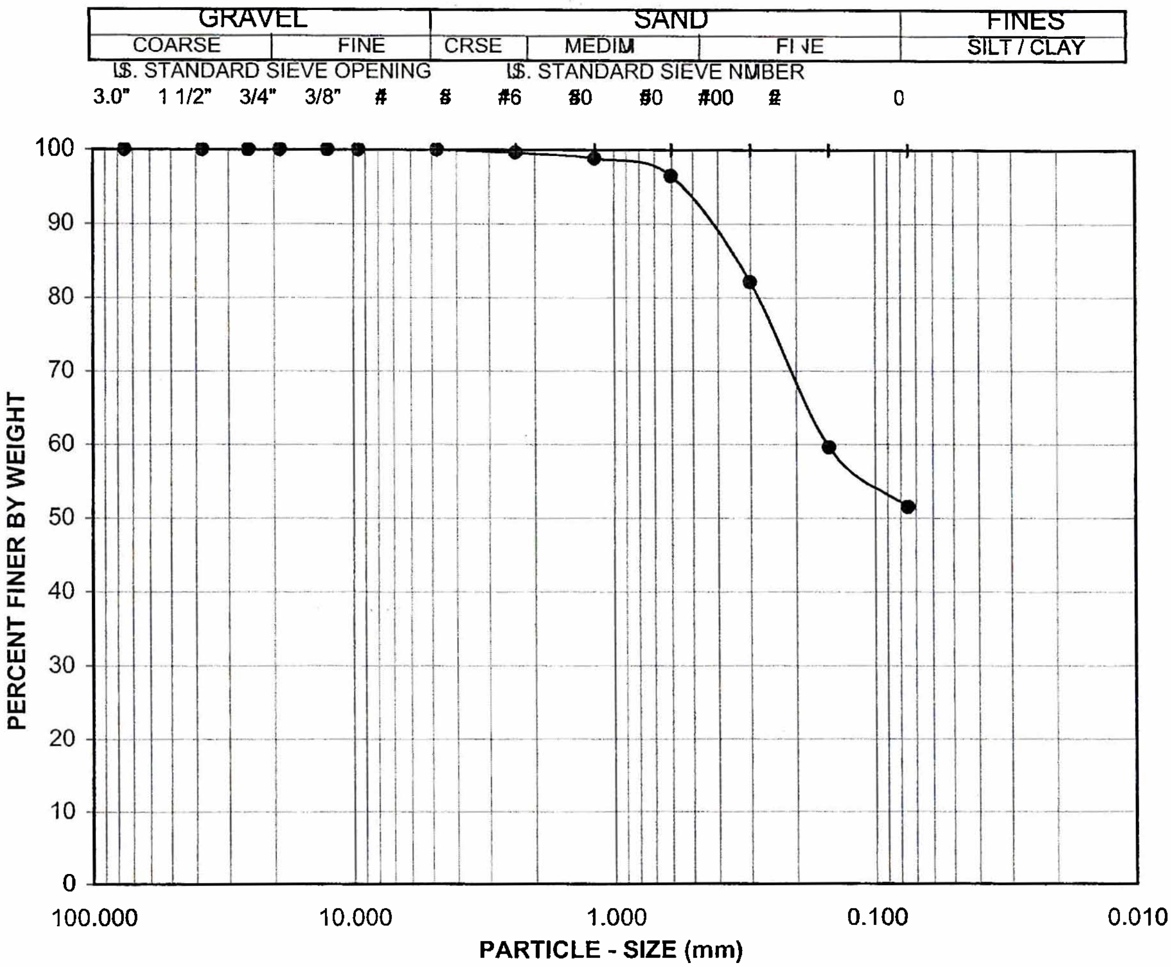
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-10	R-1	1.5	s(CL)	0 : 48 : 52

Visual Sample Description:
s(CL), LIGHT BROWN SANDY LEAN CLAY.

Leighton

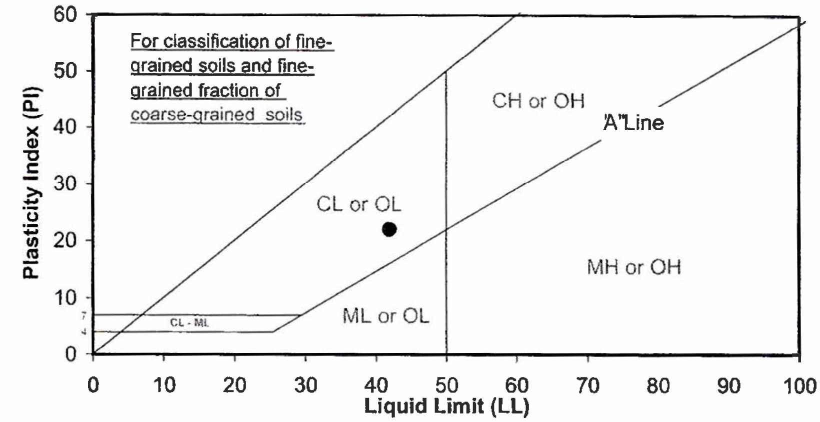
Project No.: 600158-905

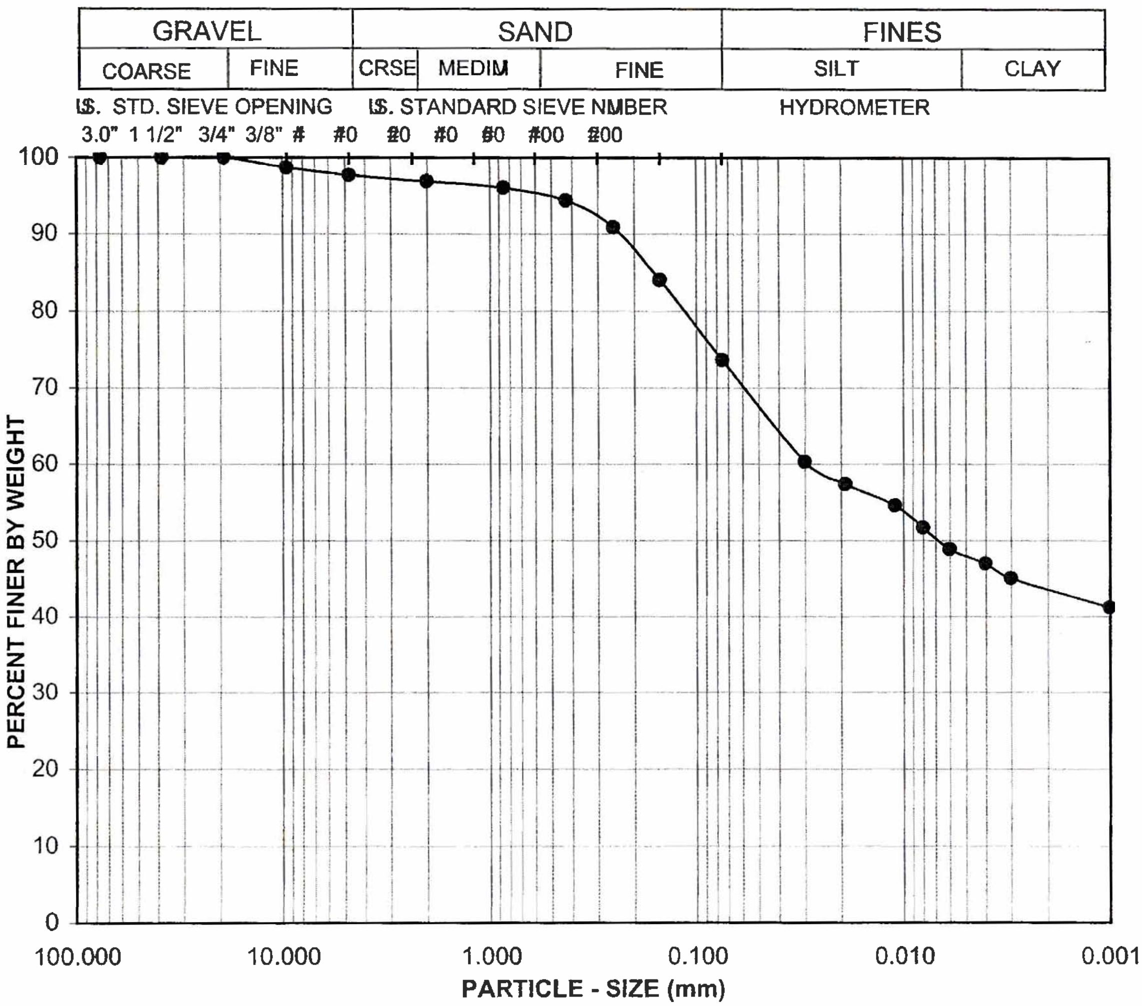
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-10,R-1





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	B-1	0-1.2	(CL)s	2:24:74	42:20:22

Sample Description:
(CL)s, LIGHT BROWN LEAN CLAY WITH SAND AND TRACE GRAVEL.

Leighton

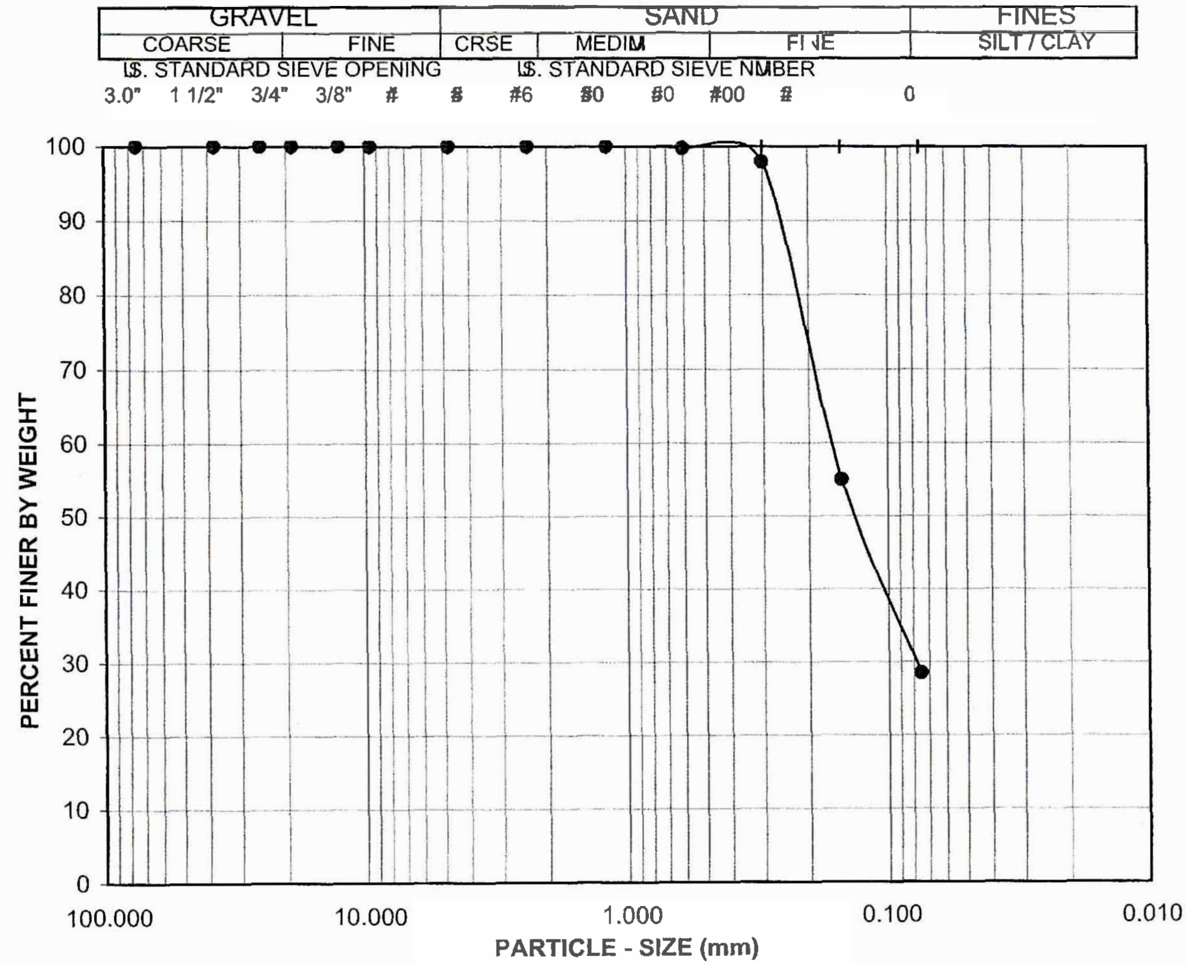
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-15	S-1	3.0	SM	0 : 72 : 28

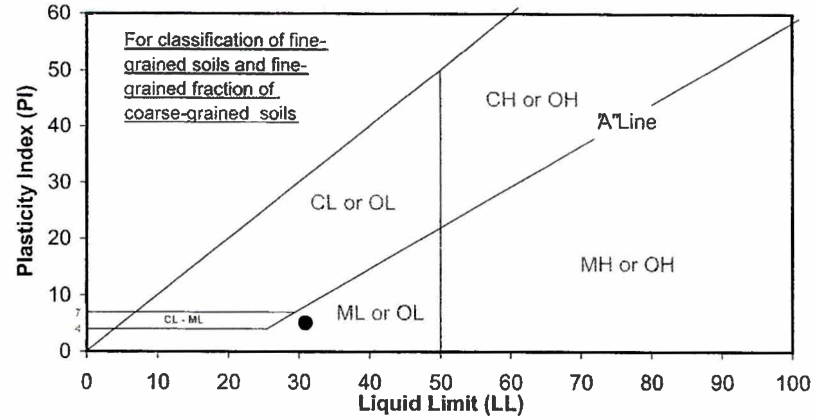
Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

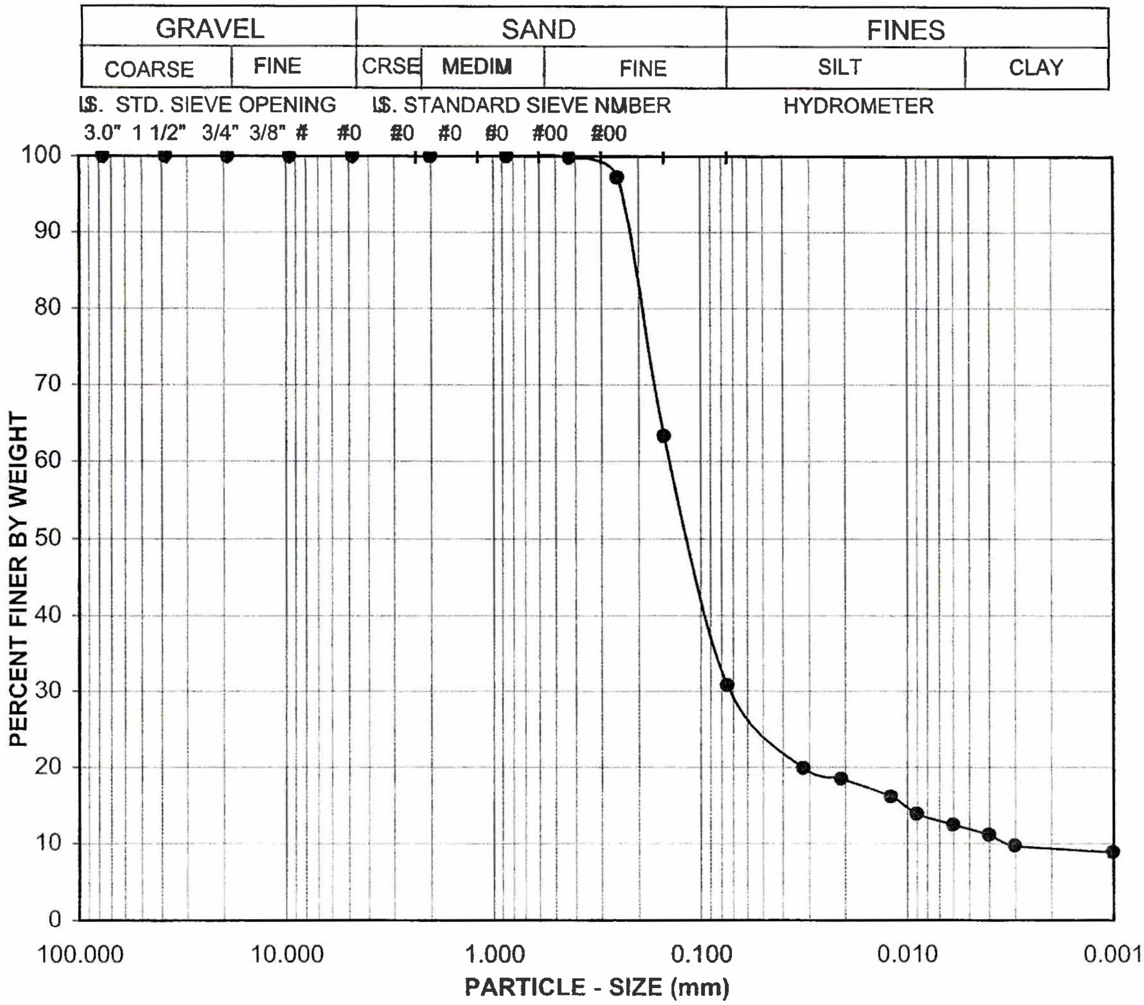
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-16	S-1	1.5	SM	0:69:31	31:26:5

Sample Description:
SM, BROWN SILTY SAND.

Project No.: 600158-905

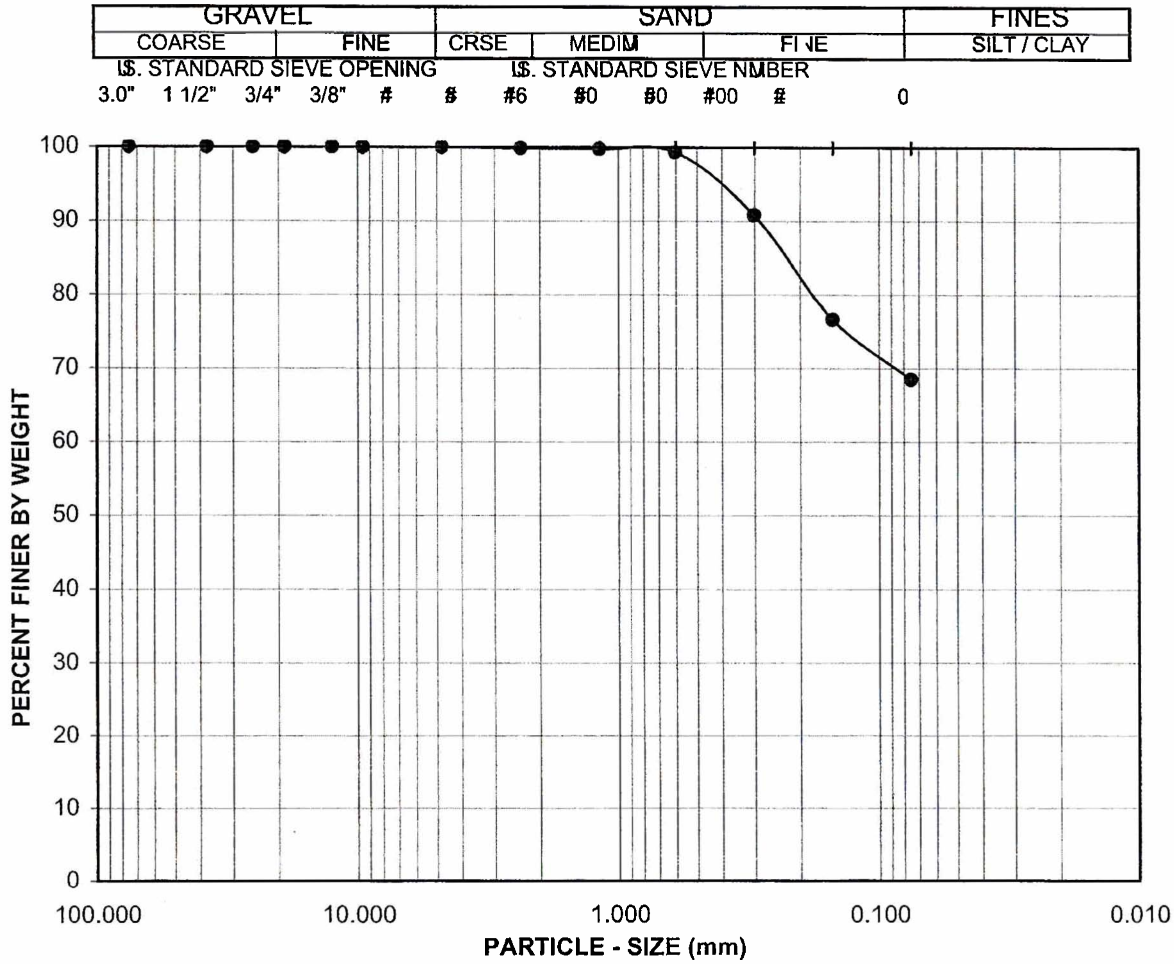
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIE CEVE

ASTM D 4318, D 422

Leighton

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-18	B-1	0-1.0	s(CL)	0 : 32 : 68

Visual Sample Description:
s(CL), DARK OLIVE BROWN SANDY LEAN CLAY.

Leighton

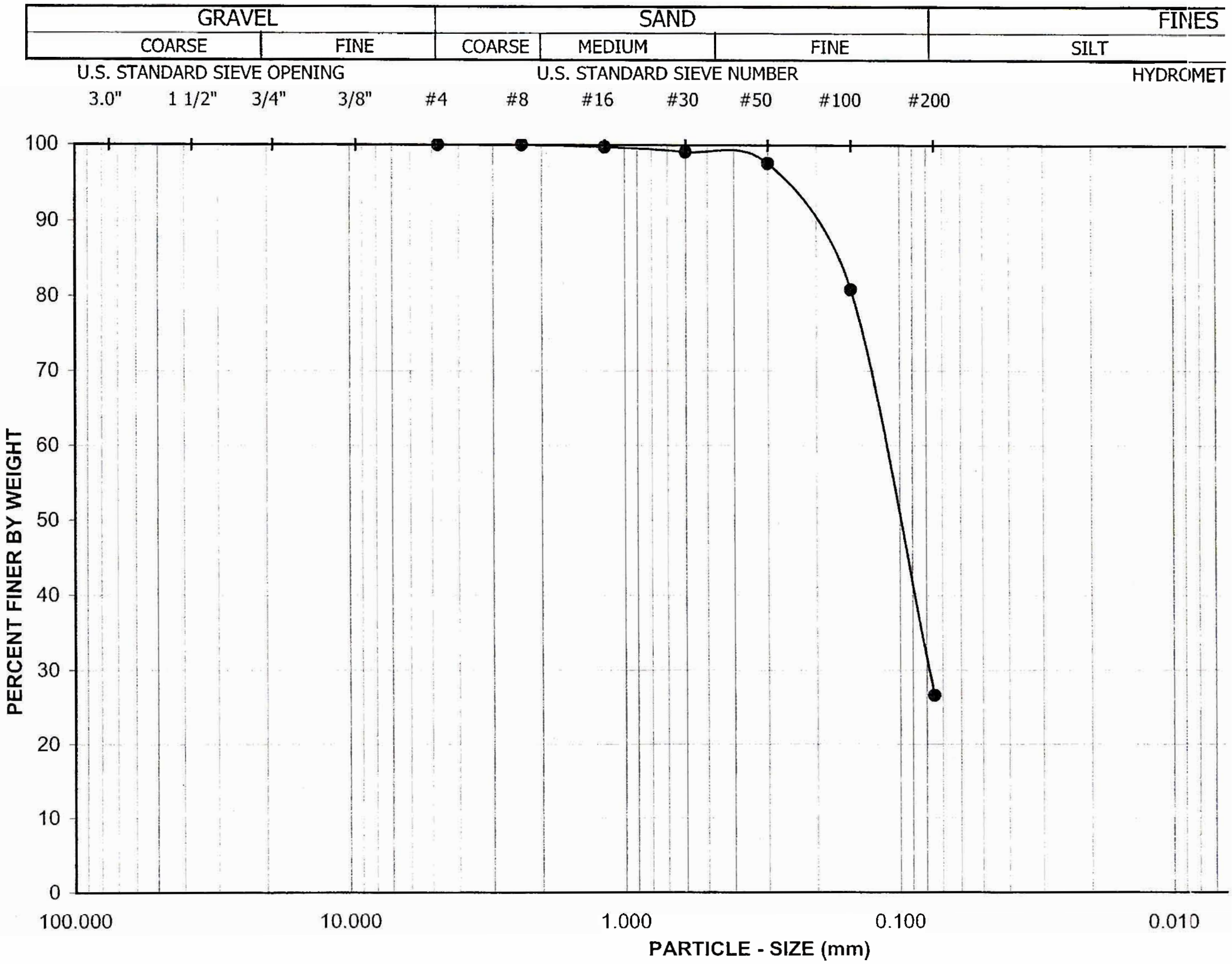
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-18,B-1



Project Name: SR 125 / 905 Interchange

Project No.: 600158-905

Exploration No.: B-19

Sample No.: F

Depth (m): 1.5

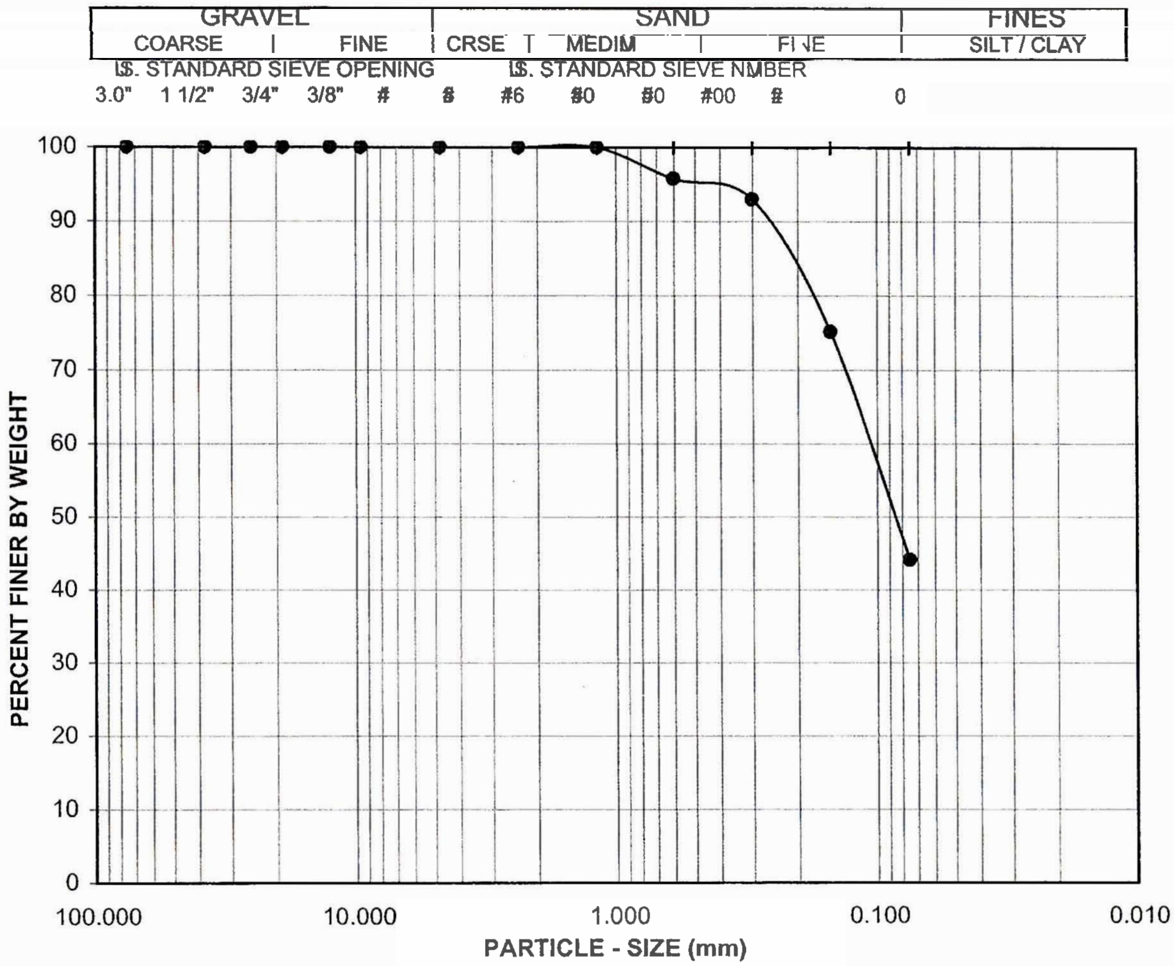
Soil Type : S

Soil Identification: Very pale brown silty sand (SM)

GR:SA:FI : (%) 0 : 73 : 27

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-1	3.0	SM	0 : 56 : 44

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

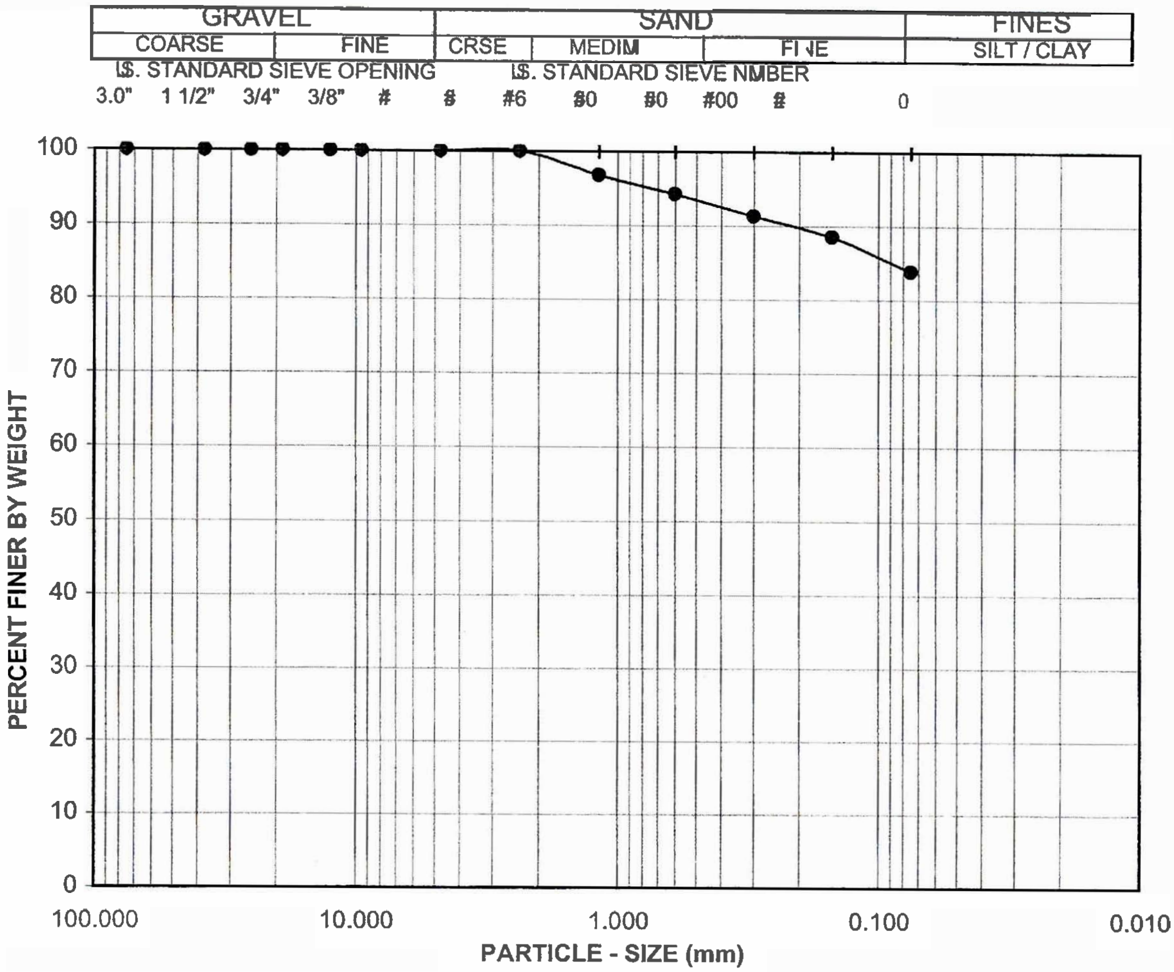
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-2	6.1	(ML)s	0 : 16 : 84

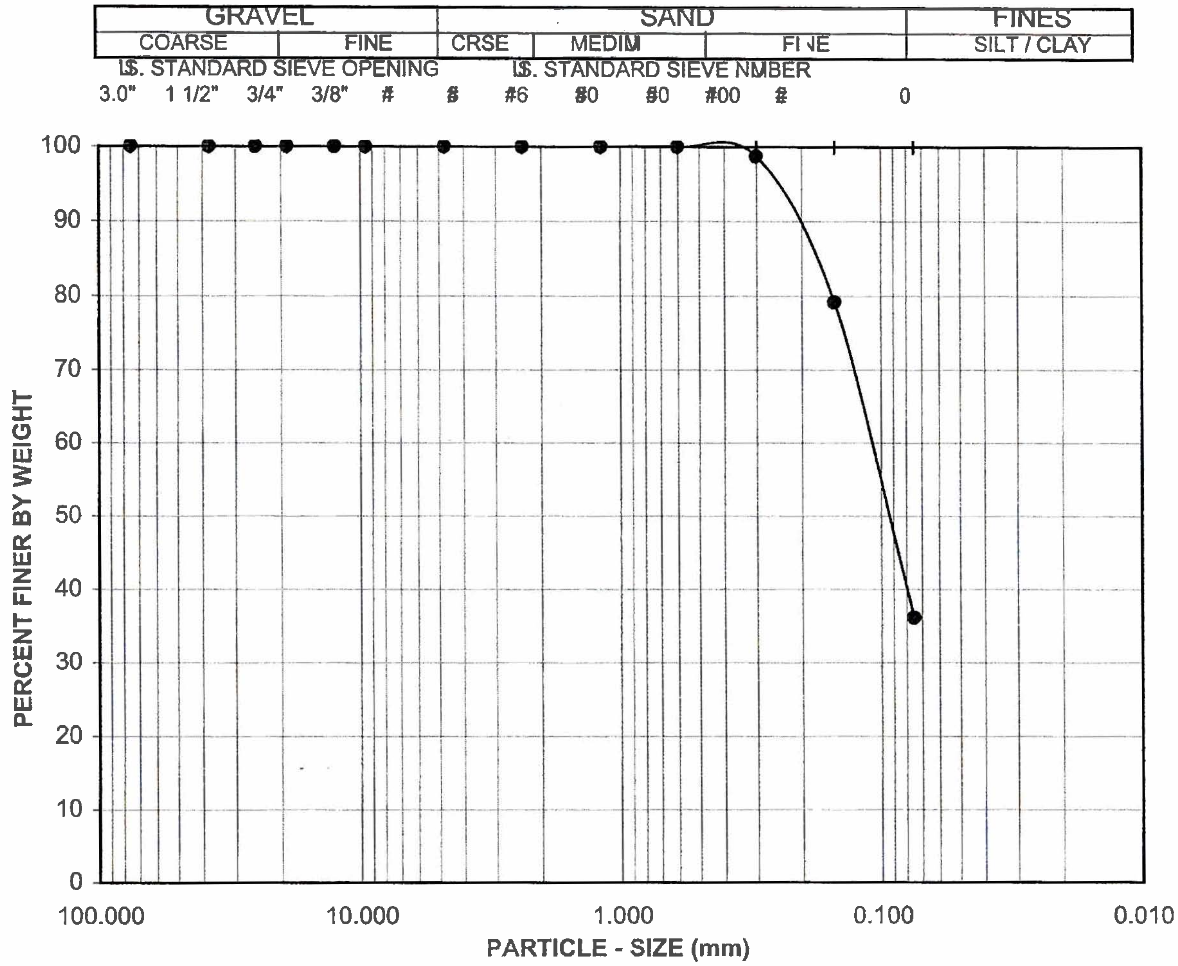
Project No.: 600158-905
SR-125 / 905

Visual Sample Description:
(ML)s, LIGHT BROWN SILT WITH SAND.

Leighton

CALTRANS 202

Rev. 12-06



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-4	10.7	SM	0 : 64 : 36

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

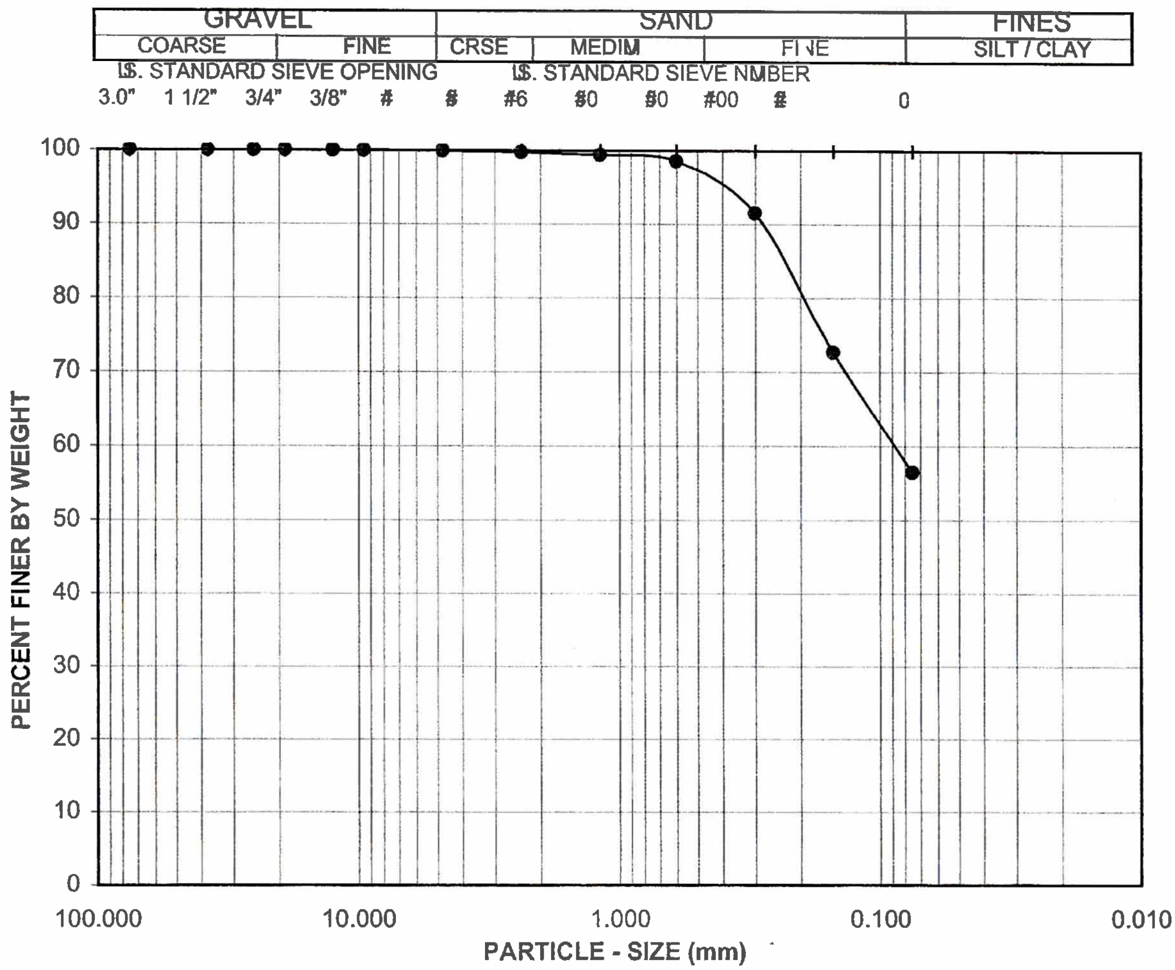
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-4



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-21	B-1	1.8-3.0	s(CL)	0 : 44 : 56

Visual Sample Description:

s(CL), LIGHT OLIVE BROWN SANDY LEAN CLAY.

Leighton

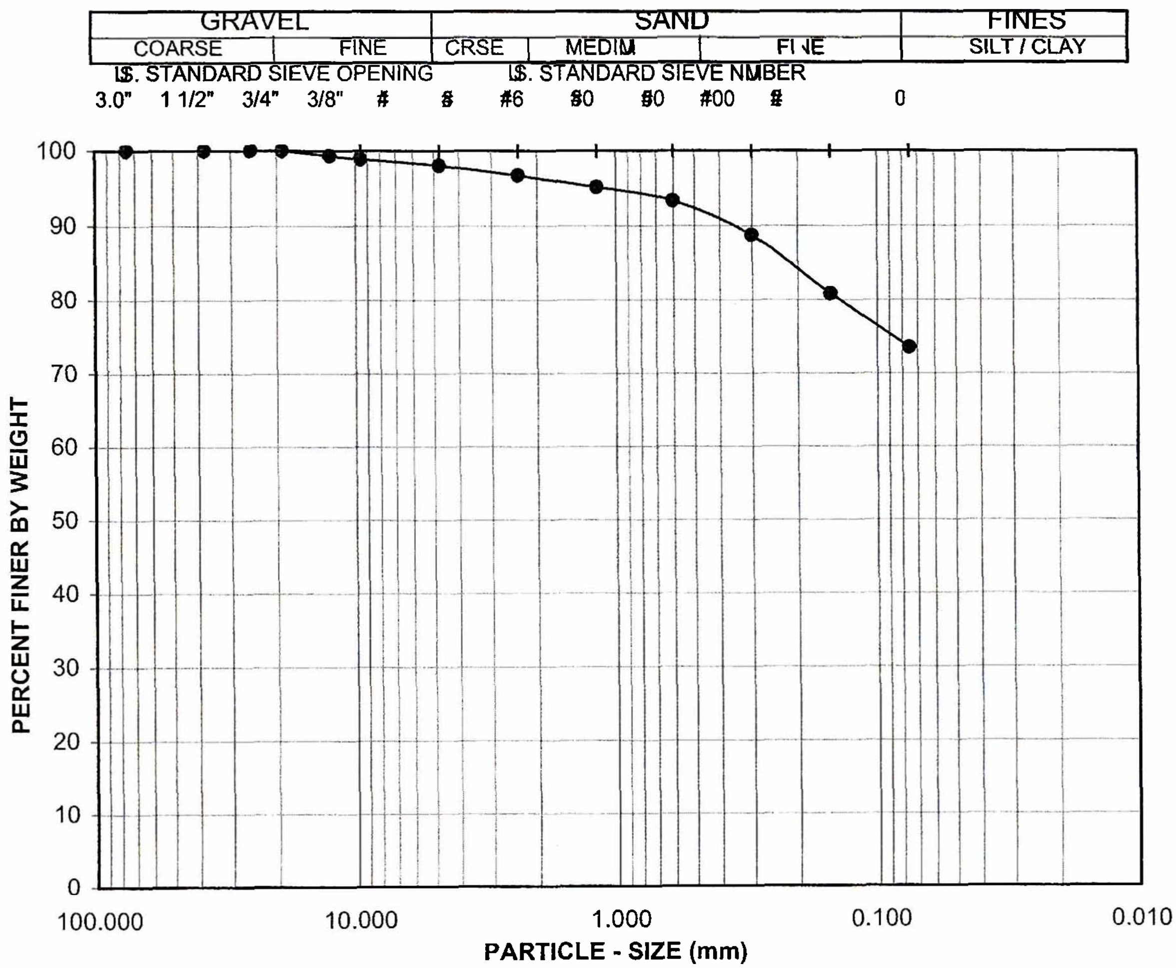
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-21,B-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
TP-1	B-1	0.6-1.0	(CH)s	2 : 24 : 74

Visual Sample Description:
(CH)s, GRAYISH BROWN FAT CLAY WITH SAND AND TRACE GRAVEL.

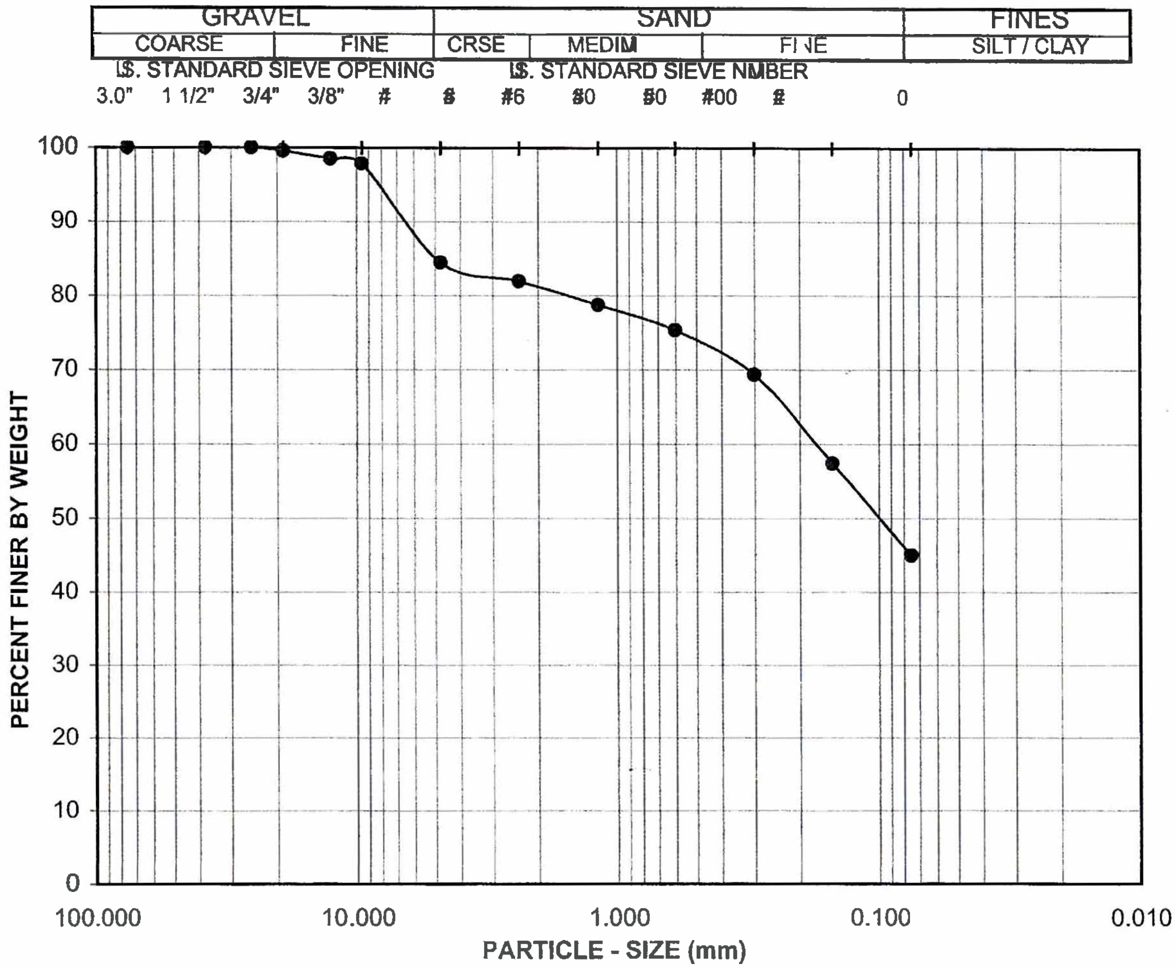
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-1,B-1



Boring No.:	Sample No.:	Depth (m.):	Soil Type	GR:SA:FI
TP-3	B-1	0.8-1.0	SC	16 : 39 : 45

Visual Sample Description:

SC, LIGHT BROWN CLAYEY SAND WITH GRAVEL.

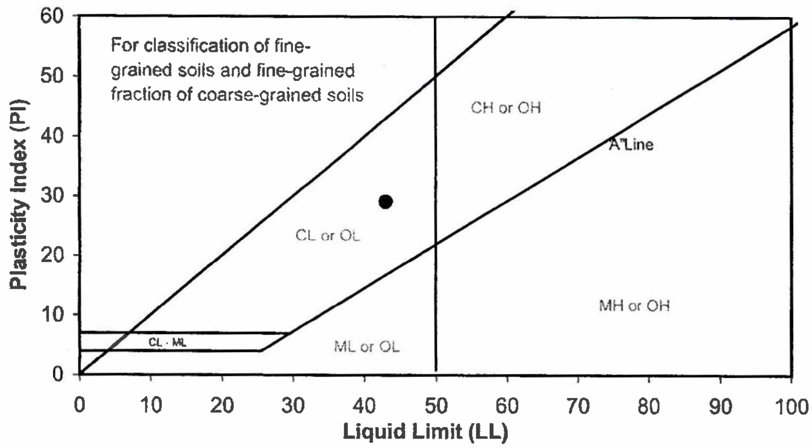
Leighton

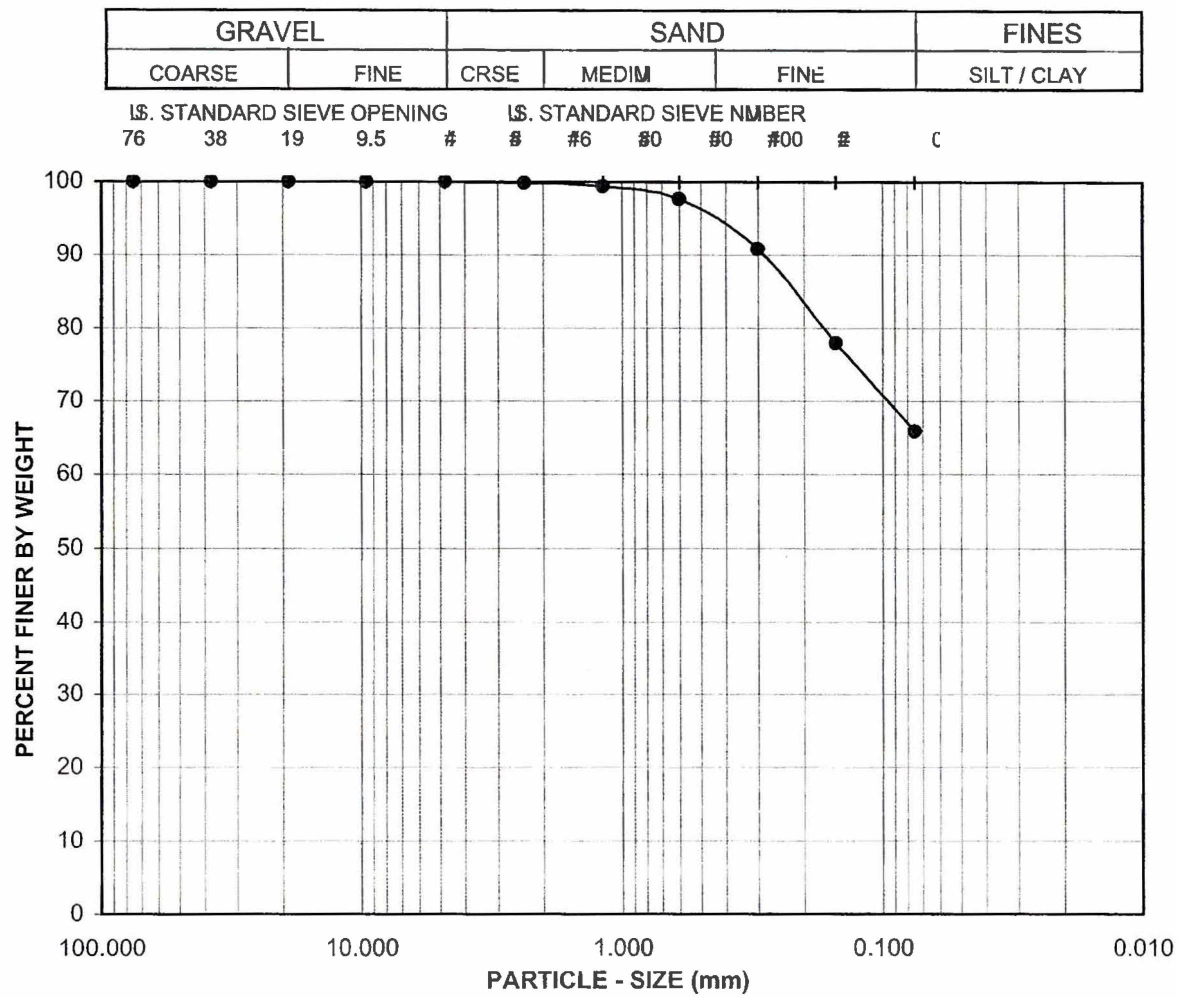
Project No.:	600158-905 SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-3,B-1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
TP-5	B1	0.0-0.5	s(CL)	0 : 34 : 66	29

Project No.: 600158-905

SR-125 / 905

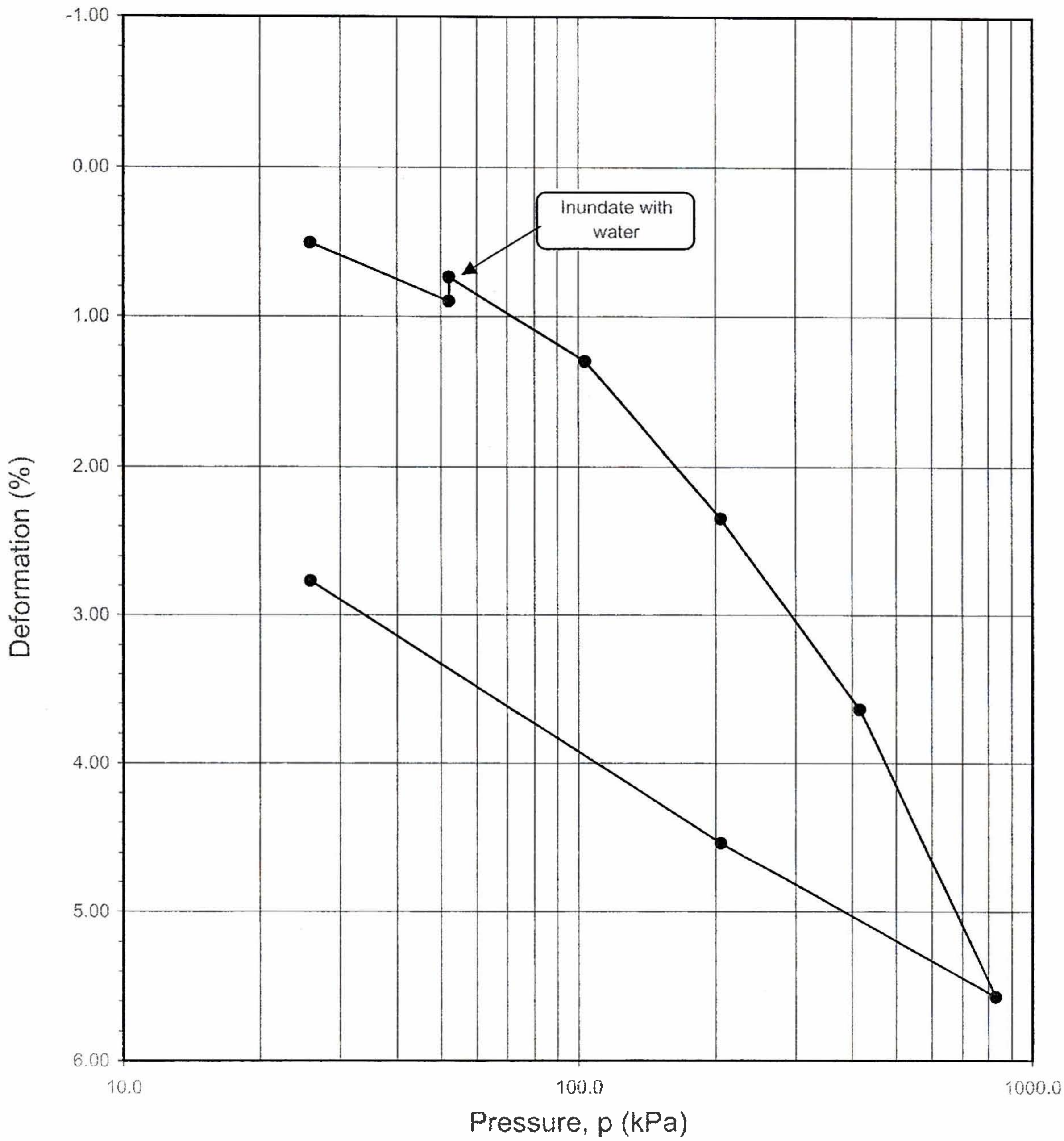
Visual Sample Description:
s(CL): BROWN SANDY LEAN CLAY

Leighton

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

Rev. 8-07

SIEVE TP-5,B1



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-1	**R1**	**1.5-1.8**	**42.6**	**44.2**	**12.40**	**12.75**	**1.177**	**1.117**	**99**	**109**

Sample Description:

ML-CL: PALE GRAY CLAYEY LEAN SILT

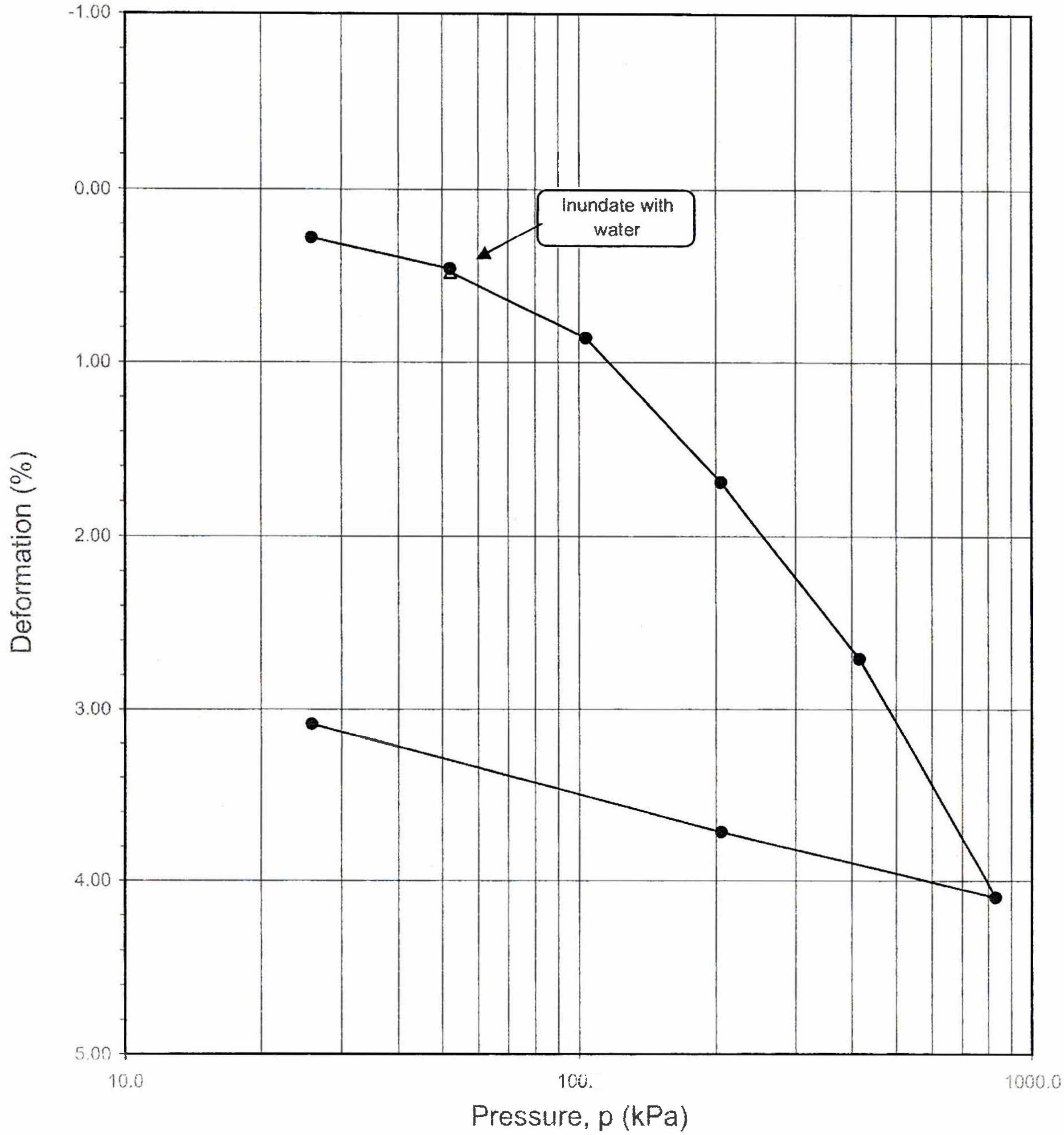
Leighton Consulting, Inc.

Project No.:	600158-905
Project Name:	SR-125

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-2	**R2**	**6.1-6.3**	**18.7**	**18.8**	**17.26**	**17.81**	**0.536**	**0.488**	**94**	**104**

Sample Description:

SM: PALE GRAY SILTY SAND

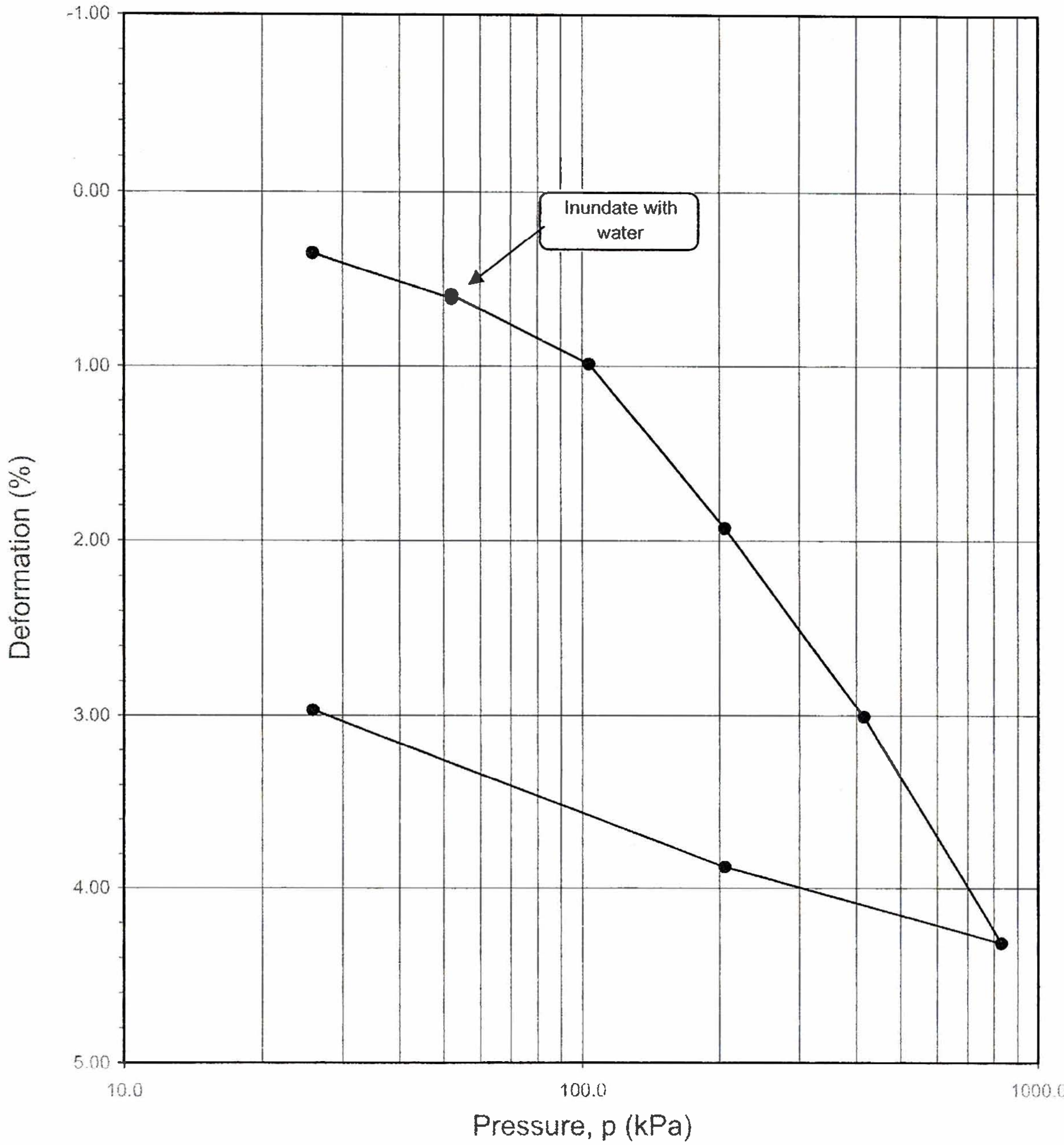
Project No.:	600158-905
Project Name:	SR-125

Leighton Consulting, Inc.

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-3	**R1**	**3.0-3.4**	**17.8**	**18.9**	**17.12**	**17.64**	**0.548**	**0.502**	**88**	**102**

Sample Description:

SM: PALE GRAY SILTY SAND

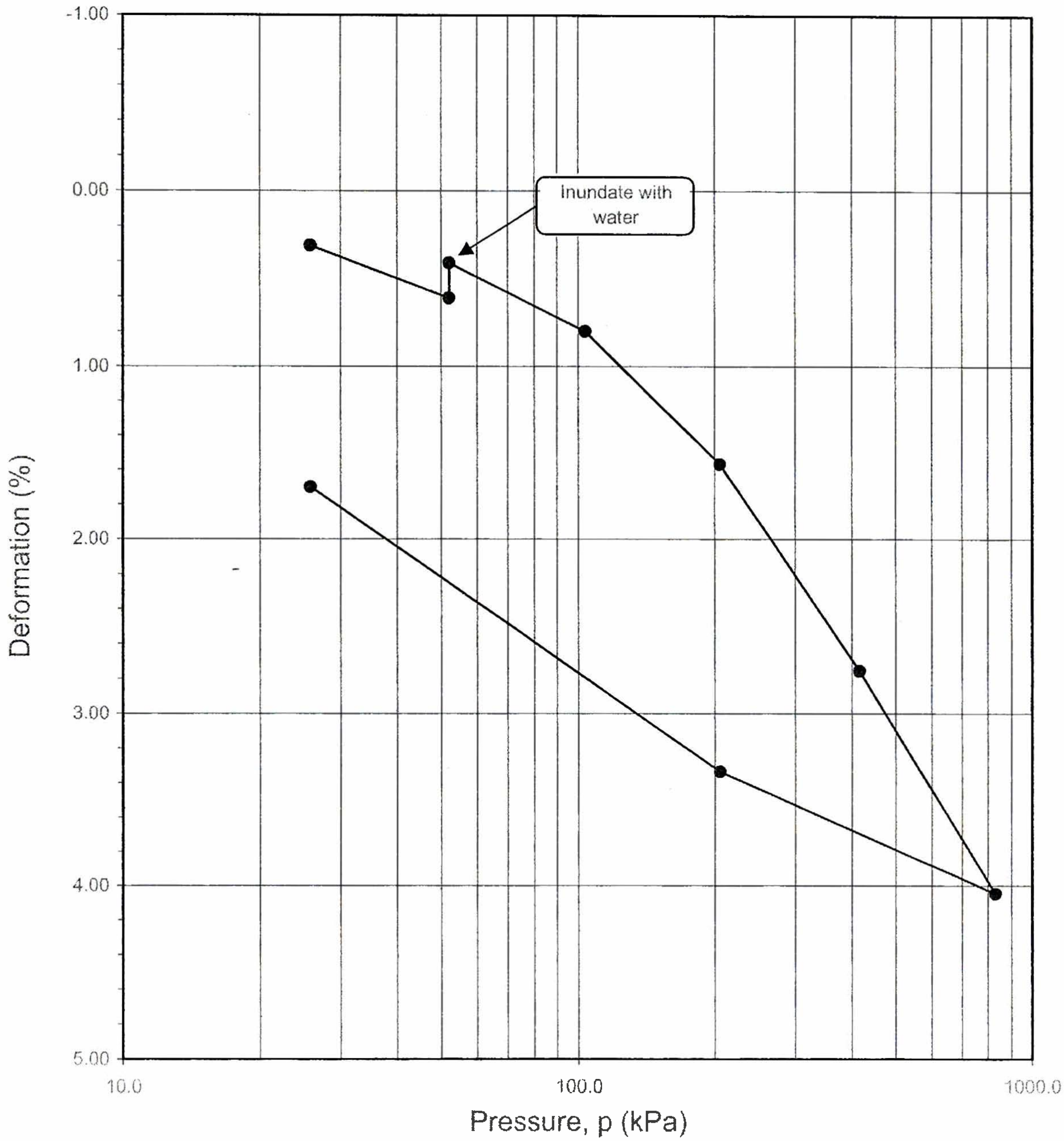
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-3	**R2**	**6.1-6.4**	**20.2**	**21.6**	**17.05**	**17.35**	**0.583**	**0.556**	**95**	**107**

Sample Description:

SM: PALE GRAY SILTY SAND

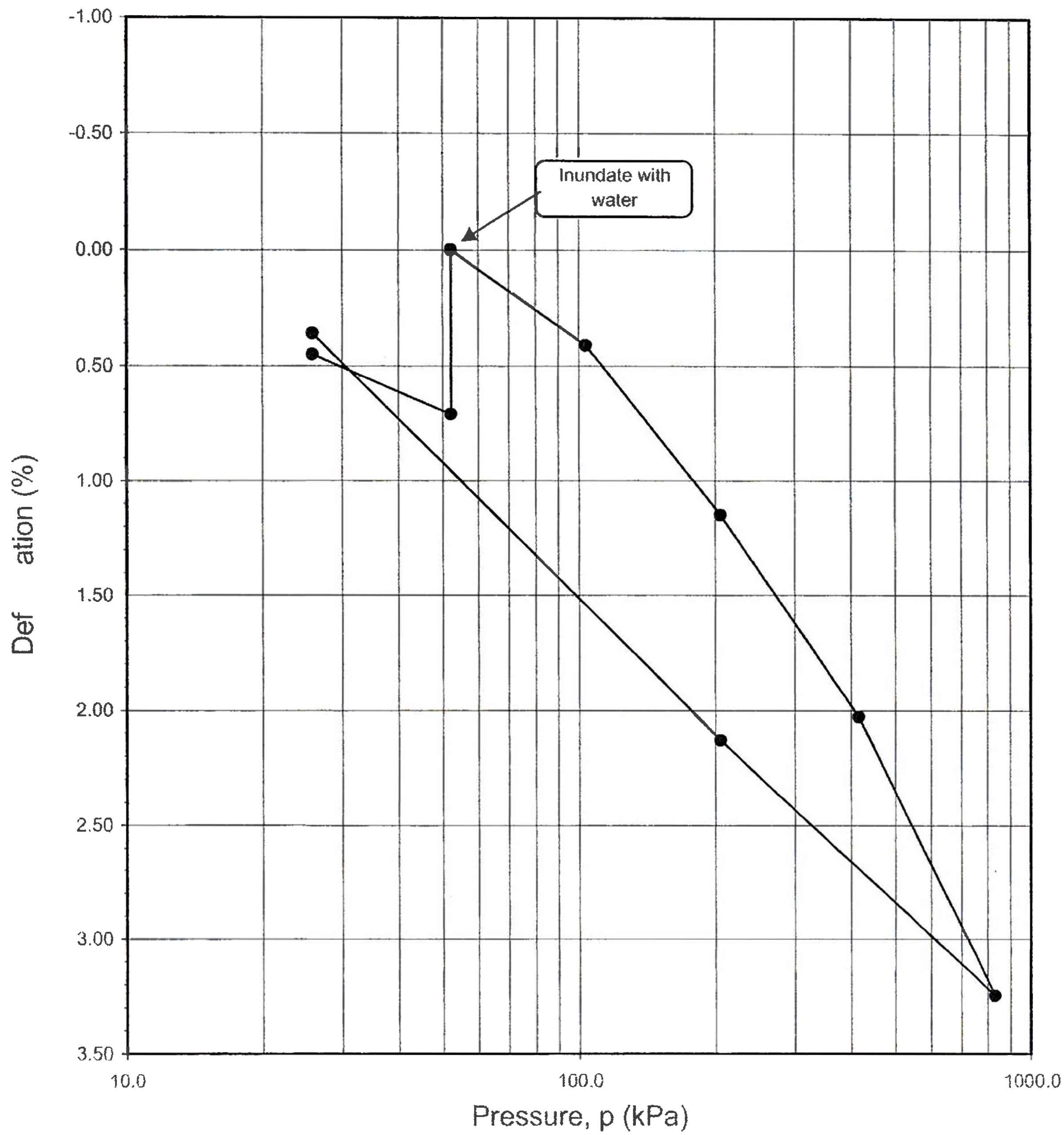
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R3**	**9.1-9.4**	**28.6**	**29.8**	**15.23**	**15.29**	**0.772**	**0.766**	**102**	**107**

Sample Description:

SC: PALE GRAY CLAYEY SAND

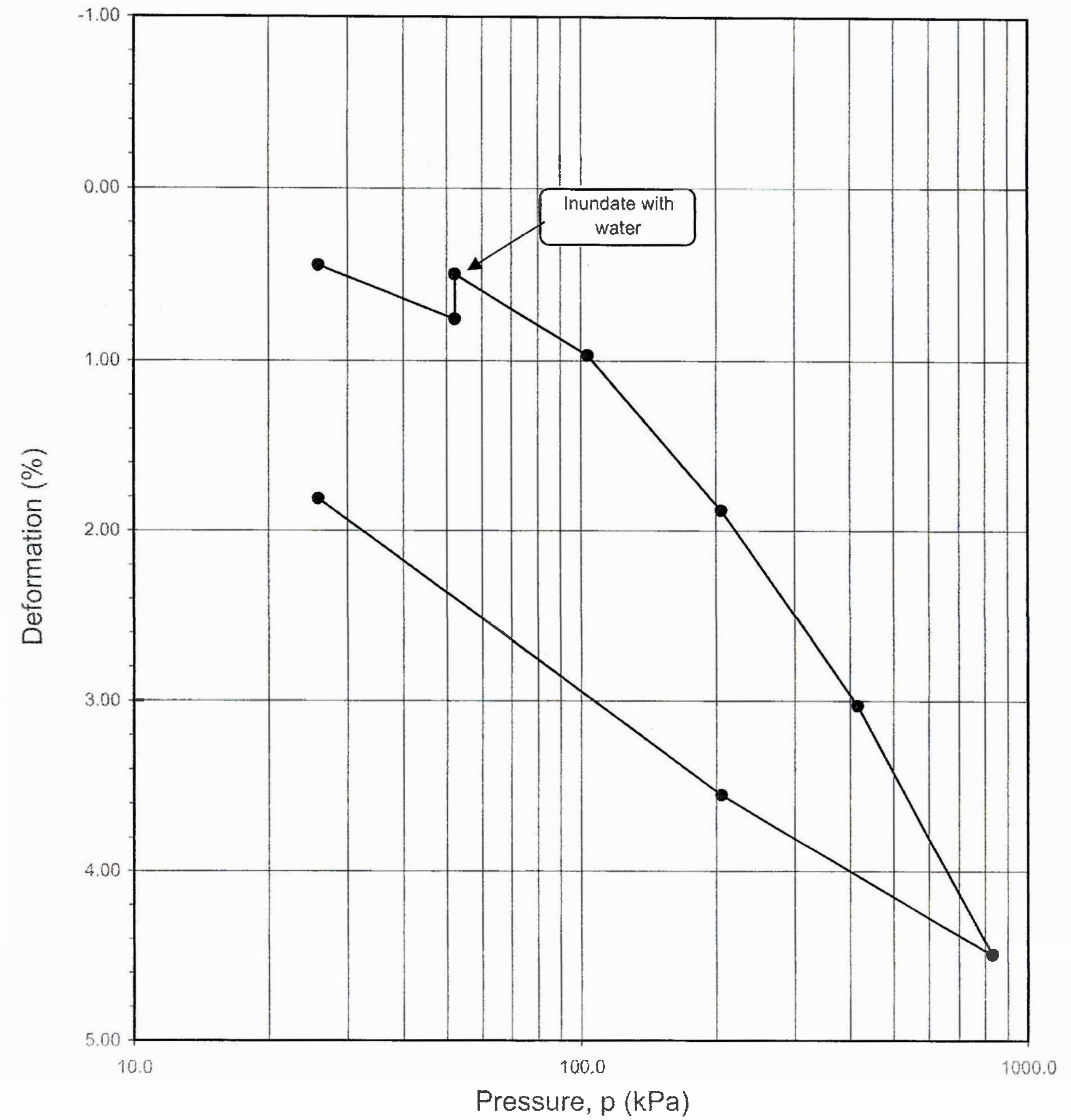
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R5**	**16.8-17.1**	**25.2**	**28.5**	**15.40**	**15.69**	**0.752**	**0.721**	**92**	**109**

Sample Description:

SC: PALE GRAY CLAYEY SAND

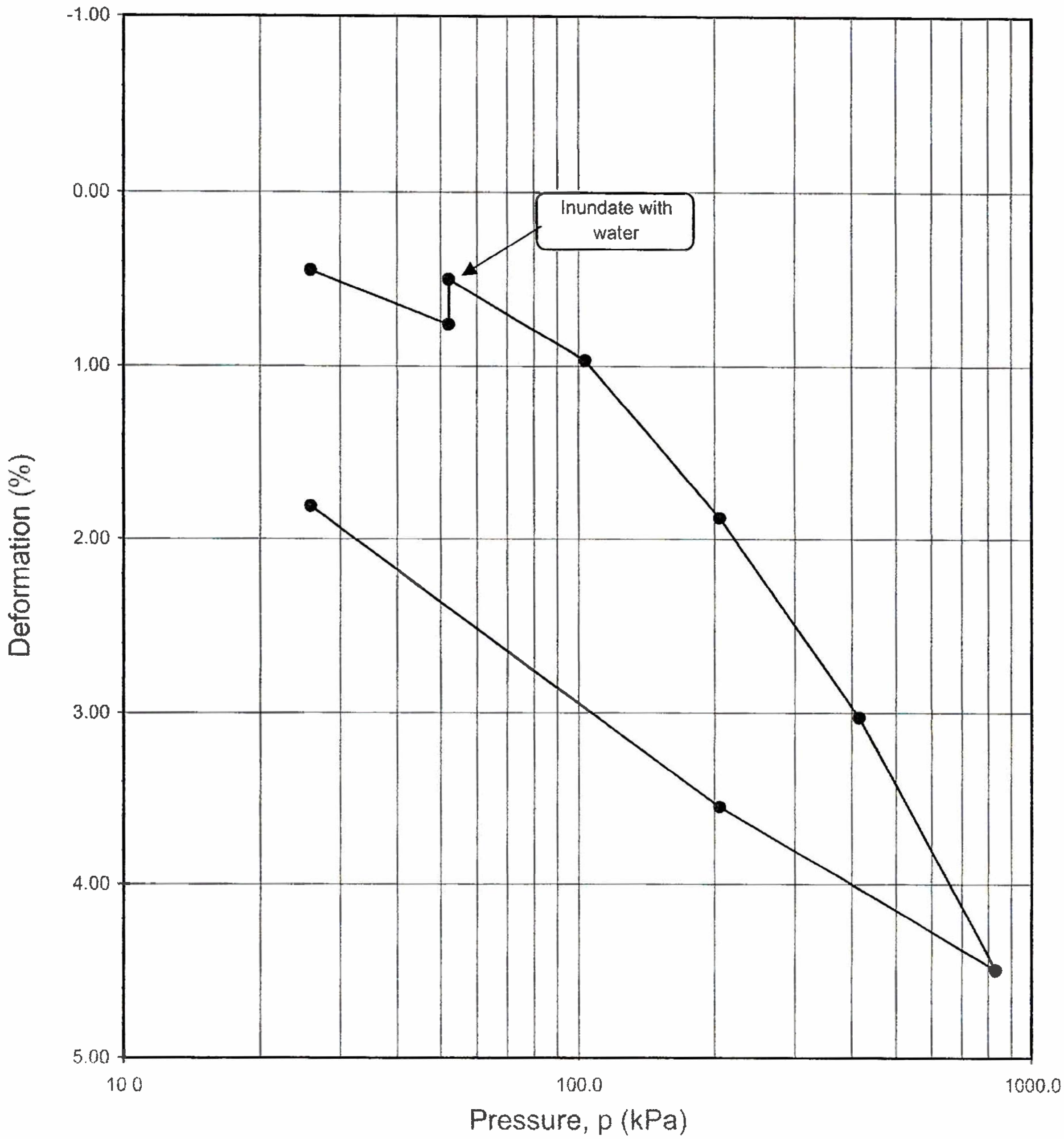
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R5**	**16.8-17.1**	**25.2**	**28.5**	**15.40**	**15.69**	**0.752**	**0.721**	**92**	**109**

Sample Description:

SC: PALE GRAY CLAYEY SAND

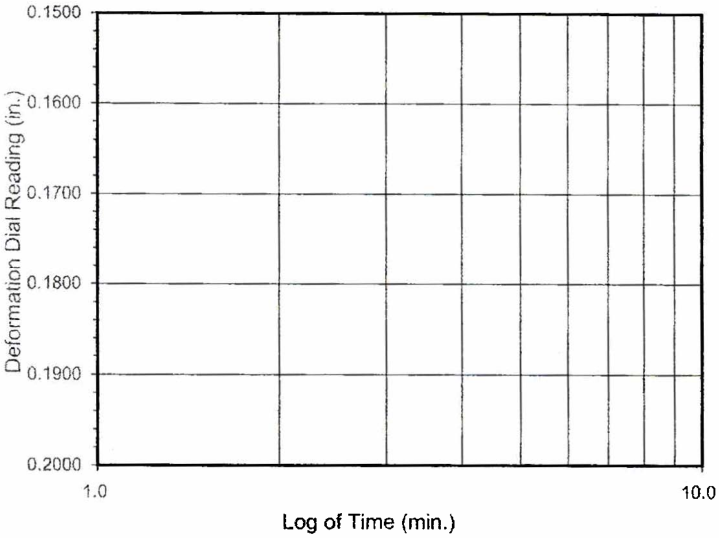
Project No.:	600158-905
Project Name:	SR-125

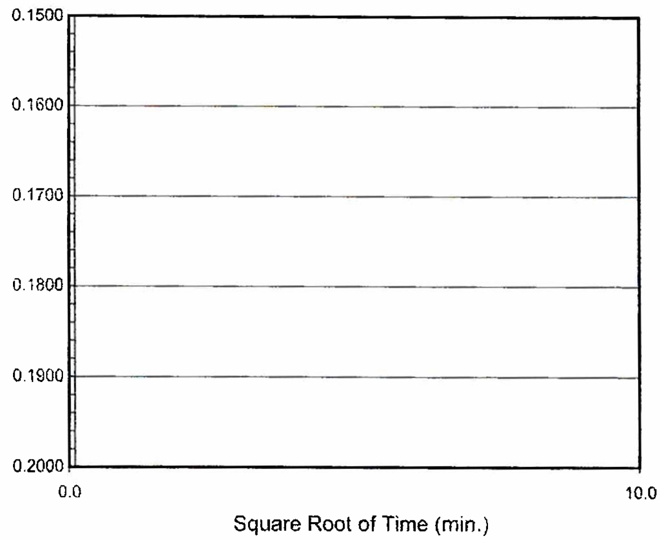
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

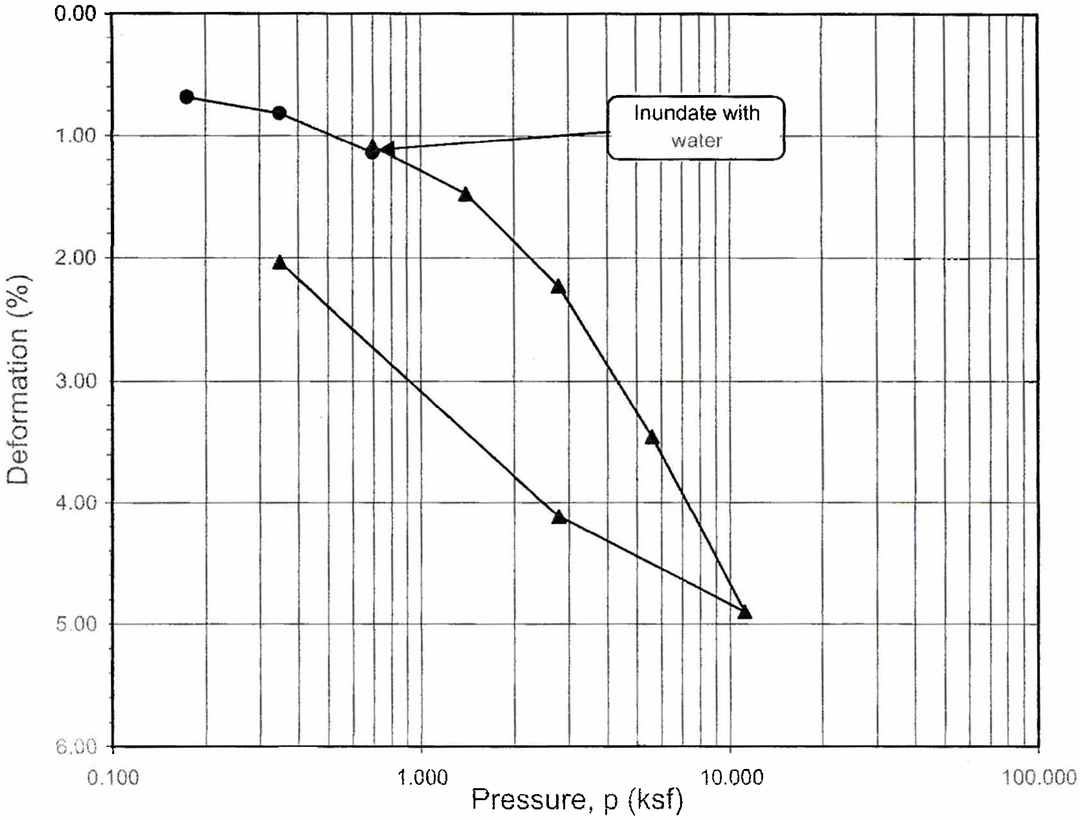
CTM 219 ASTM D 2435

Leighton

Rev. 02-05







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-7	**R-1**	**1.5**	**29.7**	**31.9**	**1437.0**	**1467.4**	**0.878**	**0.840**	**91**	**100**

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

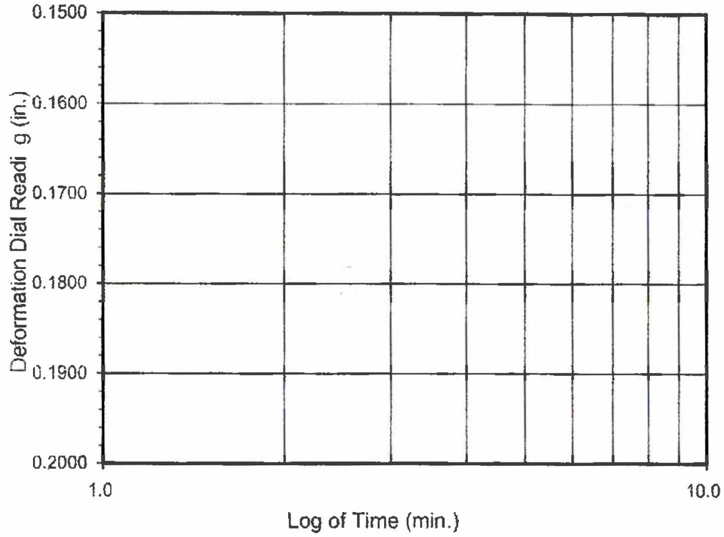
Leighton

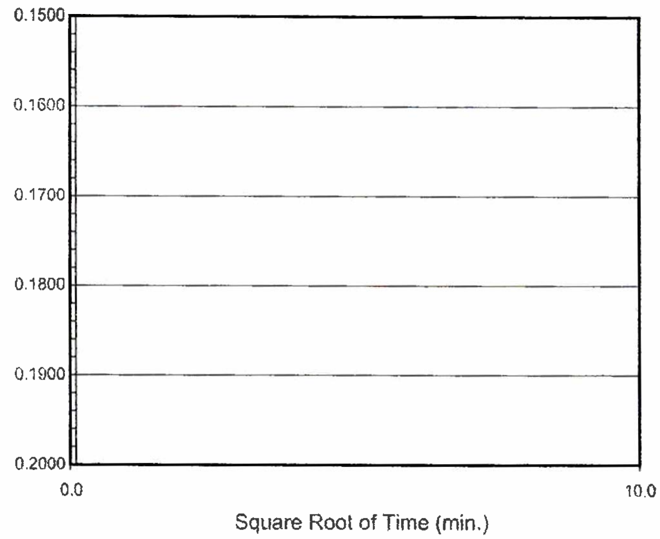
Project No.:	600158-905
Project Name:	SR-125 / 905

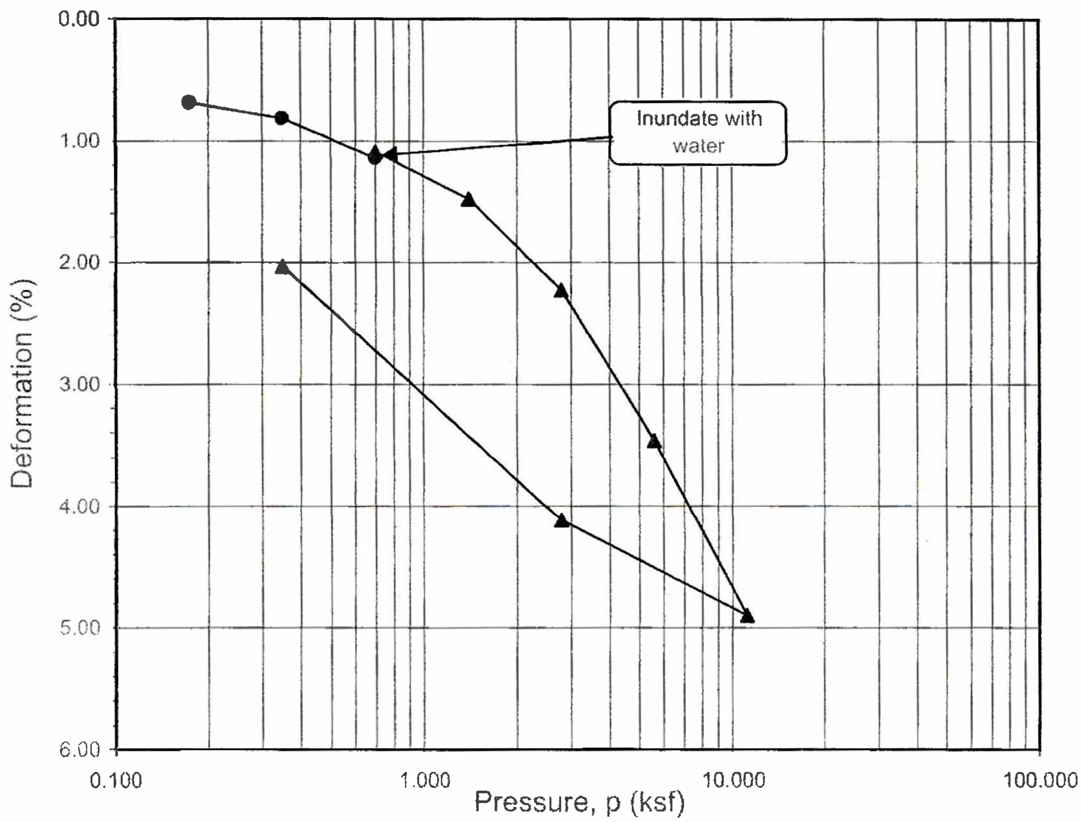
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-7	**R-1**	**1.5**	**29.7**	**31.9**	**1437.0**	**1467.4**	**0.878**	**0.840**	**91**	**100**

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

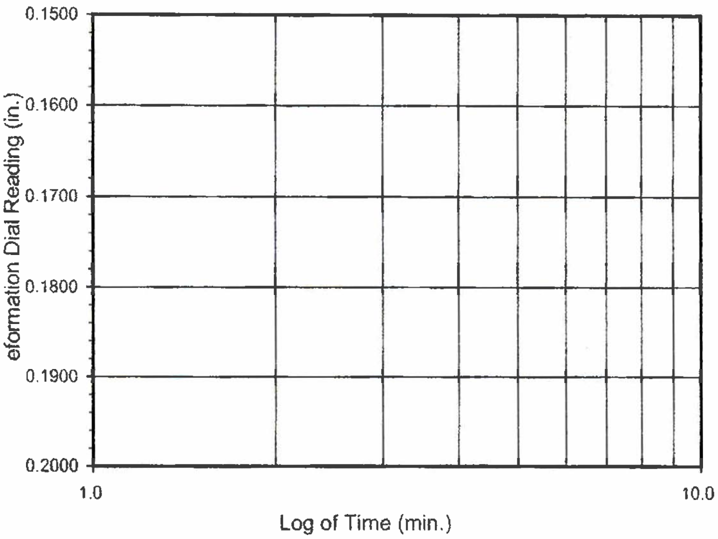
Leighton

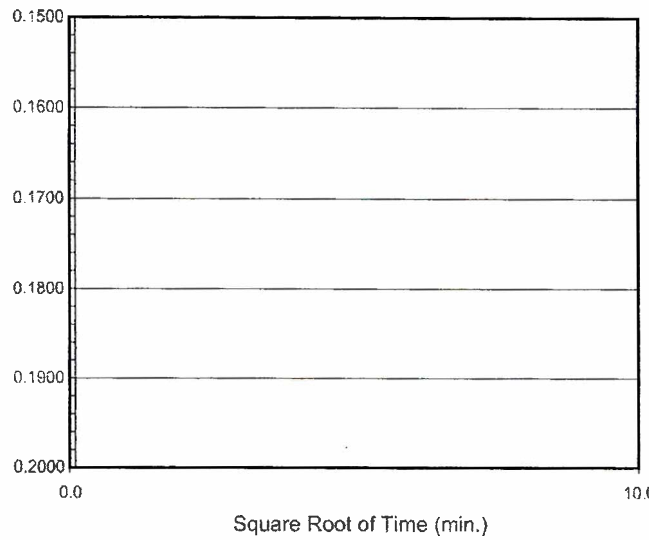
Project No.:	600158-905
Project Name:	SR-125 / 905

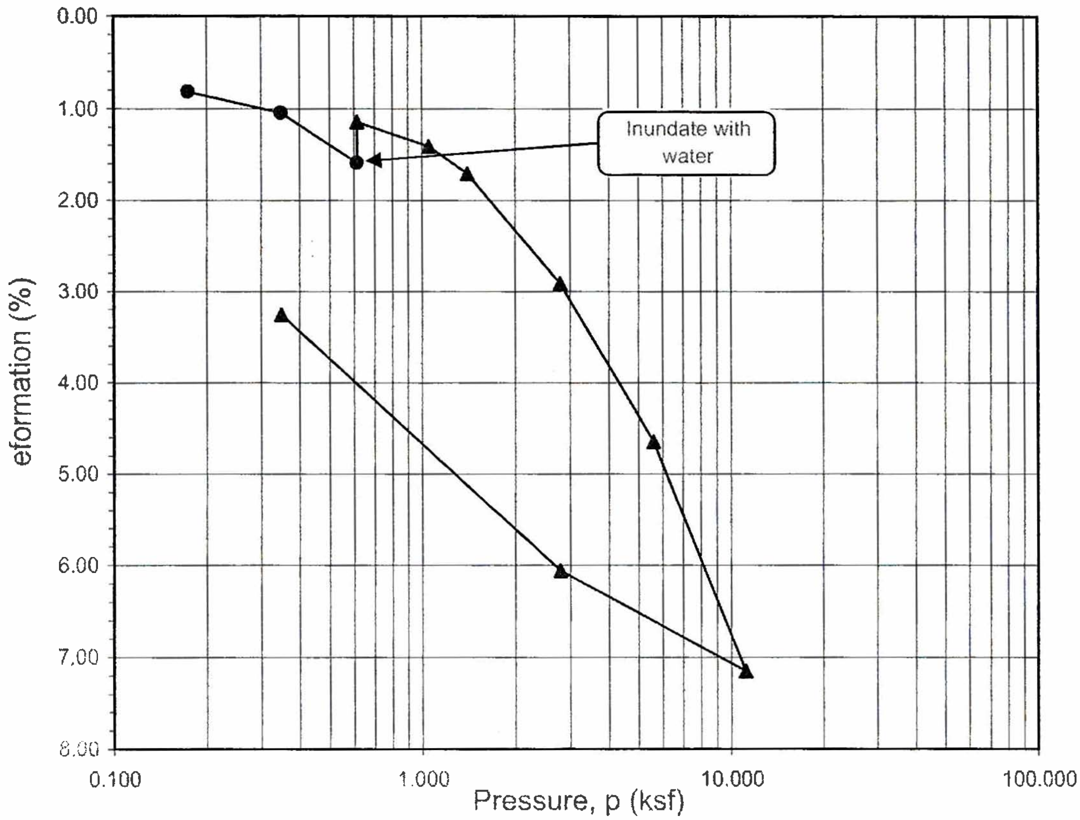
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-10	R-1	1.5	19.8	21.2	1610.0	1664.5	0.676	0.622	79	92

Sample Description:

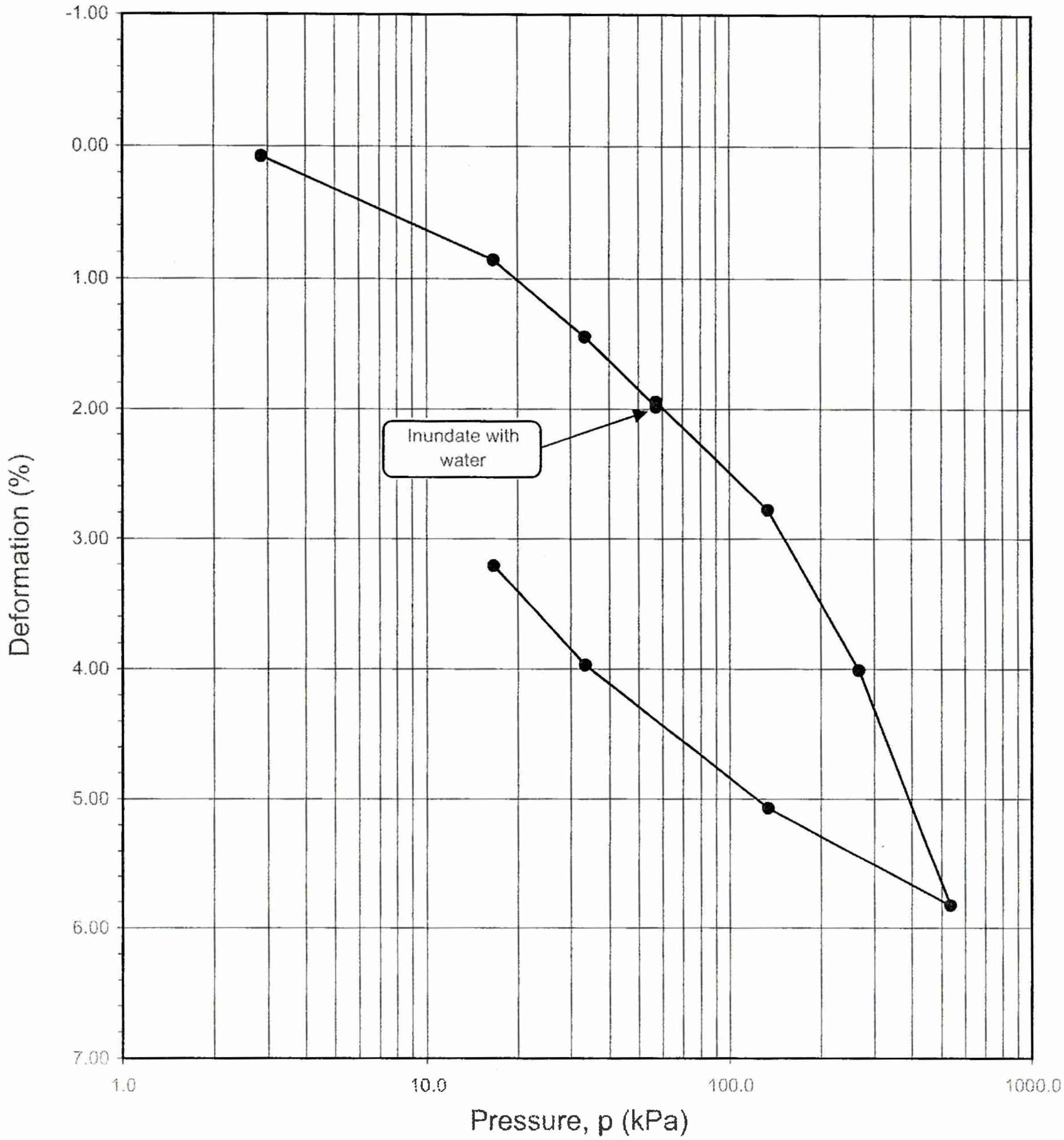
s(CL), LIGHT BROWN SANDY LEAN CLAY.

Project No.:	600158-905
Project Name:	SR-125 / 905

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Rev. 08-04



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m³)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-14	**R-1**	**3**	**28.7**	**21.4**	**14.45**	**16.21**	**0.835**	**0.776**	**93**	**91**

Sample Description:

Brown lean clay (CL)

Leighton

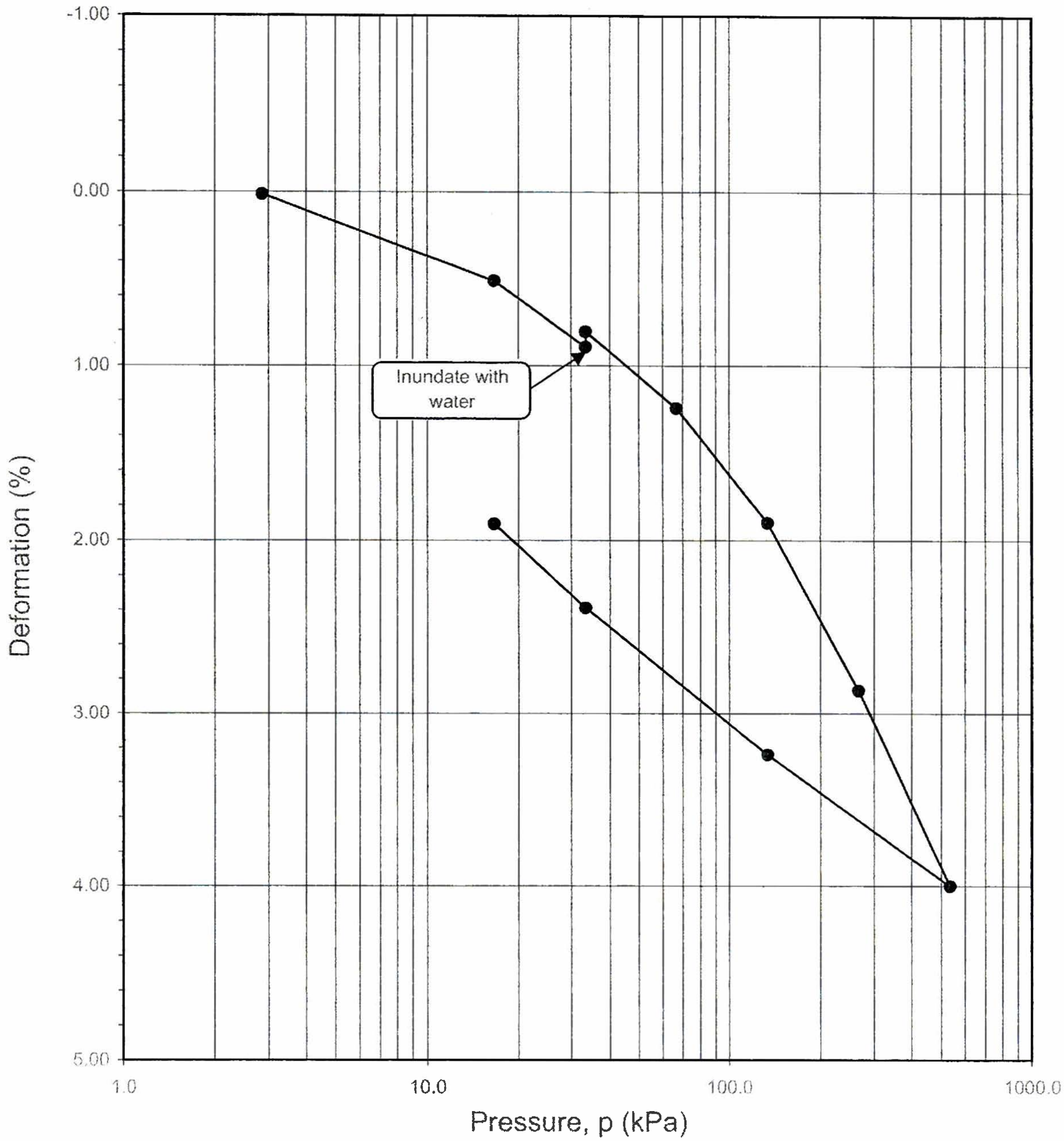
Project No.: 600158-905

Project Name: **SR125 / 905 Interchange**

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-20	**R-1**	**1.5**	**29.5**	**22.5**	**14.32**	**15.32**	**0.851**	**0.815**	**94**	**83**

Sample Description:

Brown lean clay (CL)

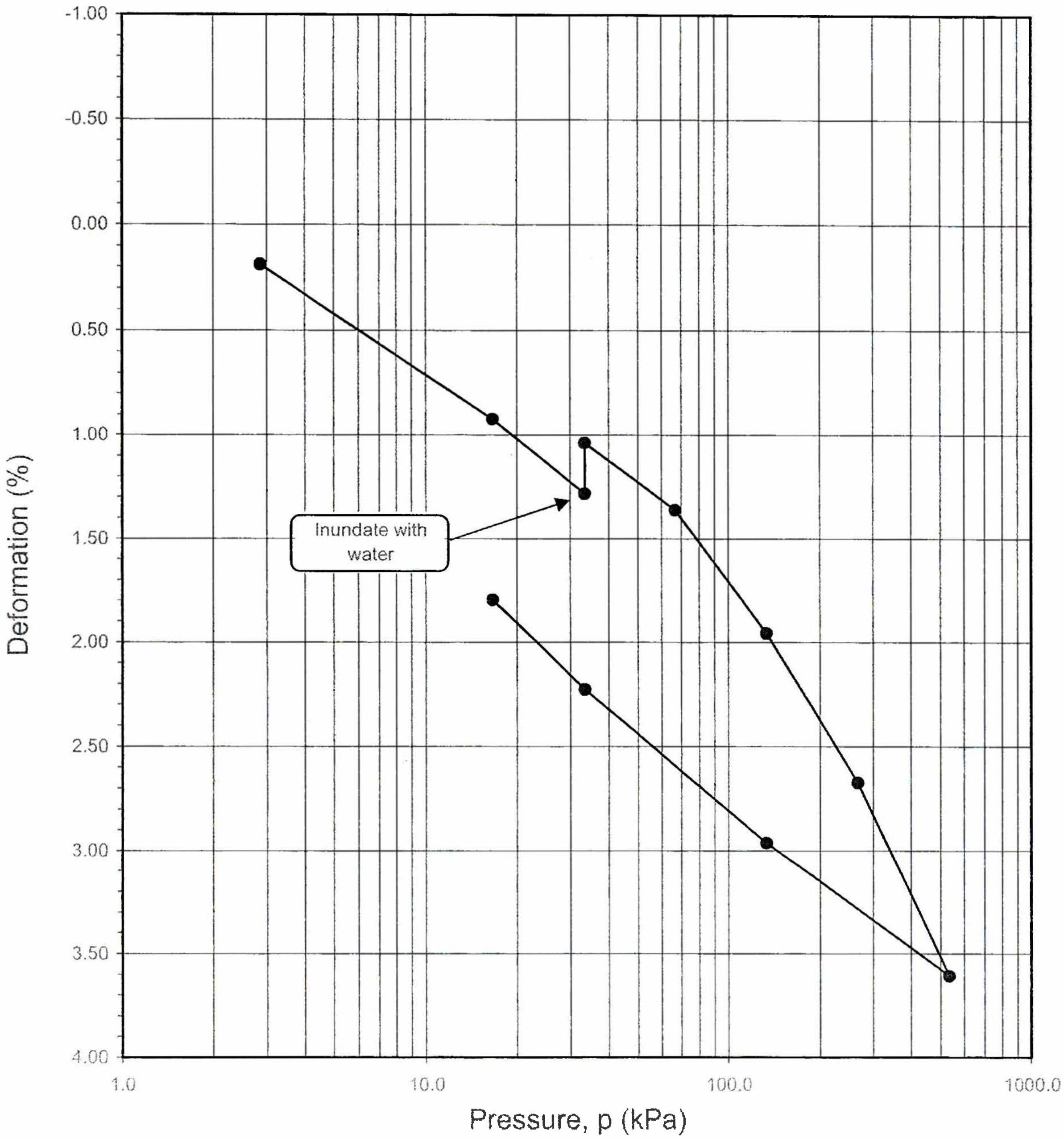
Leighton

Project No.:	600158-905
Project Name:	SR125 / 905 Interchange

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-20	**R-3**	**9.1**	**21.0**	**18.3**	**16.18**	**16.89**	**0.638**	**0.608**	**89**	**87**

Sample Description:

Light grayish brown silty sand (SM)

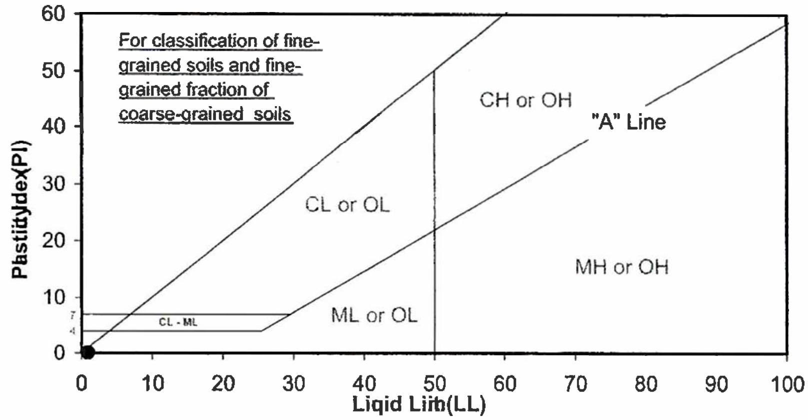
Leighton

Project No.:	600158-905
Project Name:	SR125 / 905 Interchange

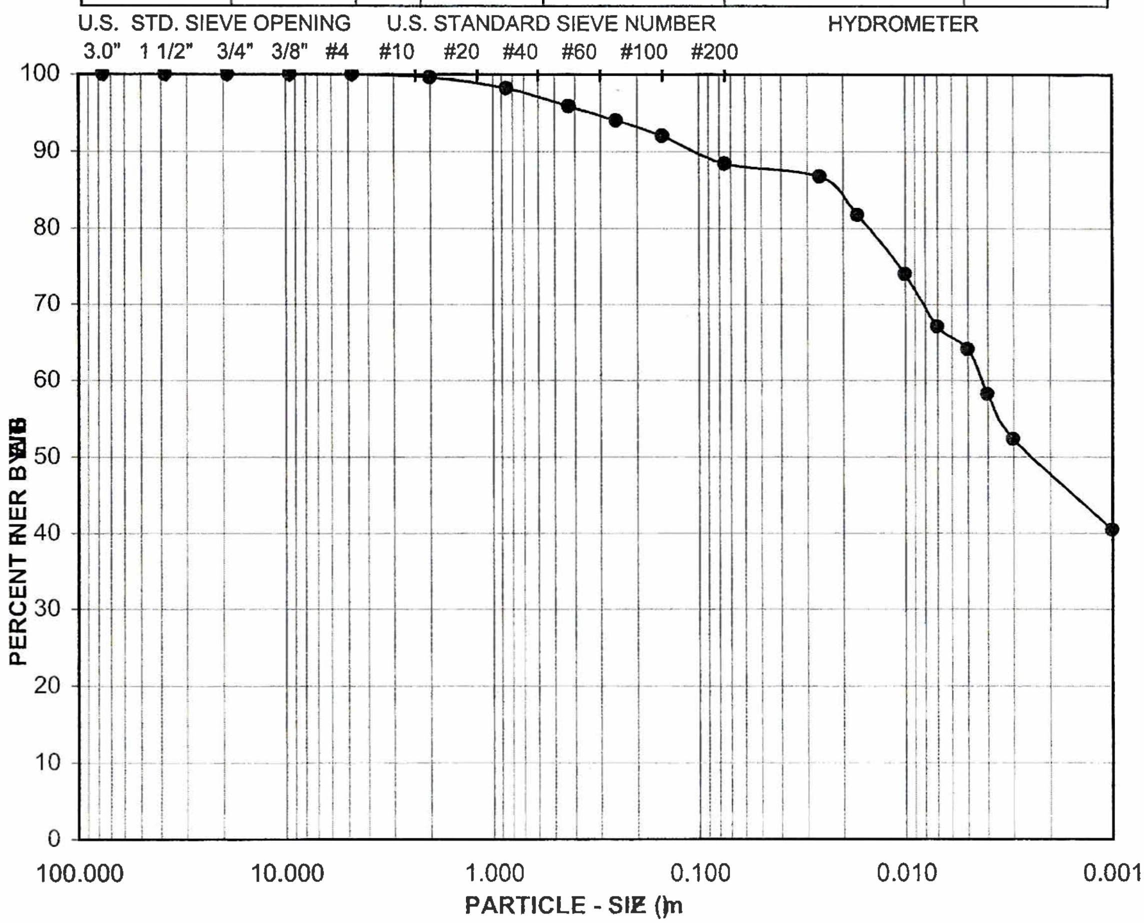
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-1	B-1	0.3-1.5	(CL-ML)	0:12:88	**

Sample Description:
(CL-ML), PALE BROWN SILTY LEAN CLAY WITH FEW TO LITTLE SAND.

Leighton

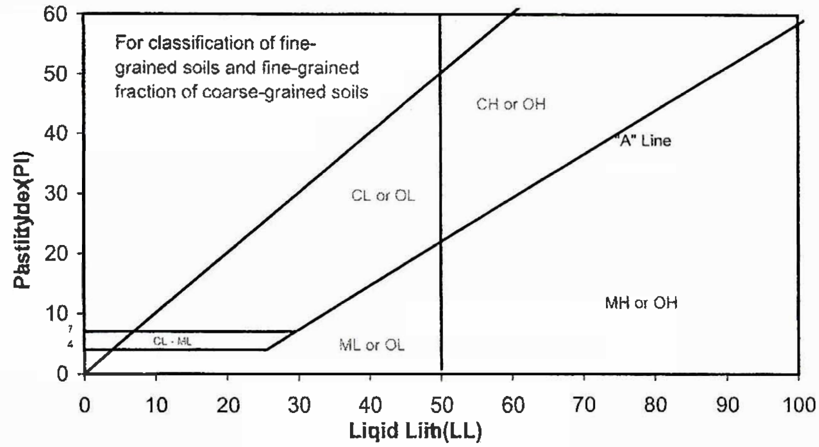
Project No.: 600158-905

SR-125 / 905

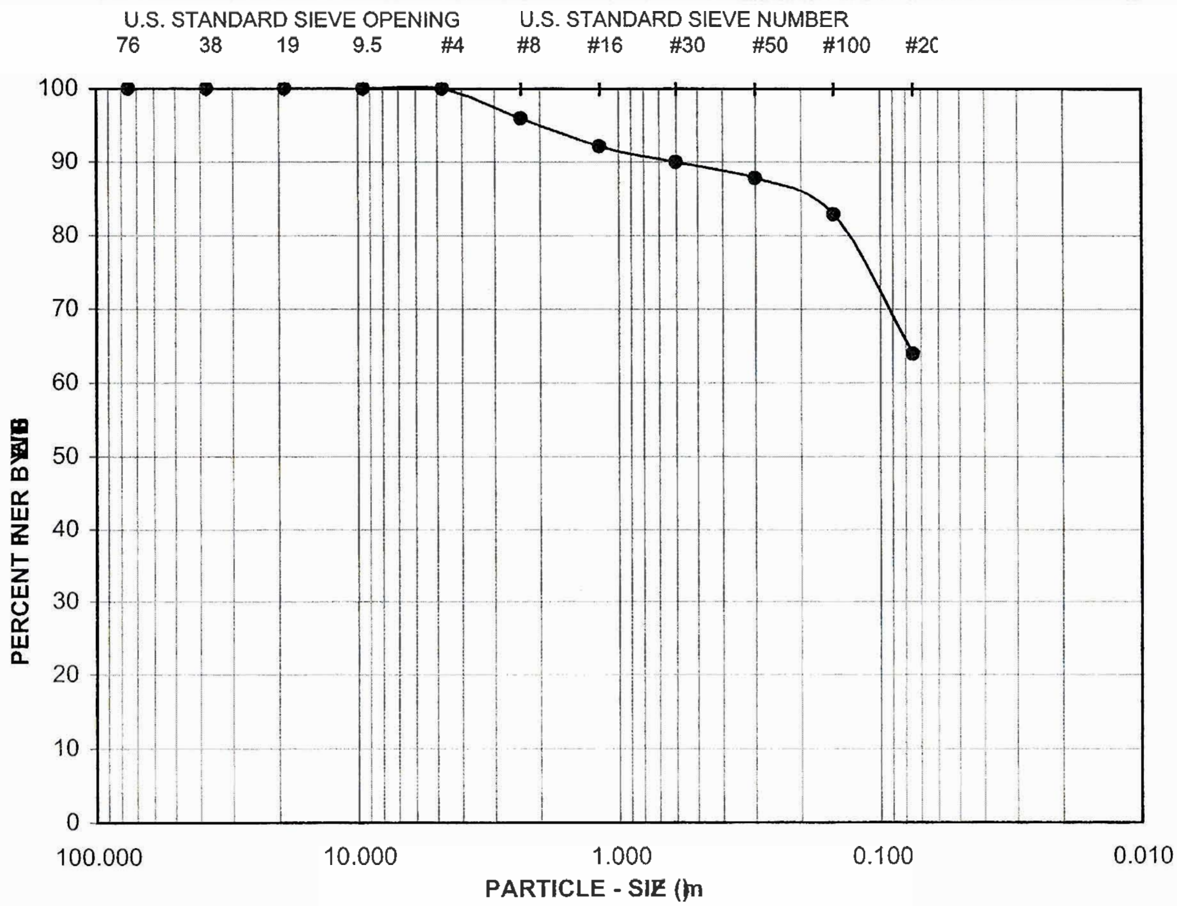
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S1	3.0-3.4	s(ML)	0 : 36 : 64	NP

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

Project No.: 600158-905

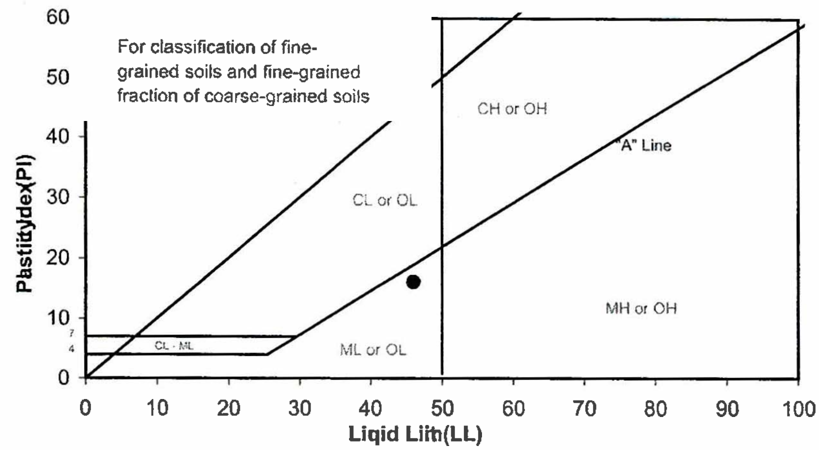
SR-125 / 905

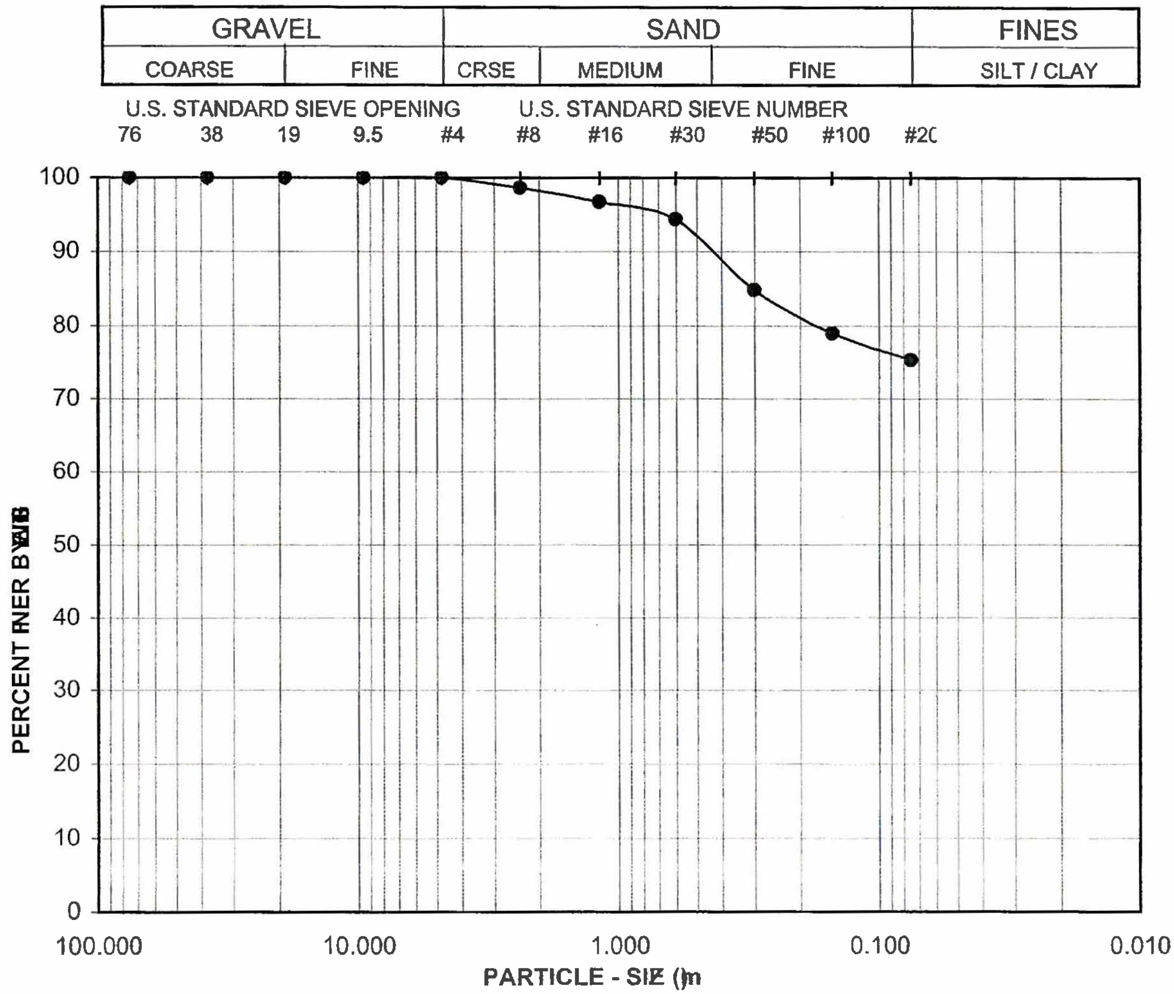
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-1,S1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S3	9.1-9.4	(ML)s	0 : 25 : 75	N/A

Project No.: 600158-905

SR-125 / 905

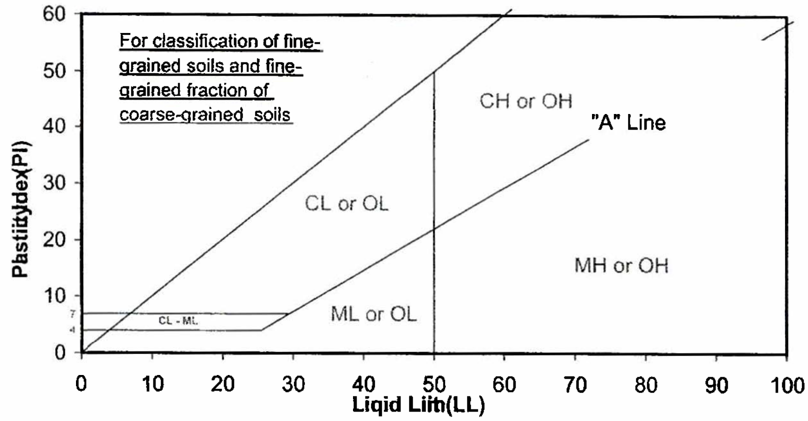
Visual Sample Description:
(ML)s: PALE BROWN LEAN SILT WITH SAND

Leighton

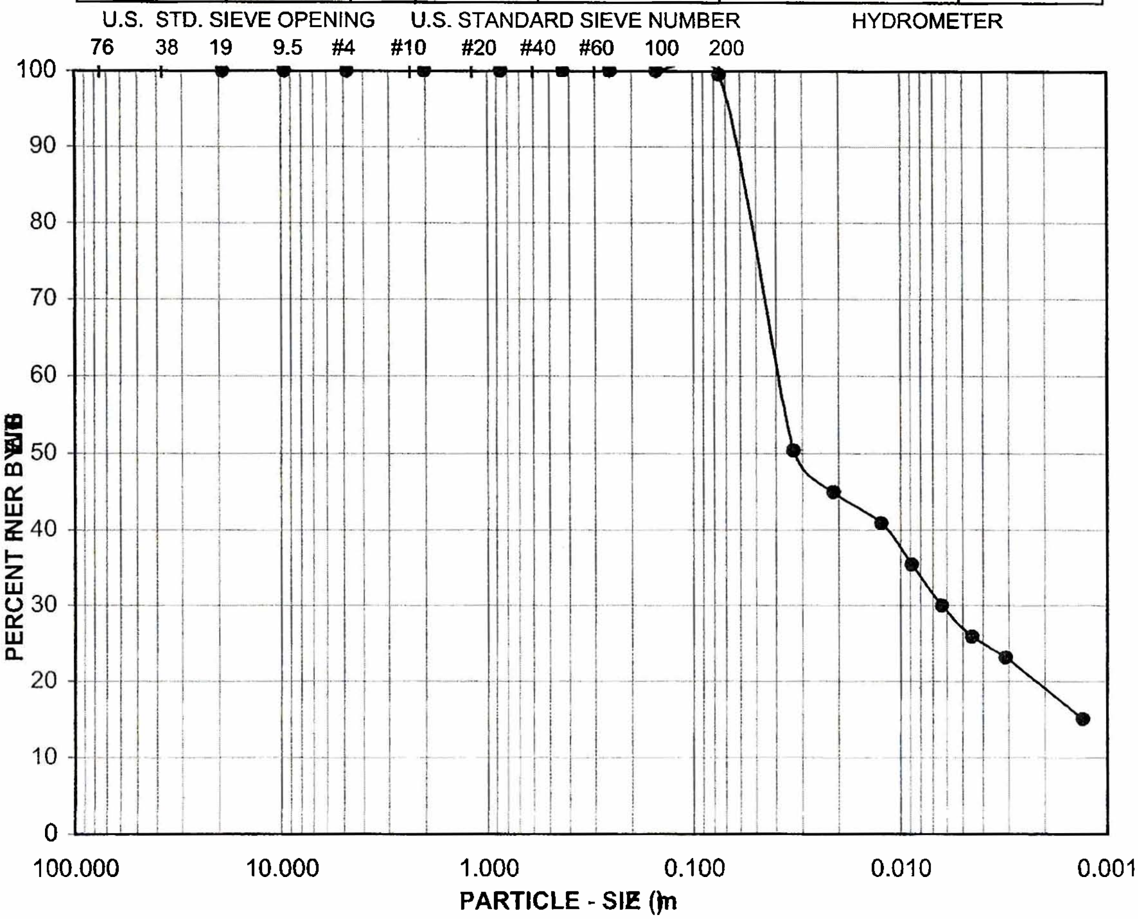
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Rev. 8-07

SIEVE B-1,S3



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S4	10.7-11.1	CH	0:0:100	79:34:45

Sample Description:
CH: PALE BROWN HEAVY CLAY

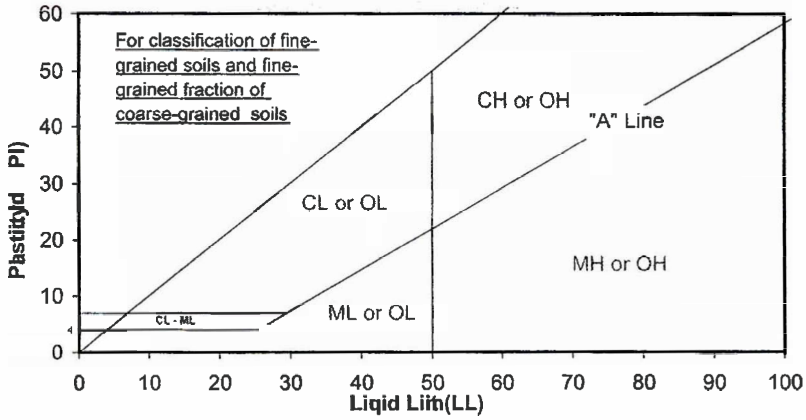
Project No.: 600158-905

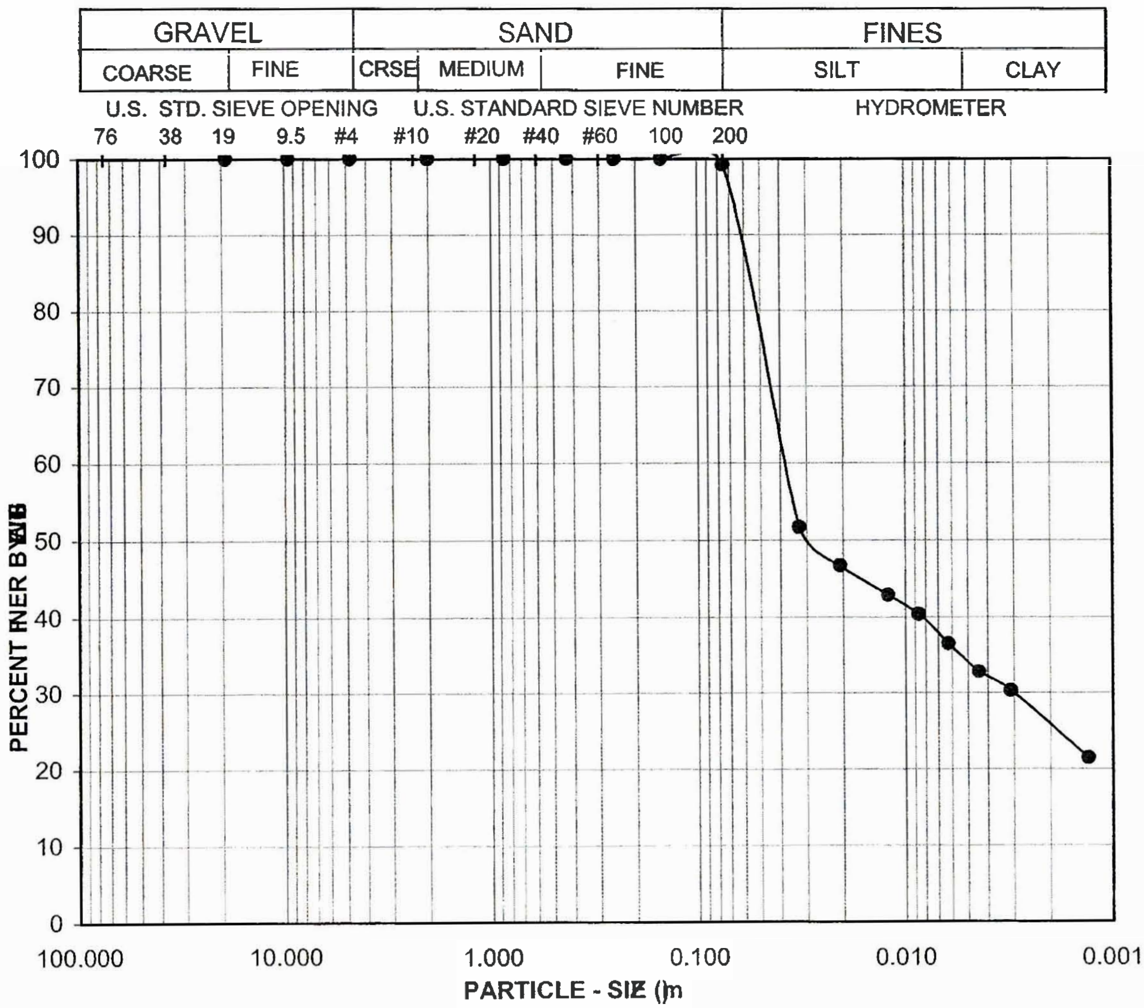
SR-125 / 905

Leighton

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

Rev. 8-07





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S6	16.8-17.2	CL	0:0:100	N/A

Sample Description:
CL: PALE RED-BROWN LEAN CLAY

Leighton

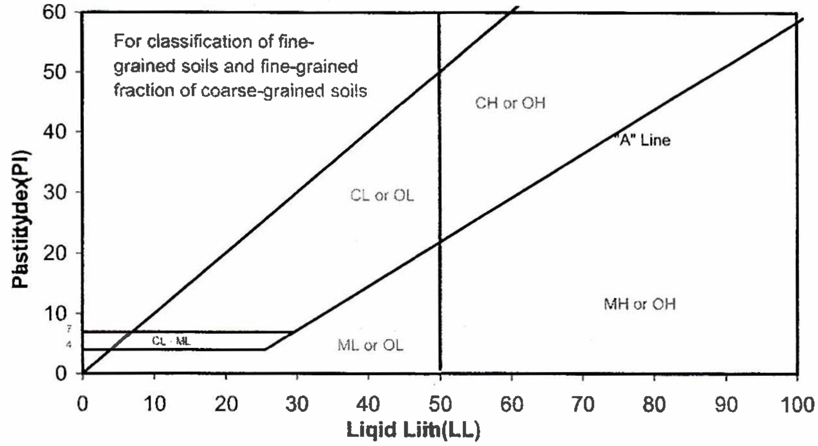
Project No.: 600158-905

SR-125 / 905

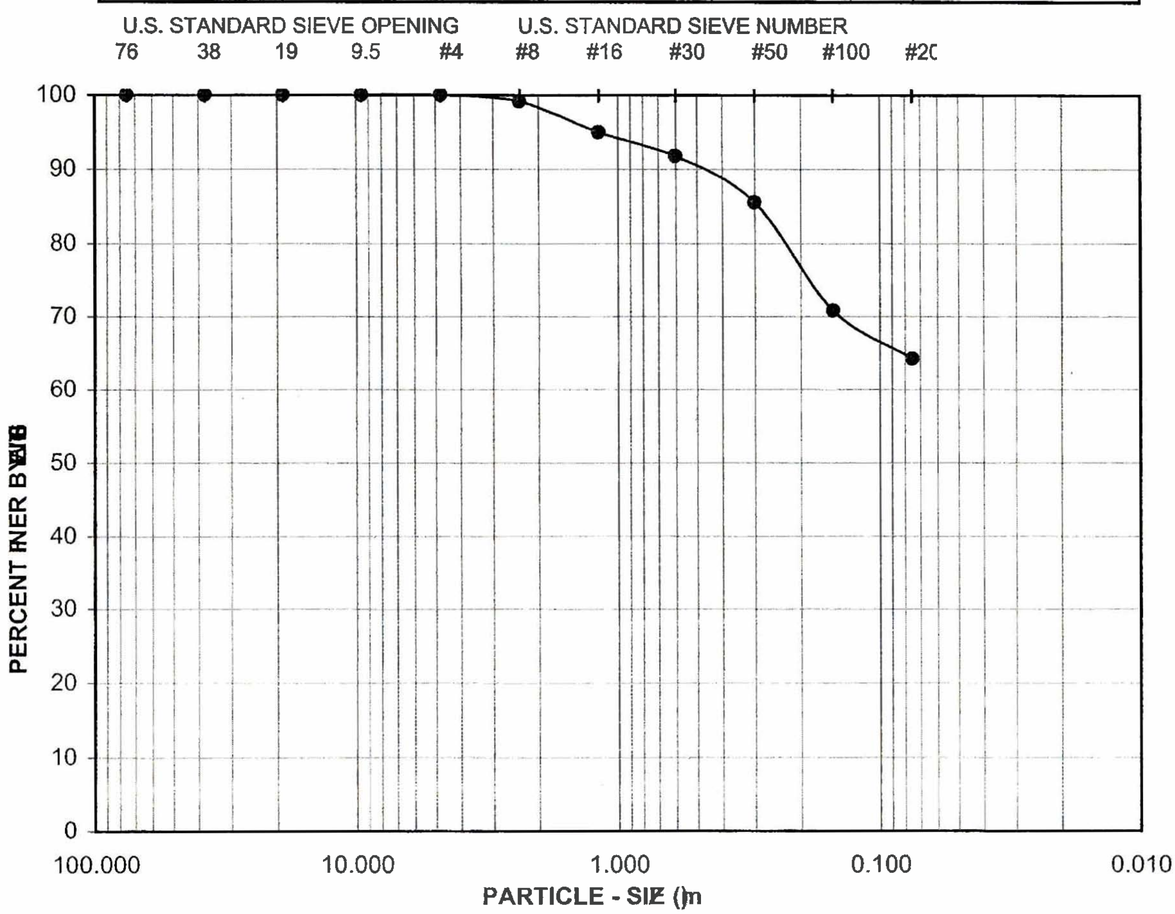
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-2	S8	22.9-23.2	s(ML)	0 : 36 : 64	N/A

Project No.: 600158-905

SR-125 / 905

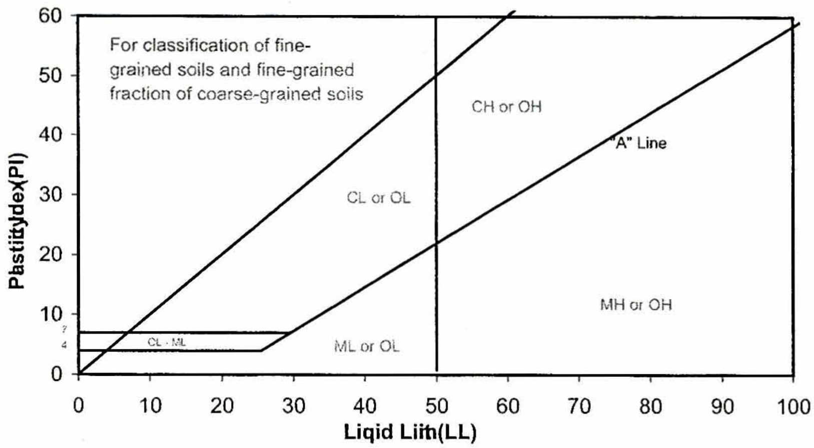
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

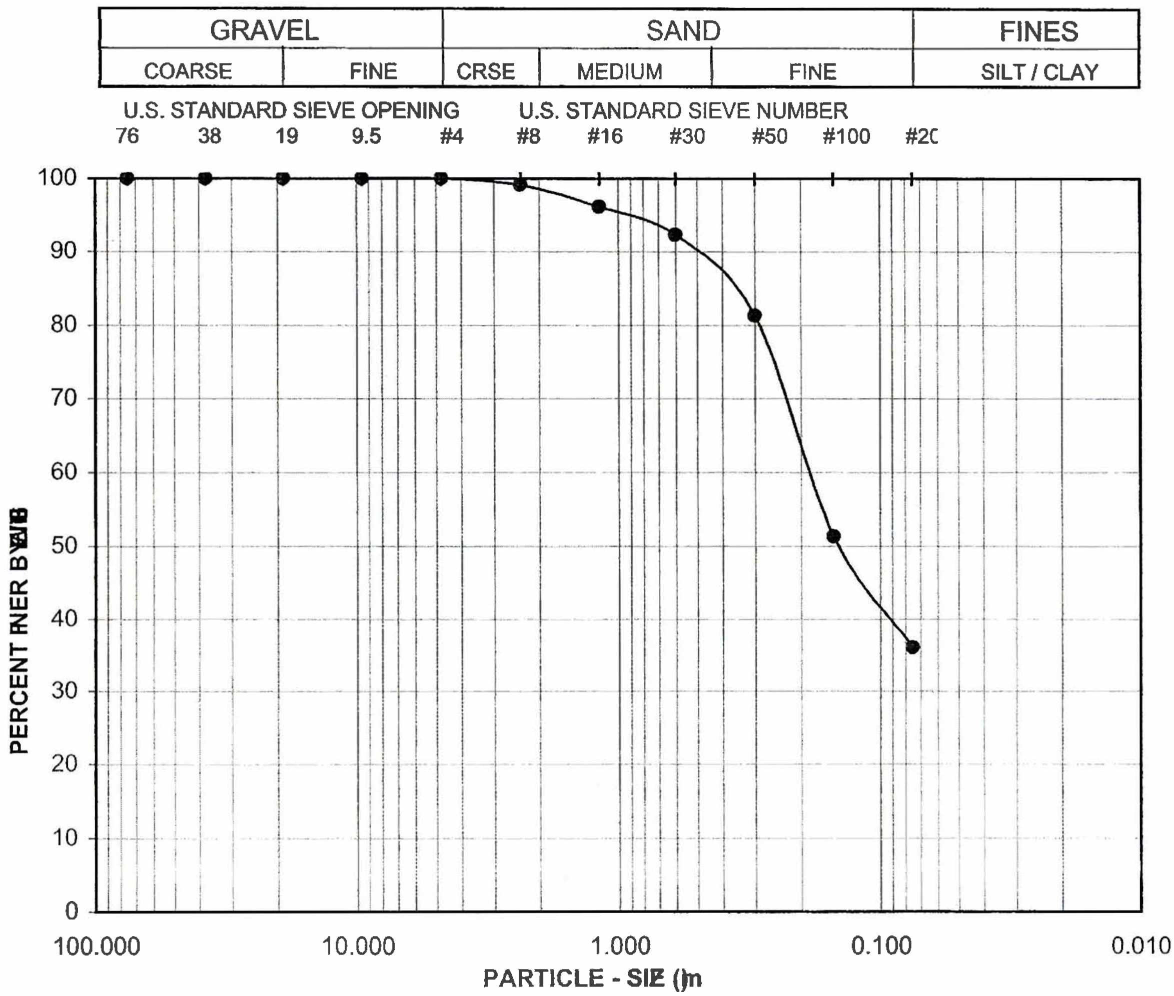
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Leighton

Rev. 8-07

SIEVE B-2.S8





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S1	4.6-5.0	SM	0 : 64 : 36	N/A

Visual Sample Description:
SM: PALE BROWN SILTY SAND

Leighton

Project No.: 600158-905

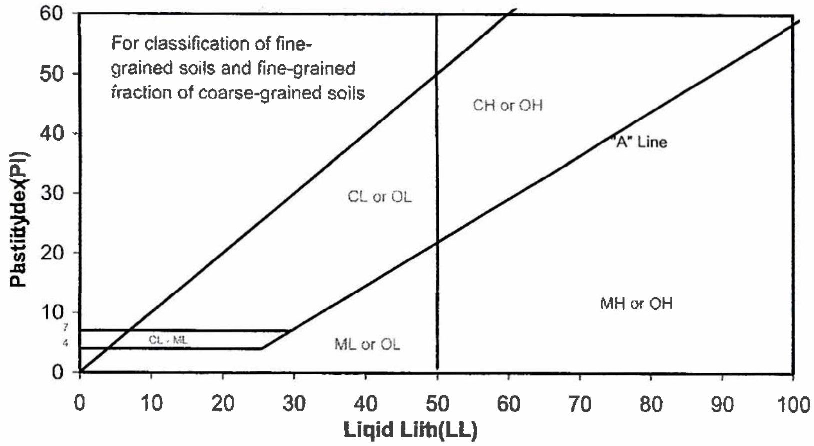
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

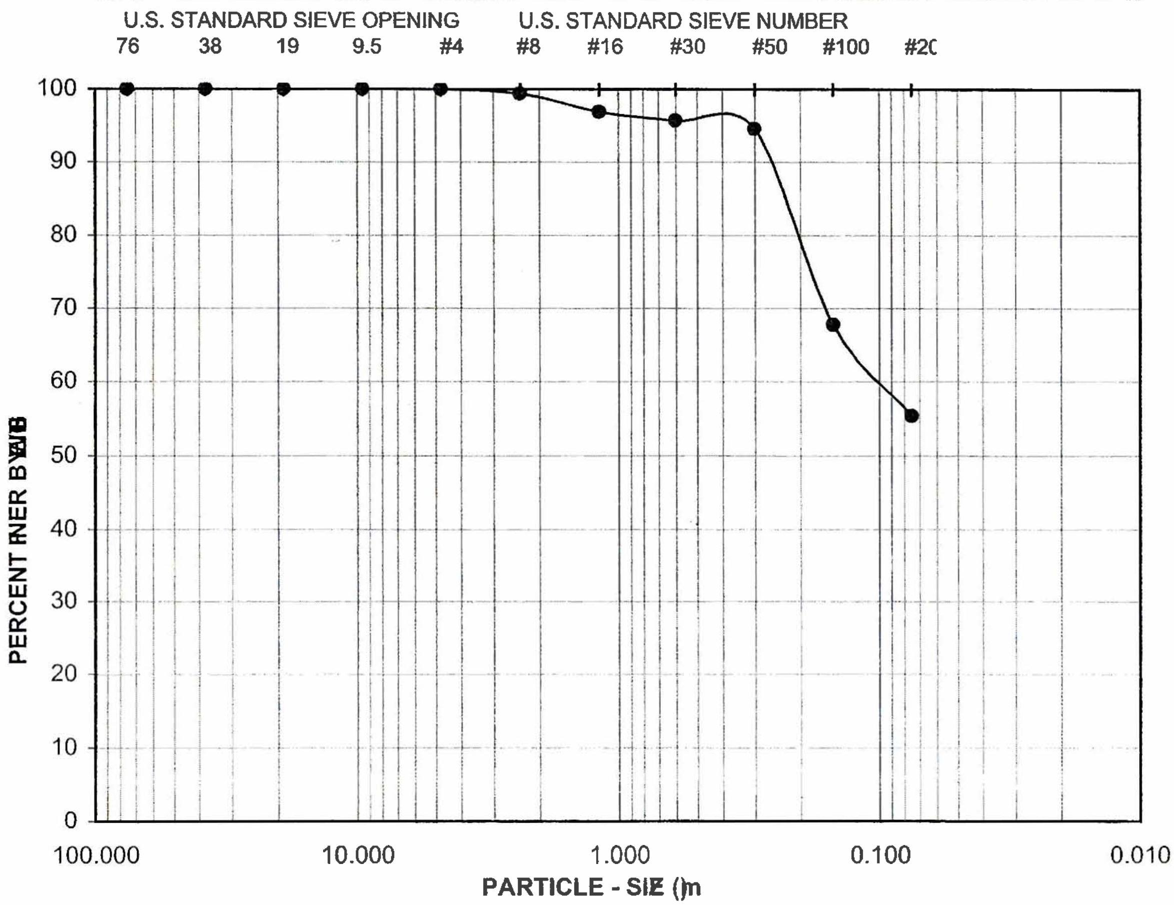
ASTM D 4318, D 422

Rev. 8-07

SIEVE B-3,S1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S3	10.7-11.1	s(ML)	0 : 45 : 55	N/A

Project No.: 600158-905

SR-125 / 905

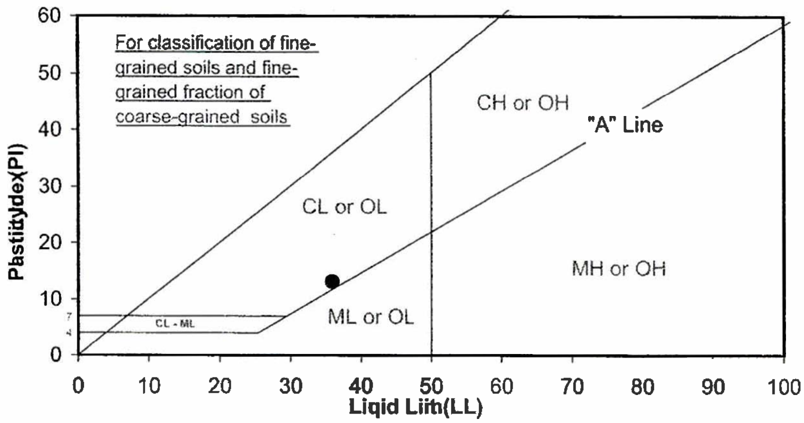
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

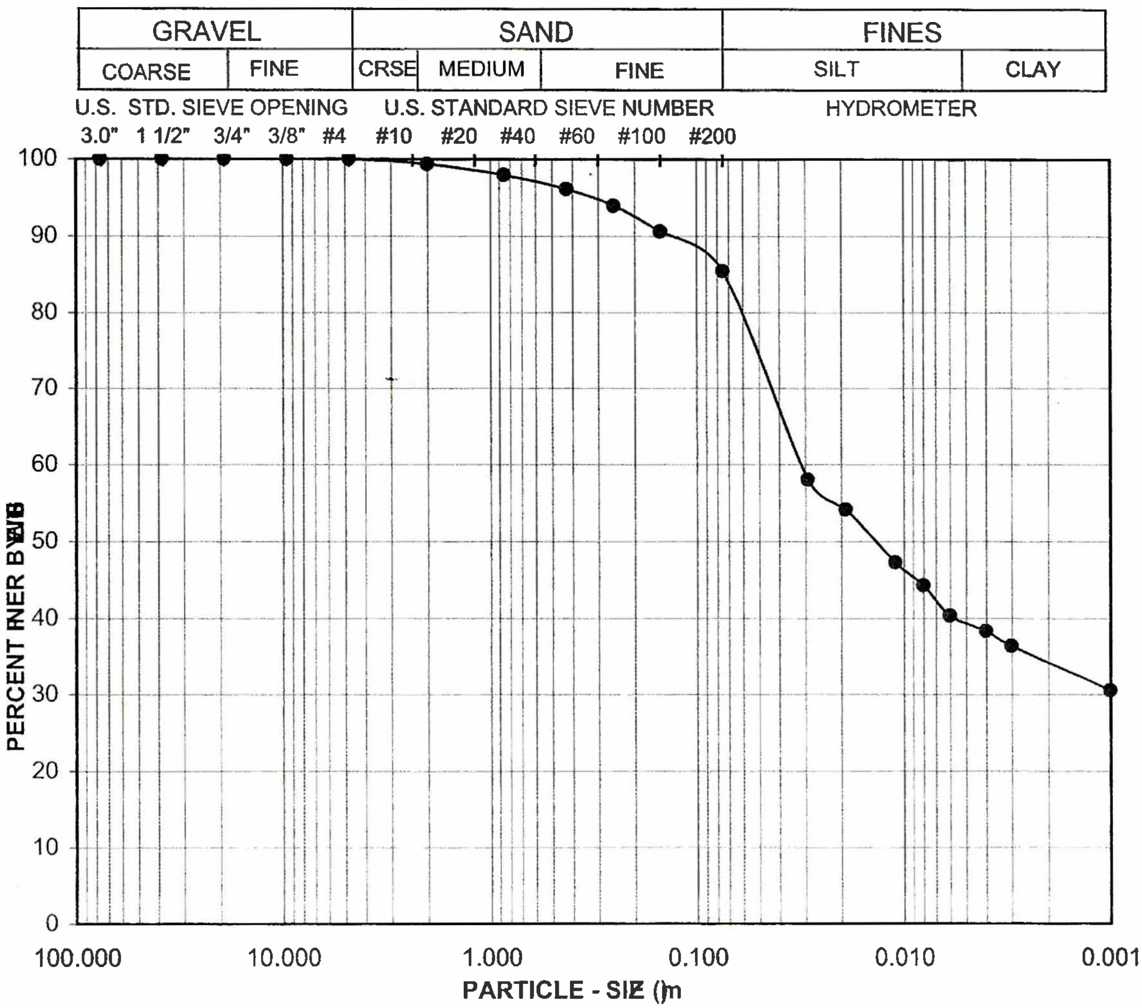
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Leighton

Rev. 8-07

SIEVE B-3,S3





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	B-1	0.3-1.5	(ML-CL)s	0:15:85	36:23:13

Sample Description:
(ML-CL)s, DARK OLIVE BROWN CLAYEY SILT WITH SAND.

Project No.: 600158-905

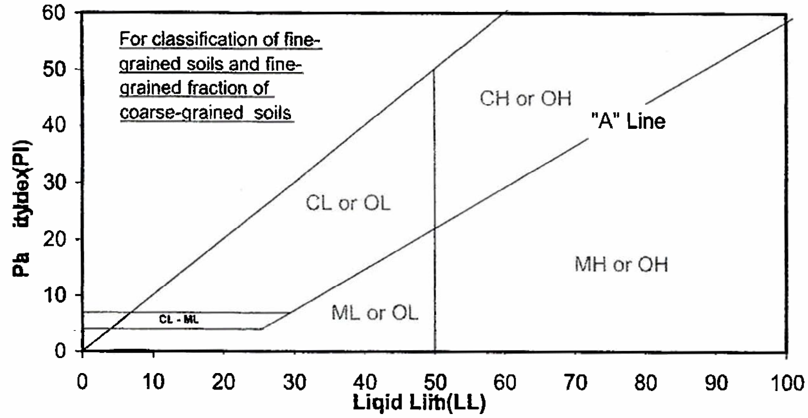
SR-125 / 905

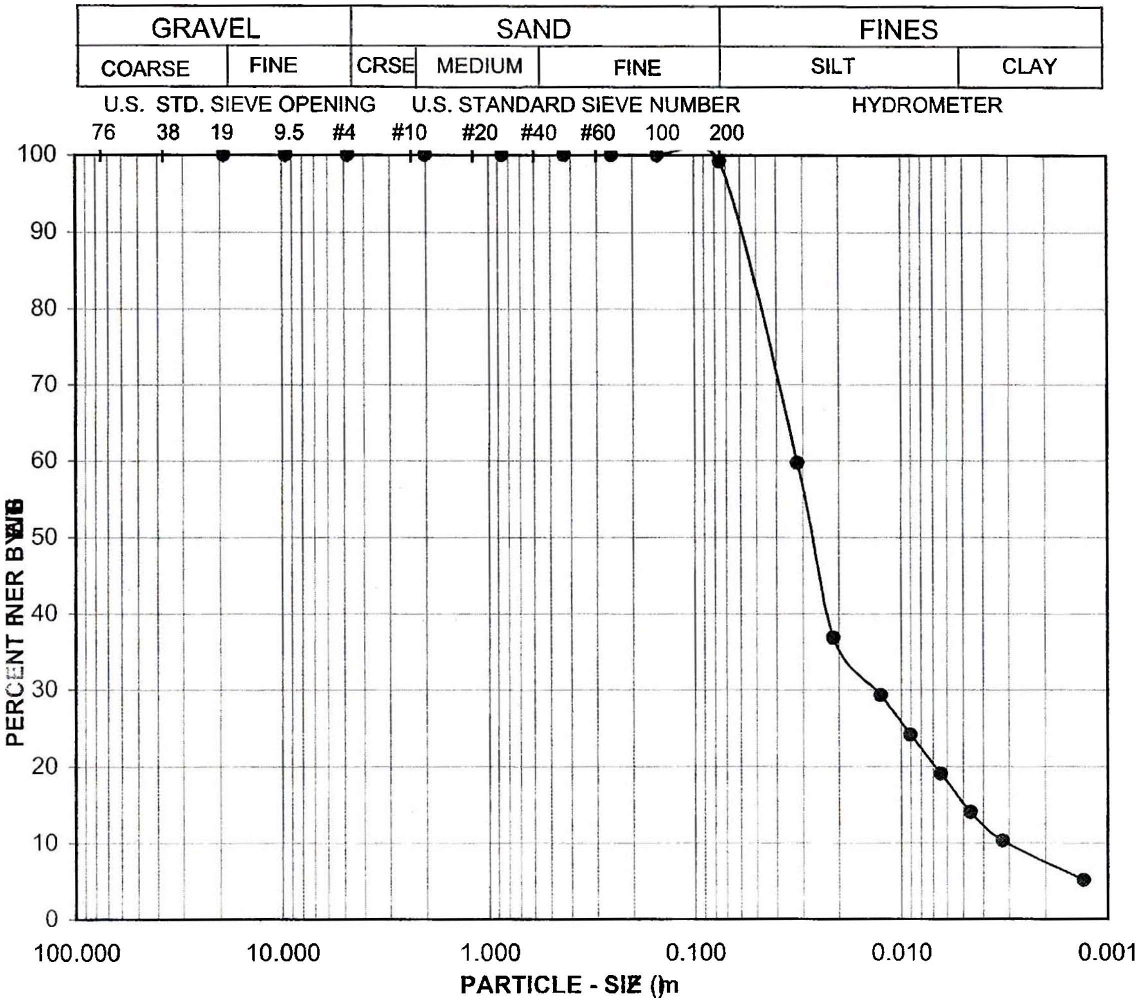
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Leighton

Rev. 08-04





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	S1	3.0-3.4	ML-CL	0:0:100	N/A

Sample Description:
ML-CL: PALE BROWN CLAYEY LEAN SILT

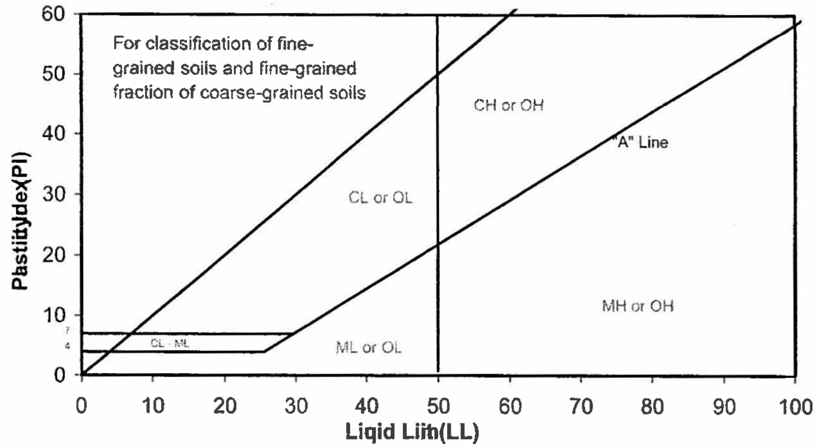
Leighton

Project No.: 600158-905

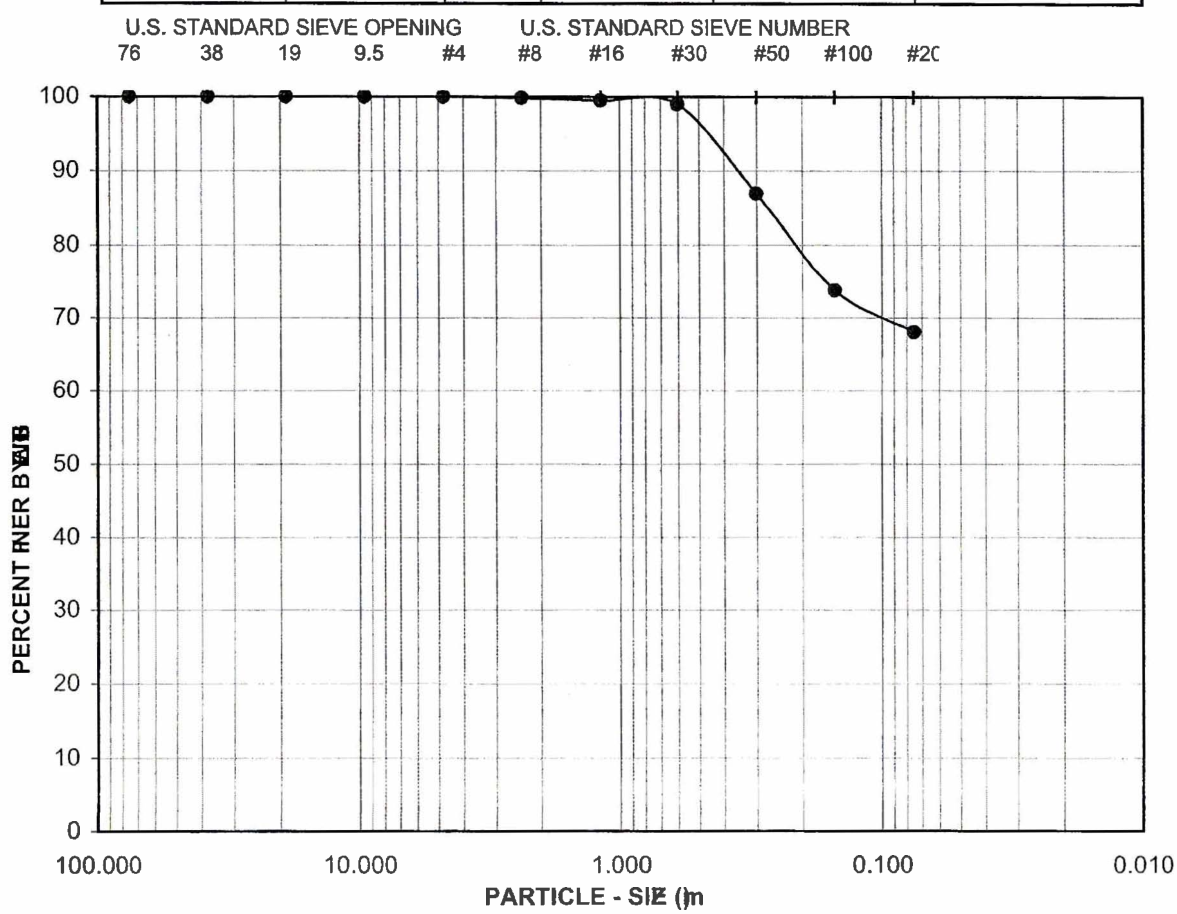
SR-125 / 905

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

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-4	S3	7.6-7.9	s(ML)	0 : 32 : 68	N/A

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

Project No.: 600158-905

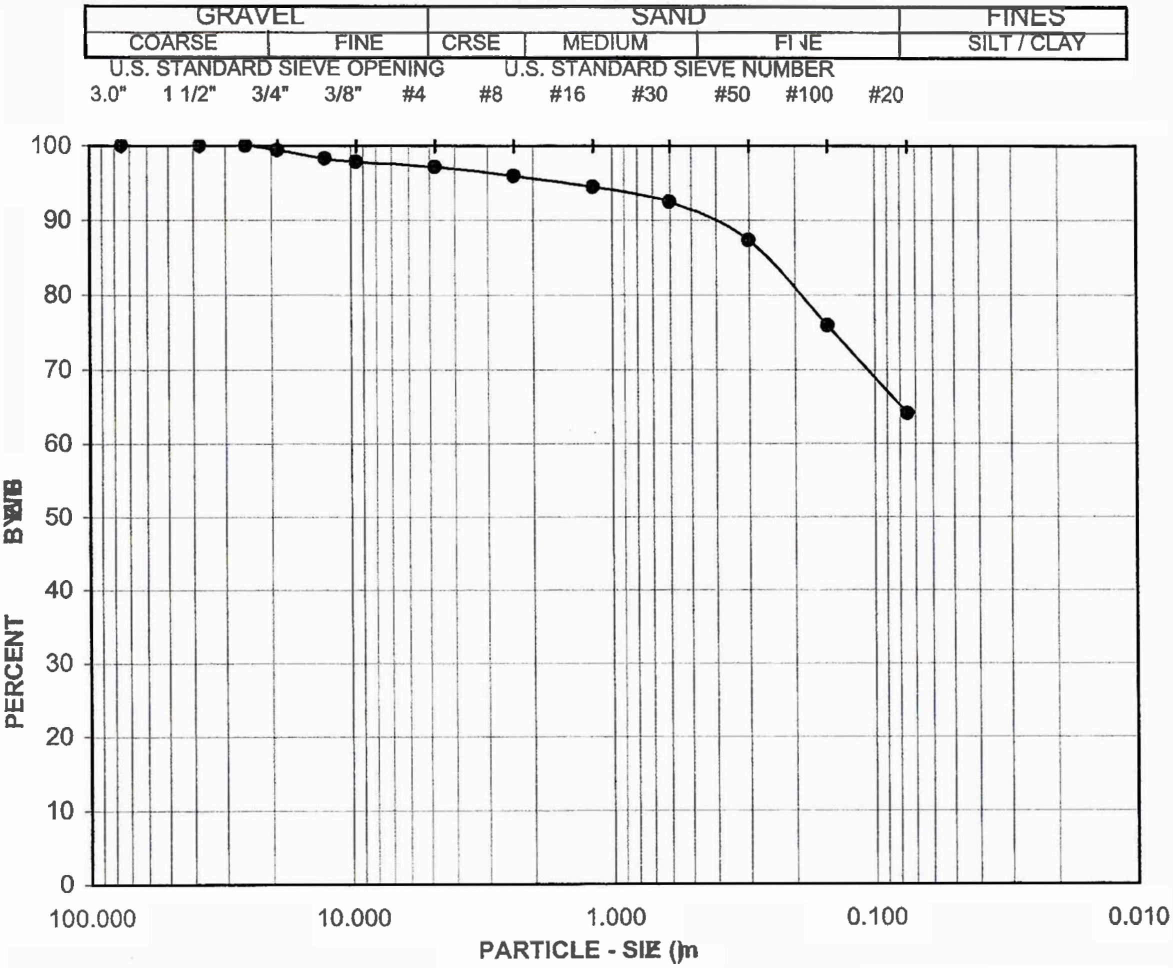
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-4,S3



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI
B-5	B-1	5-10.0	s(CL)	3 : 33 : 64

Visual Sample Description:

s(CL), DARK BROWN SANDY LEAN CLAY WITH TRACE GRAVEL.

Leighton

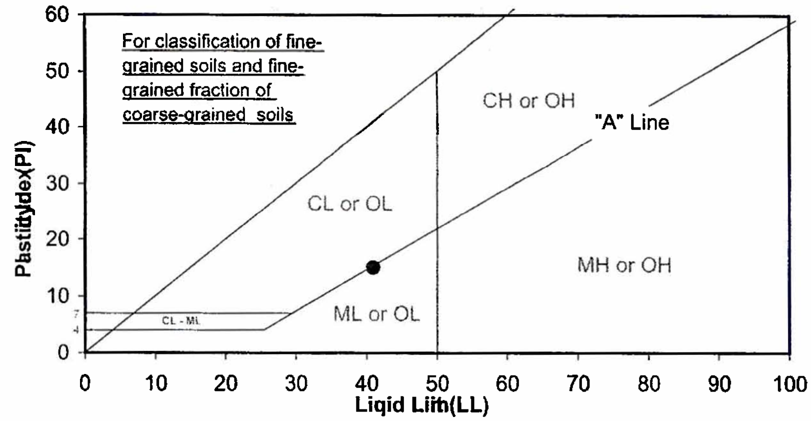
Project No.: 600158-905

SR-125 / 905

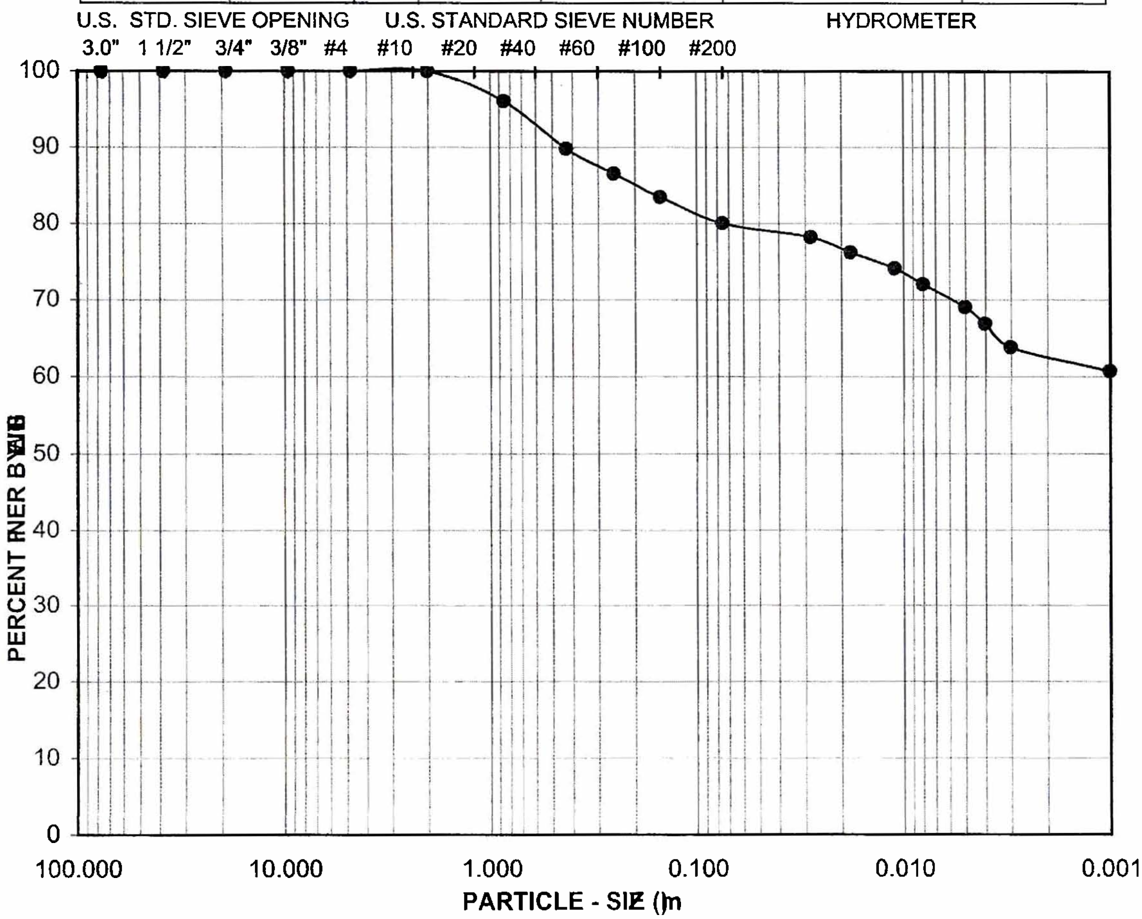
CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-5;B-1



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY



Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7	R-1	1.5	(CL)s	0:20:80	41:26:15

Sample Description:
(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

Leighton

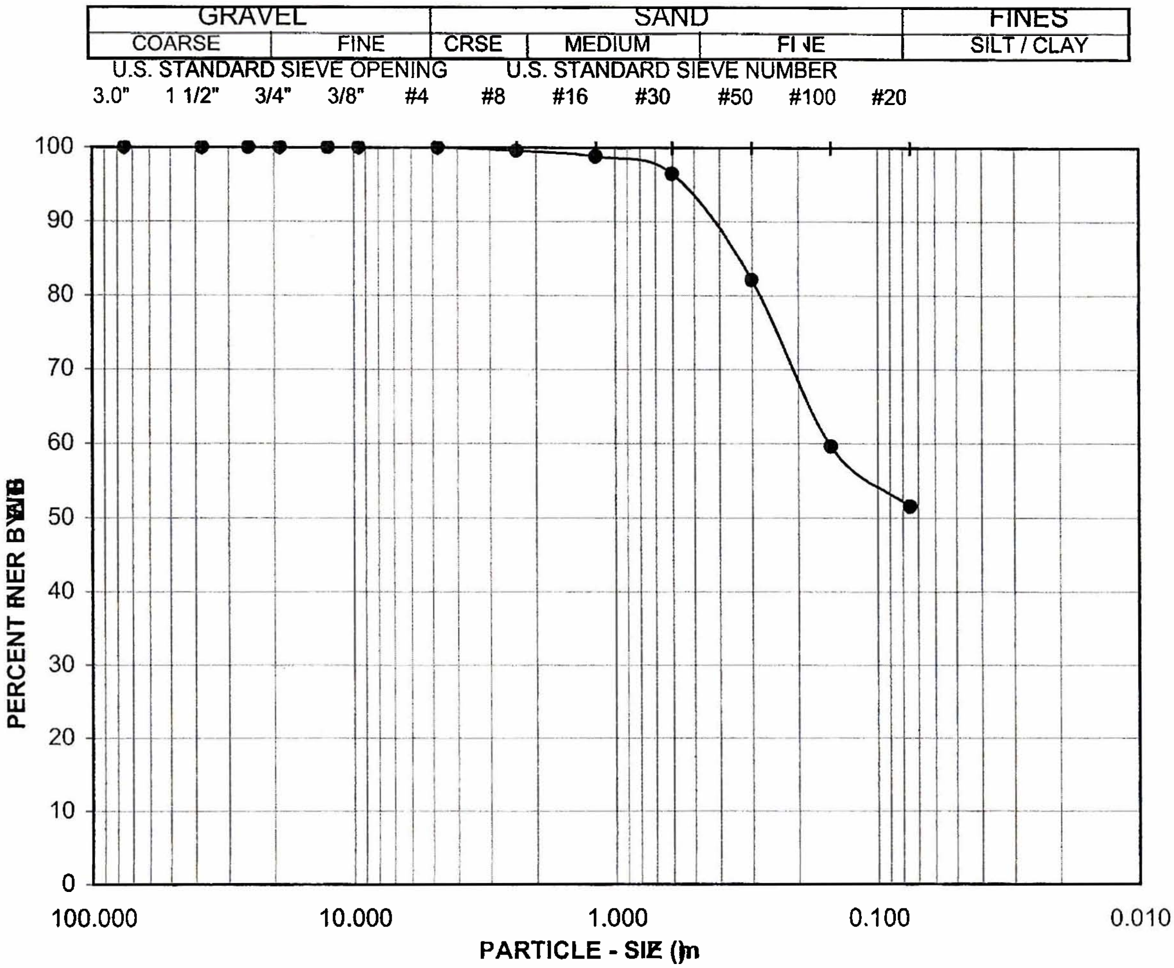
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-10	R-1	1.5	s(CL)	0 : 48 : 52

Visual Sample Description:
s(CL), LIGHT BROWN SANDY LEAN CLAY.

Leighton

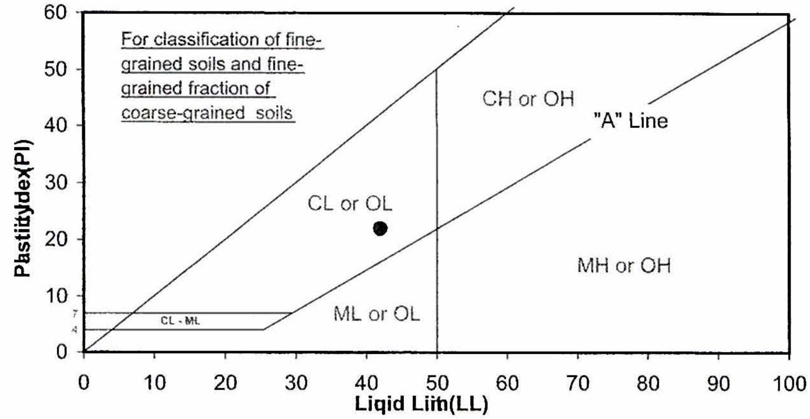
Project No.: 600158-905

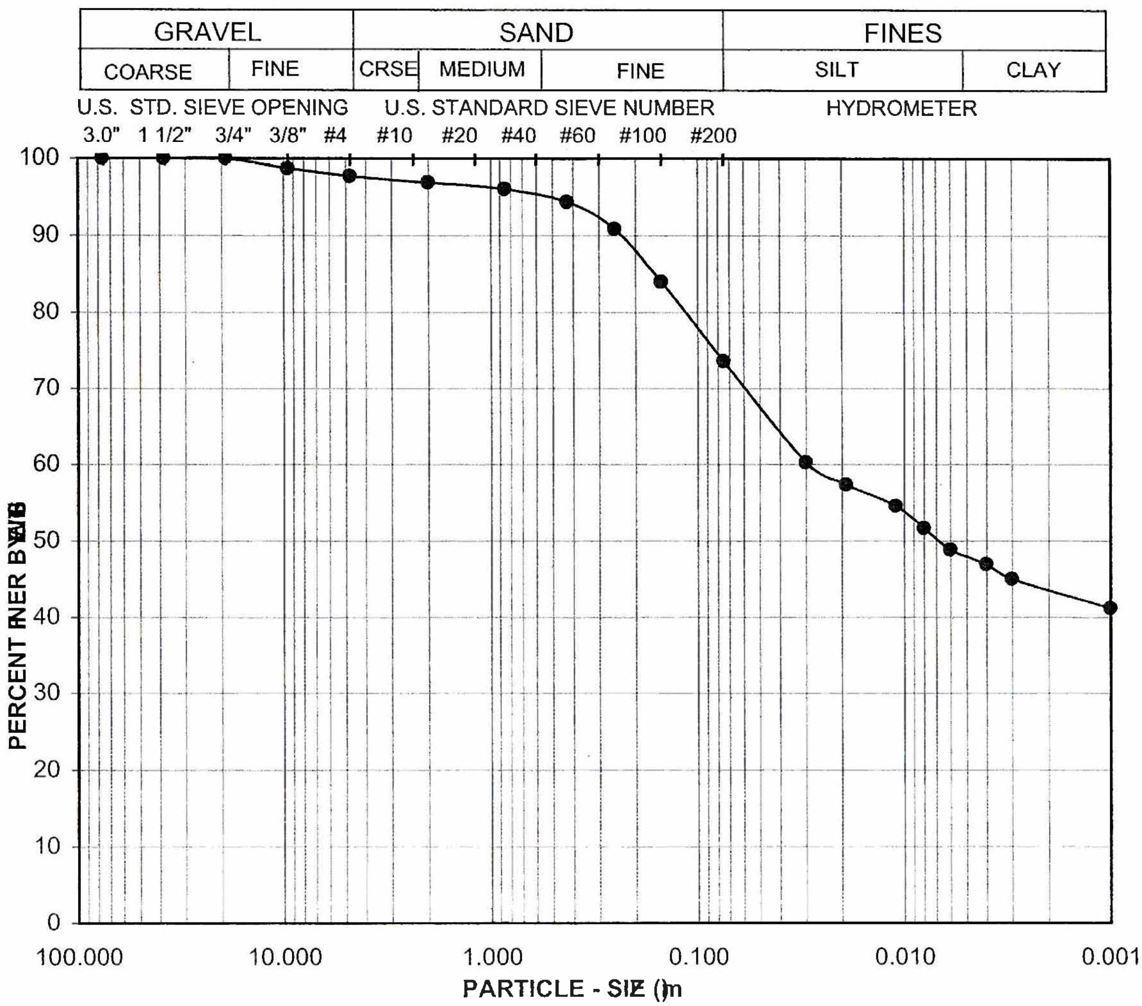
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-10,R-1





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	B-1	0-1.2	(CL)s	2:24:74	42:20:22

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND AND TRACE GRAVEL.

Leighton

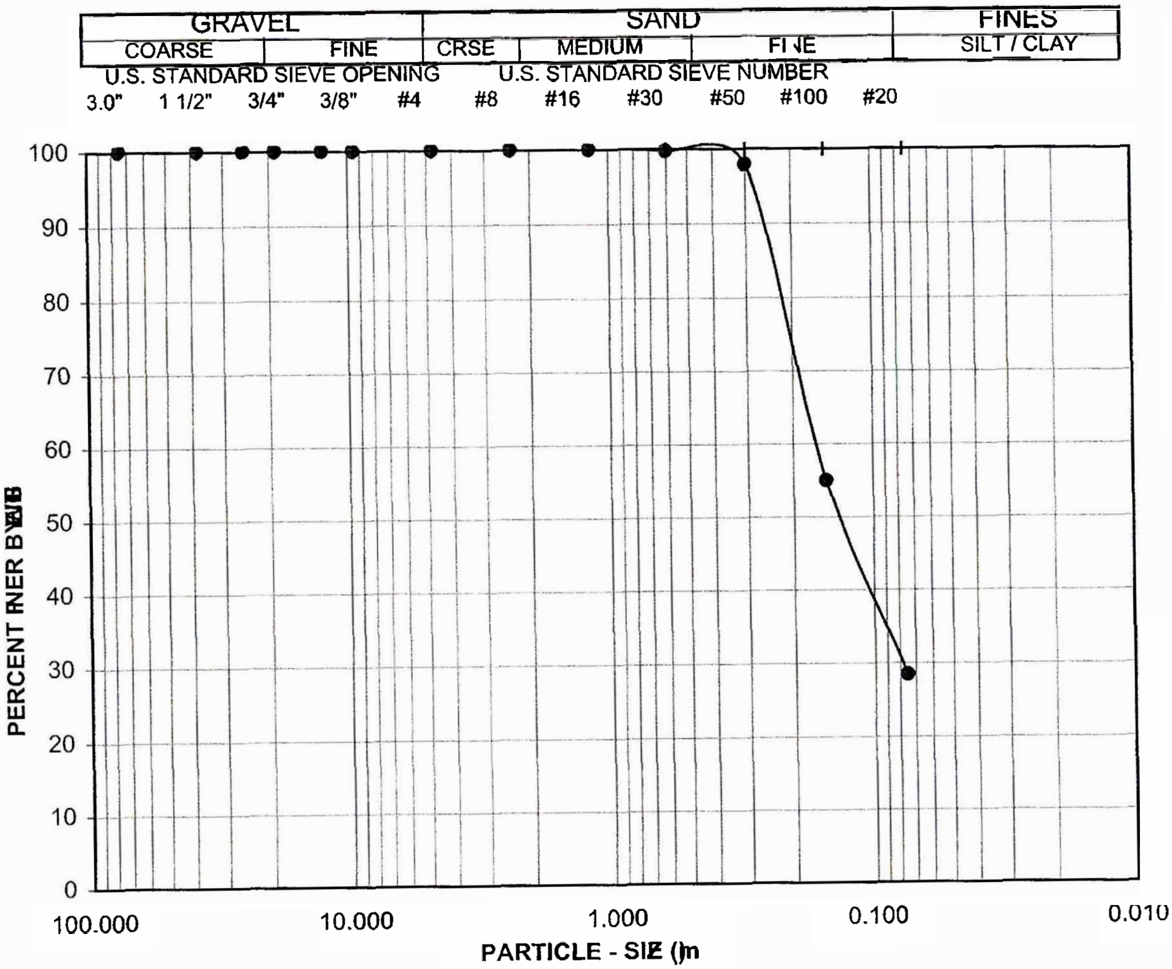
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-15	S-1	3.0	SM	0 : 72 : 28

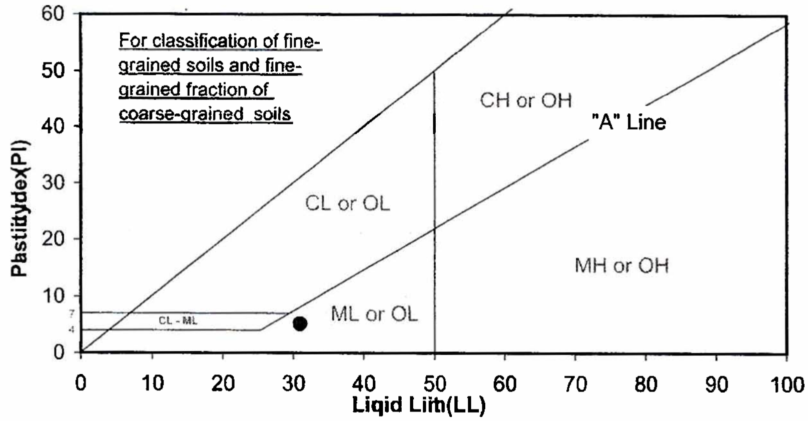
Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

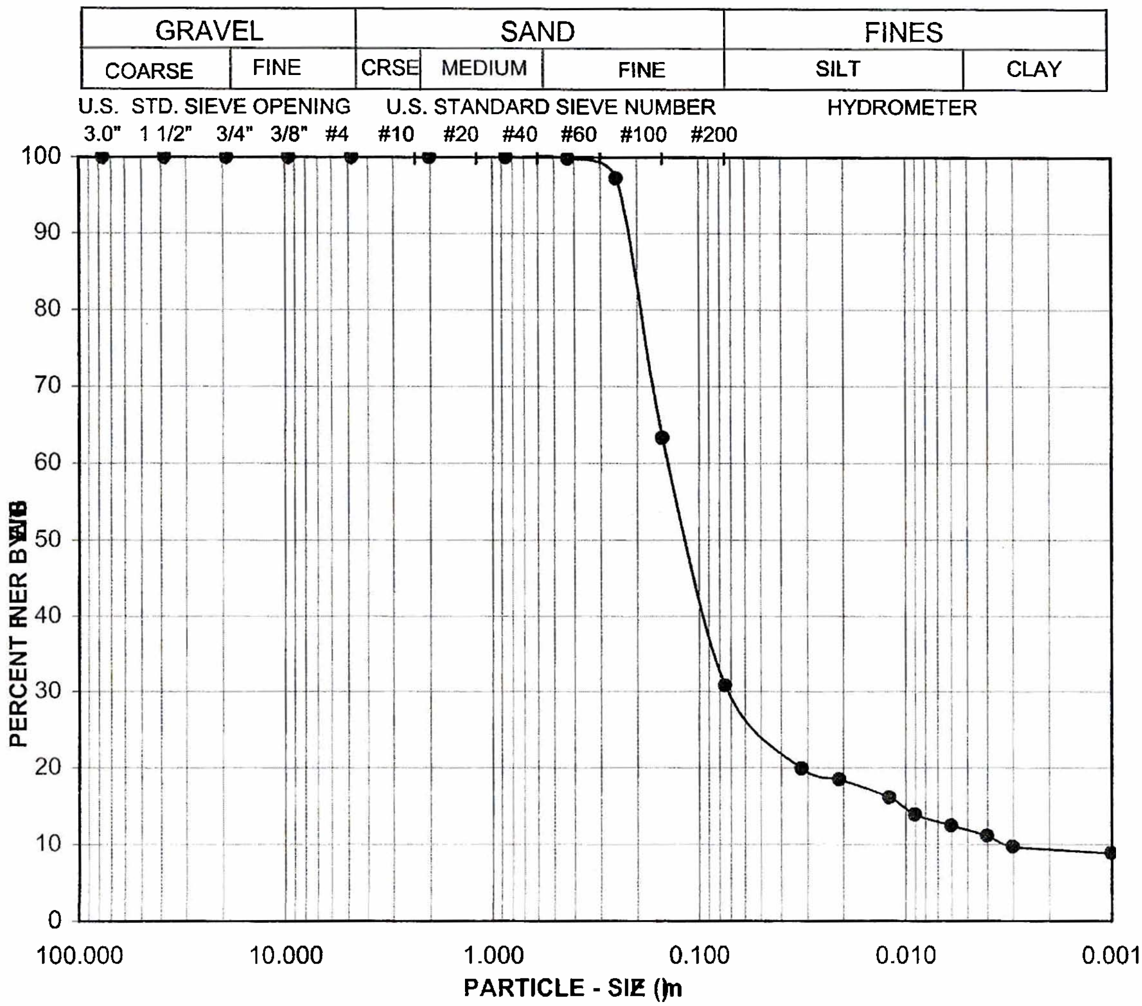
Leighton

Project No.: 600158-905 SR-125 / 905	
CALTRANS 202	

Rev. 12-06

CT 202- Sieve Split; B-15 S-1





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-16	S-1	1.5	SM	0:69:31	31:26:5

Sample Description:
SM, BROWN SILTY SAND.

Leighton

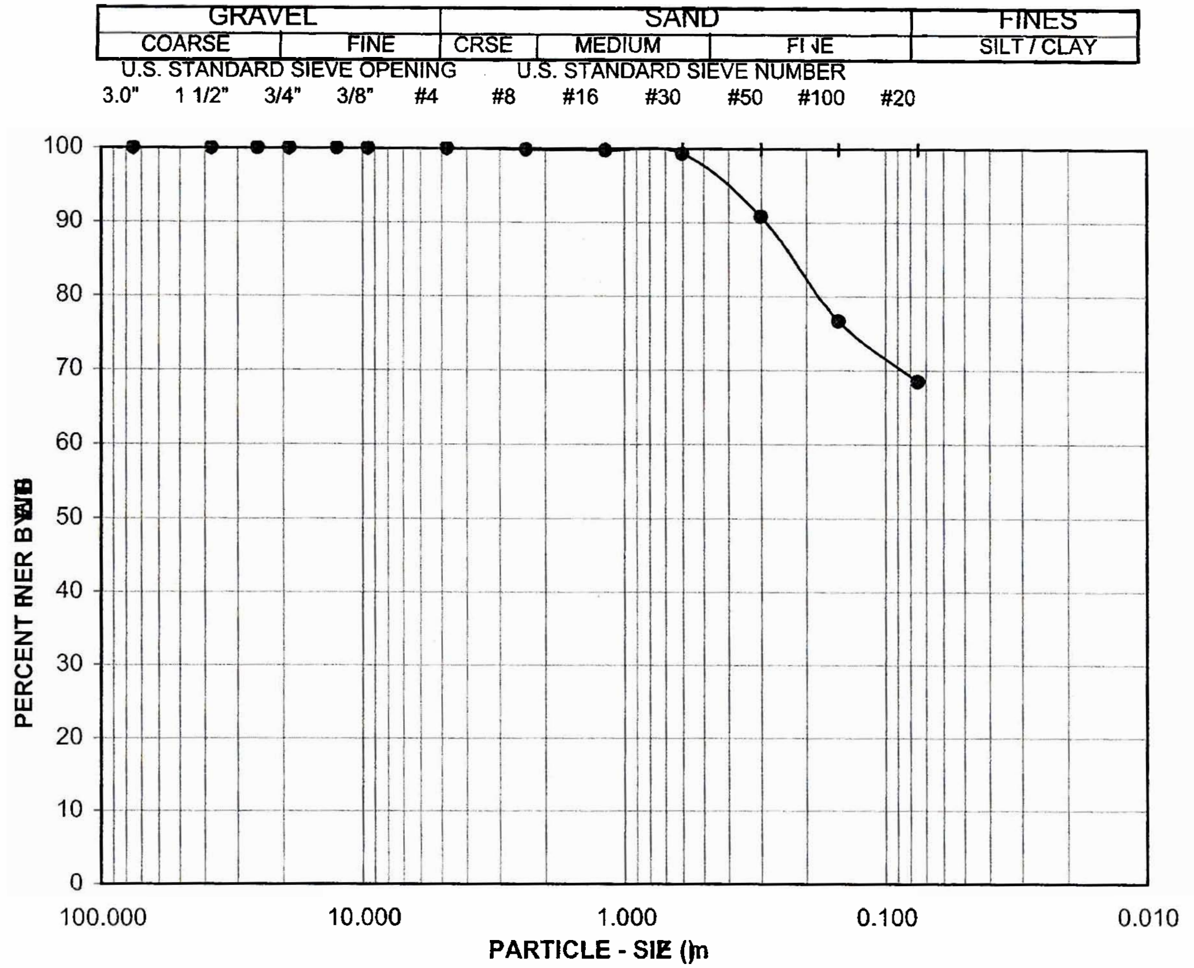
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-18	B-1	0-1.0	s(CL)	0 : 32 : 68

Visual Sample Description:
s(CL), DARK OLIVE BROWN SANDY LEAN CLAY.

Leighton

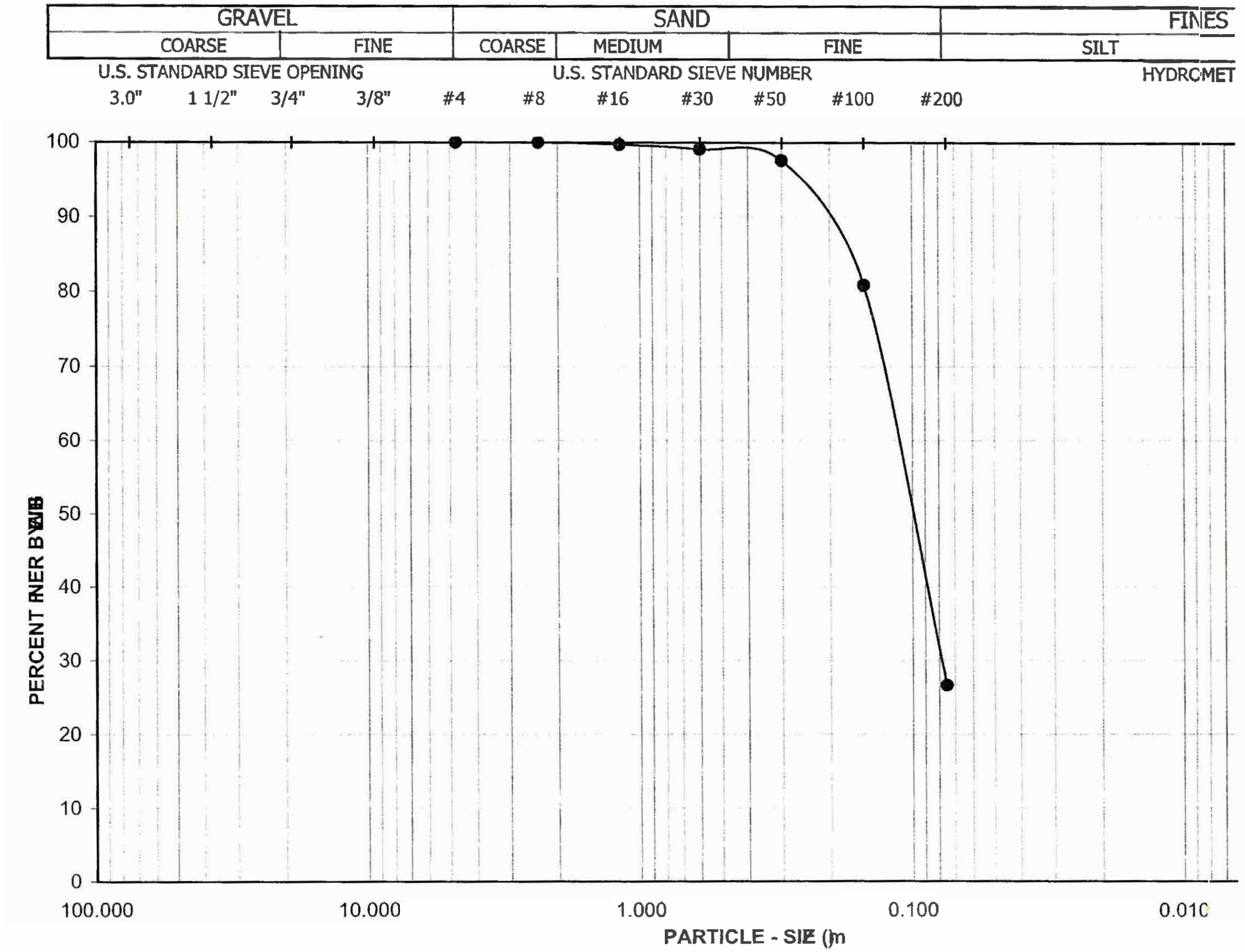
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-18,B-1



Project Name: SR 125 / 905 Interchange

Project No.: 600158-905

Exploration No.: B-19 Sample No.: F

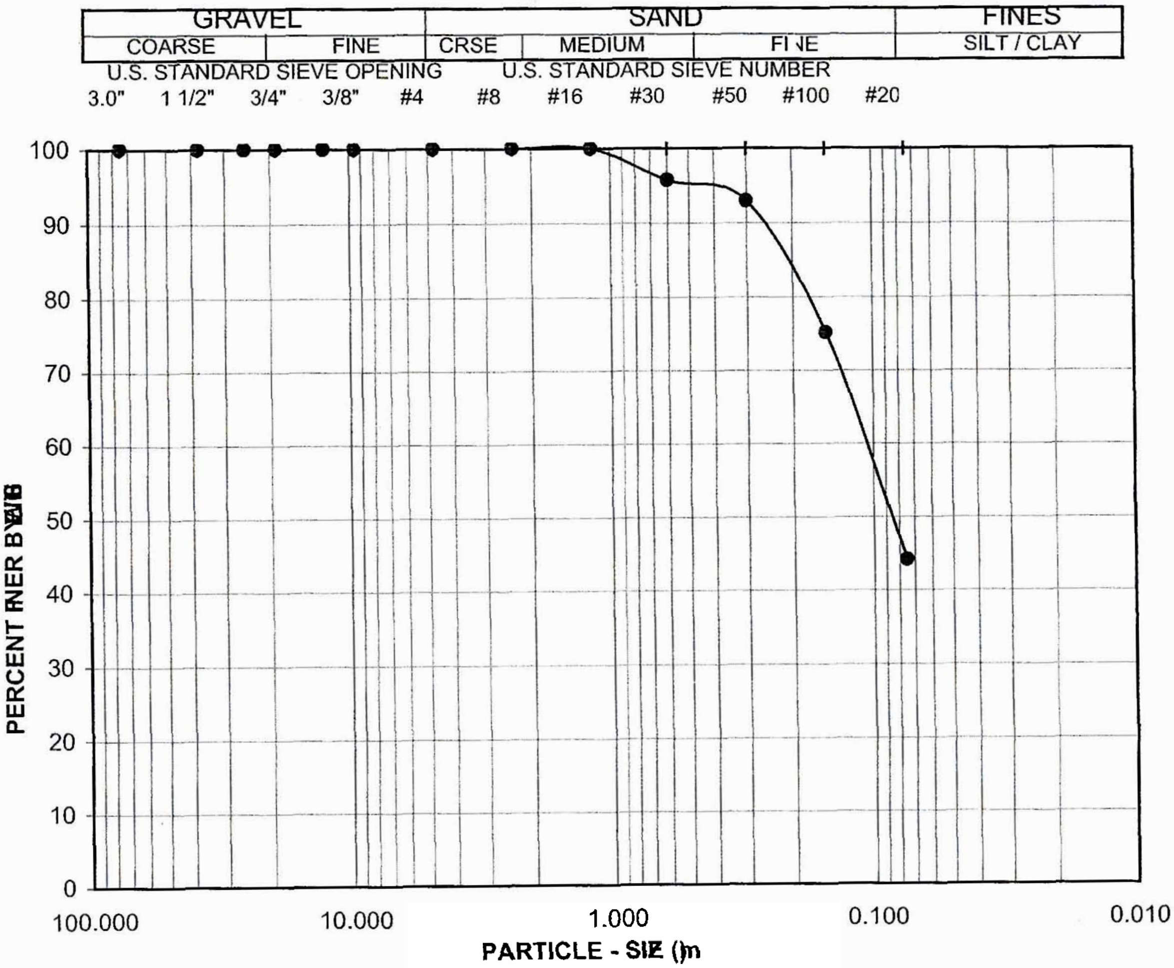
Depth (m): 1.5 Soil Type : S

Soil Identification: Very pale brown silty sand (SM)

GR:SA:FI : (%) 0 : 73 : 27

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-1	3.0	SM	0 : 56 : 44

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

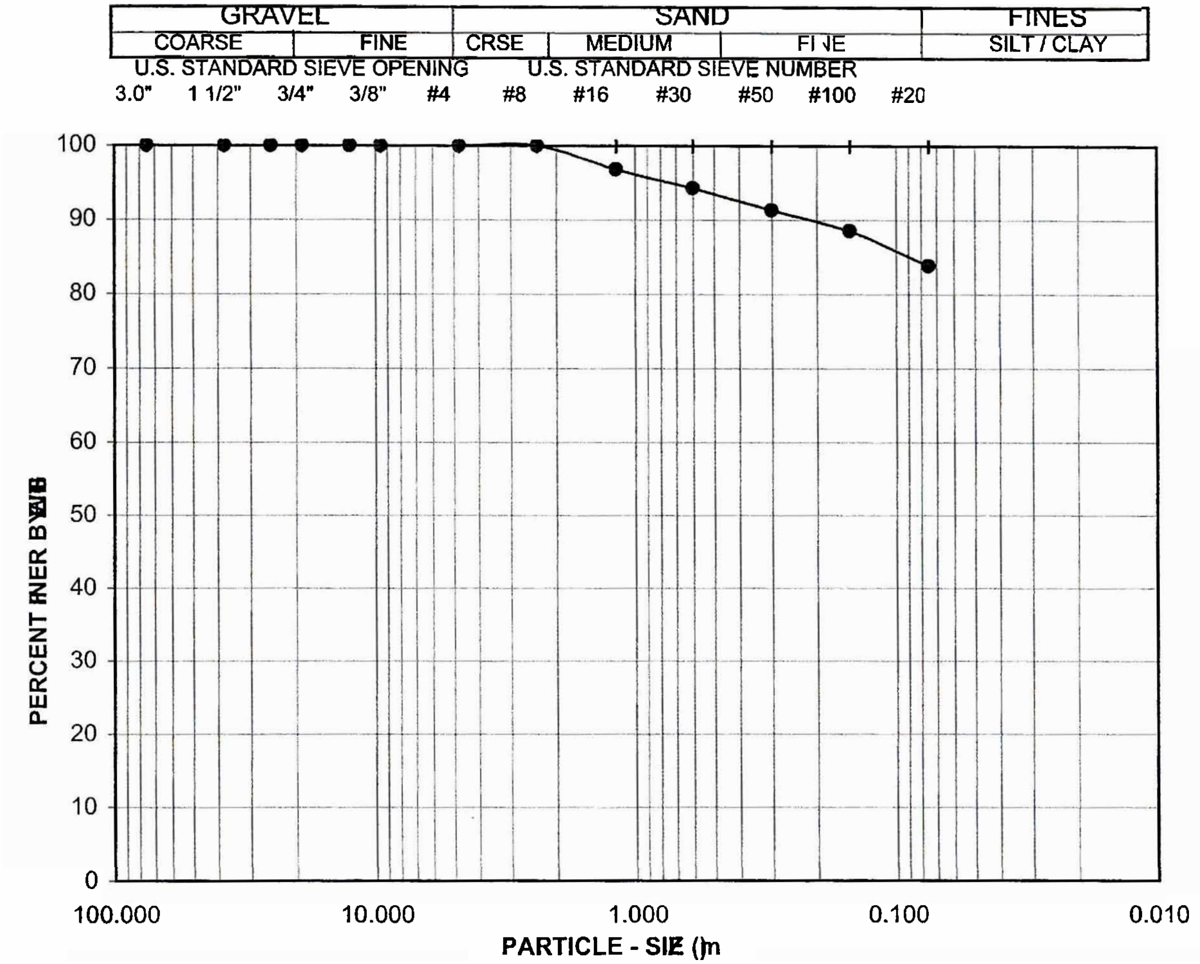
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-2	6.1	(ML)s	0 : 16 : 84

Project No.: 600158-905
SR-125 / 905

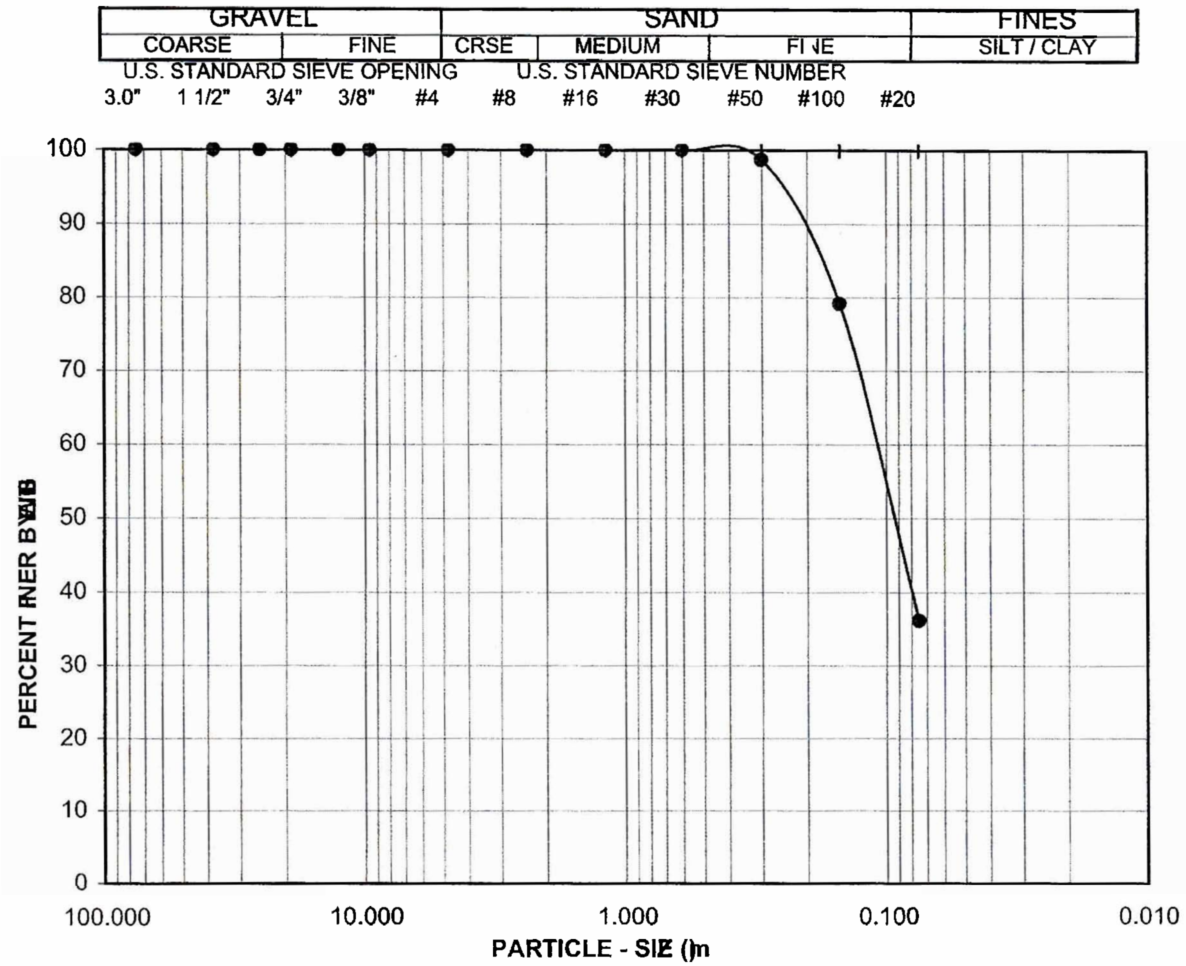
Visual Sample Description:
(ML)s, LIGHT BROWN SILT WITH SAND.

Leighton

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-2



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-4	10.7	SM	0 : 64 : 36

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

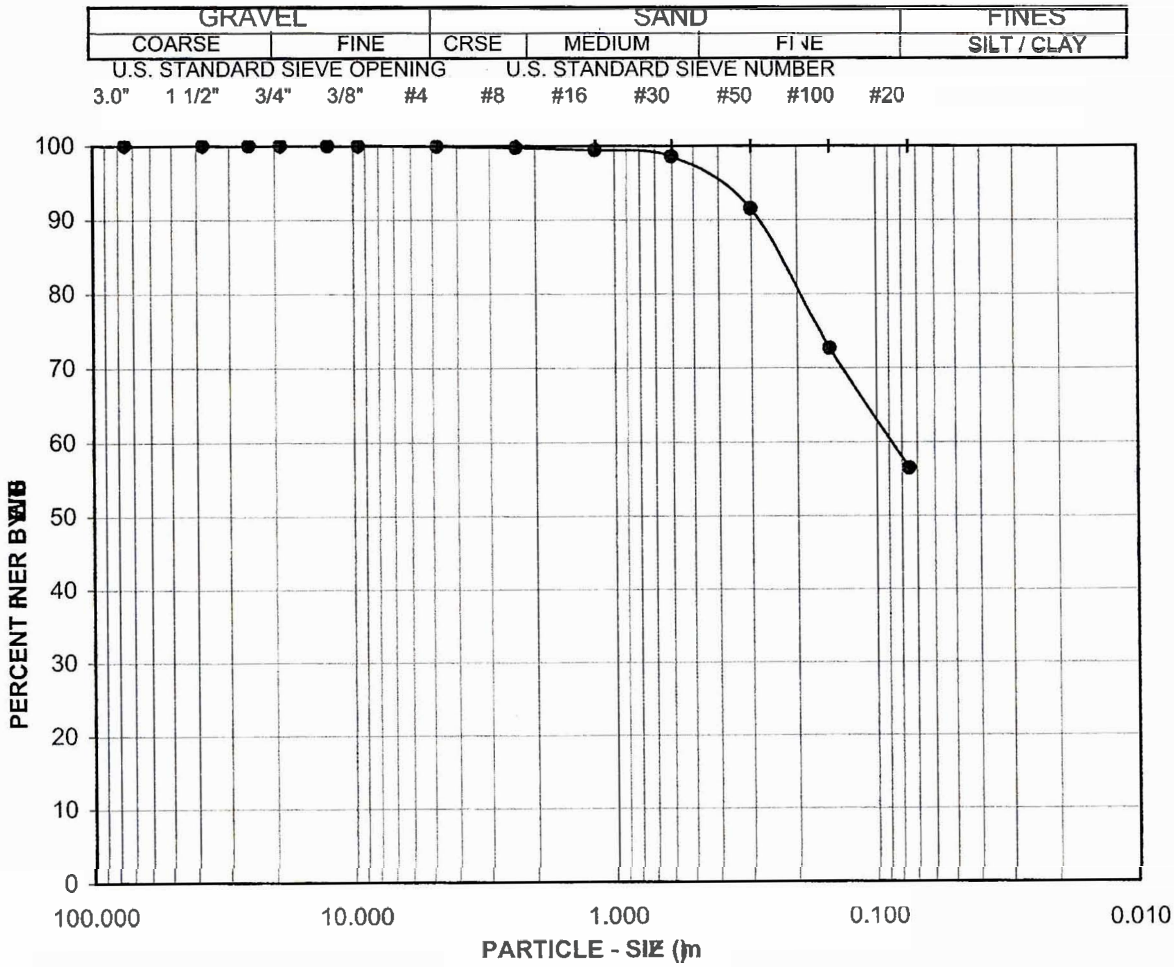
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-4



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-21	B-1	1.8-3.0	s(CL)	0 : 44 : 56

Visual Sample Description:
s(CL), LIGHT OLIVE BROWN SANDY LEAN CLAY.

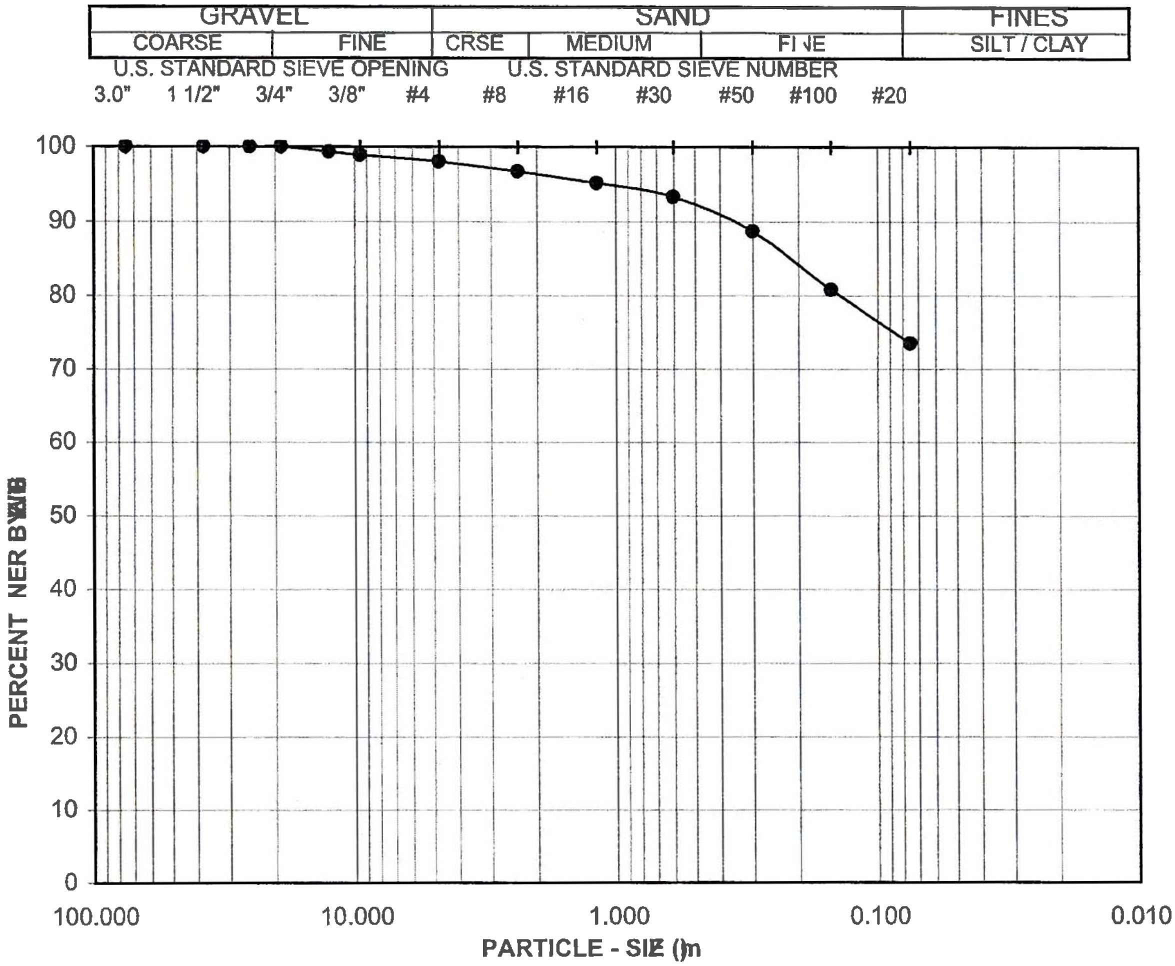
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-21,B-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
TP-1	B-1	0.6-1.0	(CH)s	2 : 24 : 74

Visual Sample Description:

(CH)s, GRAYISH BROWN FAT CLAY WITH SAND AND TRACE GRAVEL.

Leighton

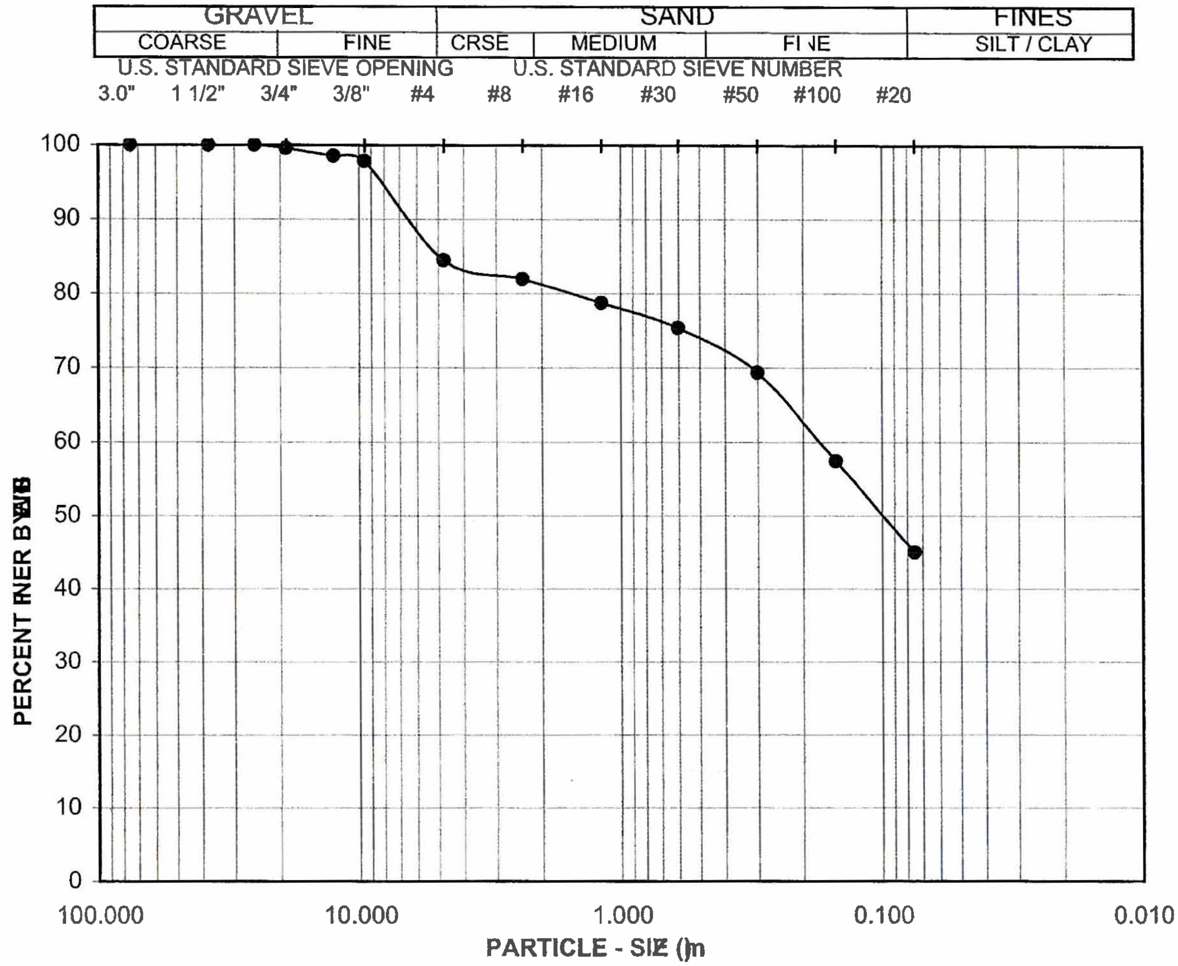
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-1,B-1



Boring No.:	Sample No.:	Depth (m.):	Soil Type	GR:SA:FI
TP-3	B-1	0.8-1.0	SC	16 : 39 : 45

Project No.: 600158-905
SR-125 / 905

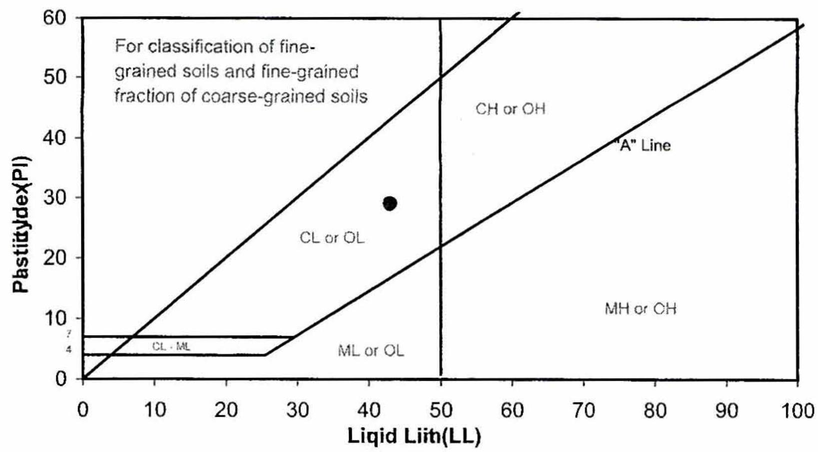
Visual Sample Description:
SC, LIGHT BROWN CLAYEY SAND WITH GRAVEL.

Leighton

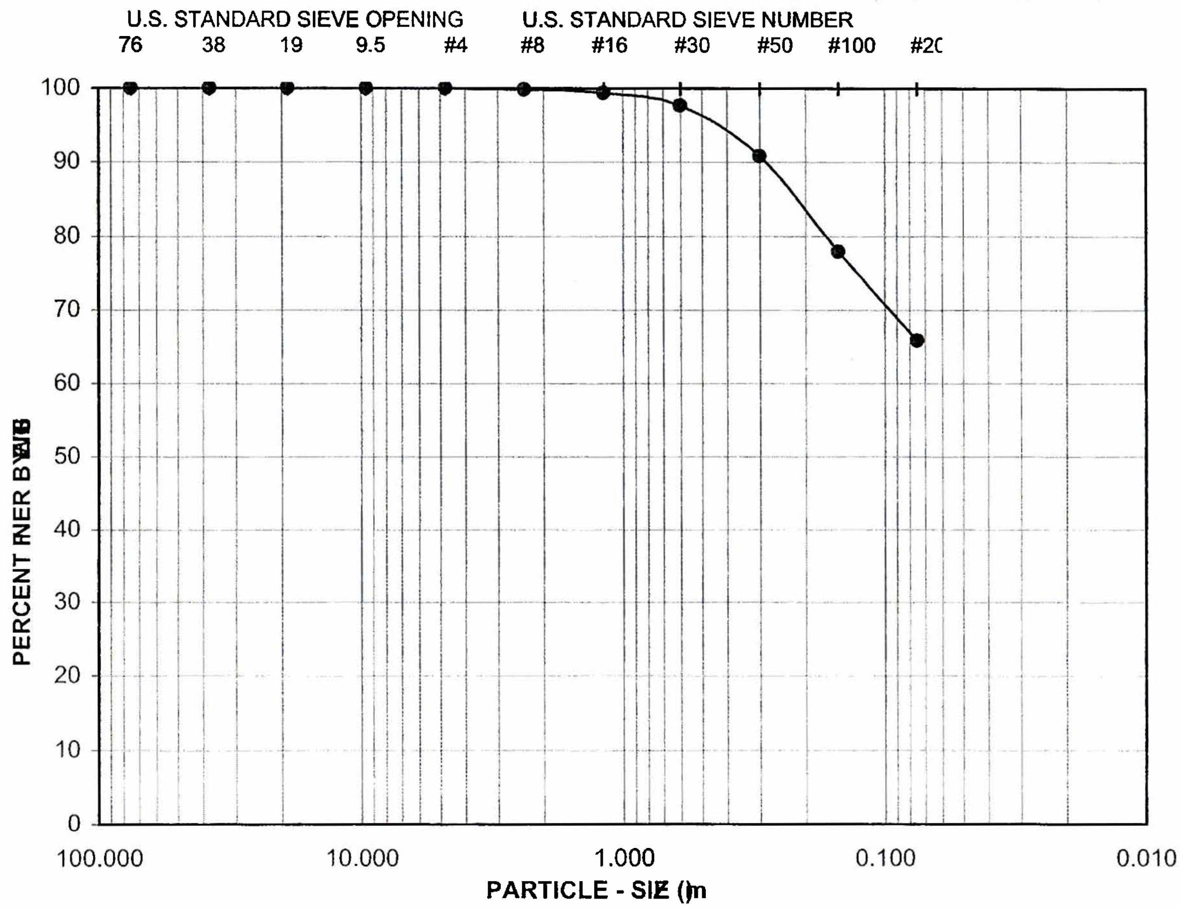
CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-3,B-1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
TP-5	B1	0.0-0.5	s(CL)	0 : 34 : 66	29

Visual Sample Description:
s(CL): BROWN SANDY LEAN CLAY

Leighton

Project No.: 600158-905

SR-125 / 905

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

Rev. 8-C7

SIEVE TP-5,B1

APPENDIX C

Laboratory Test Results and Procedures

Dry Density and Moisture Content

The dry density and moisture content of selected rings samples was determined in accordance with ASTM Test Methods D 2216 and D 2937. The results of these tests are presented summarized on the boring logs.

"R"-Value (Caltrans CT301):

The resistance "R"-value was determined by the California Materials Method CT301 for 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.

Location/Sample	Depth (m)	Sample Description	R-Value
B-9, B-1	3.4-4.6	Pale Gray Lean CLAY	9
B-21, B-1	1.8-3.0	Light Olive Brown Sandy Lean CLAY	20
TP-3, B-1	0.8-1.0	Light Brown Clayey SAND with Gravel	43

Maximum Density Tests: The maximum density and optimum moisture content of typical materials were determined in accordance with CT 216 and CT 226. The results of these tests are presented in the table below:

Location/ Sample	Depth (m)	Maximum Dry Density (kN/m^3)	Optimum Moisture Content (%)
B-2, B-1	1.5-3.0	17.8	16.9
B-4, B-1	0.3-1.5m	16.6	19.7

APPENDIX C (Continued)

Particle Size Analysis

Particle size analysis was performed by mechanical sieving or by sieve and hydrometer methods according to ASTM D422 and CT202. The percent fine particles from these analyses are summarized below. Plots of the sieve and hydrometer results are provided on the particle-size curves in this appendix.

Location / Sample	Depth (m)	% Passing No. 200 Sieve
B-1, B-1	0.3-1.5	89
B-1, S-1	3.0-3.4	64
B-1, S-3	9.1-9.4	75
B-2, S-4	10.7-11.1	100
B-2, S-6	16.8-17.2	99
B-2, S-8	22.9-23.2	64
B-3, S-1	4.6-5.0	36
B-3, S-3	10.7-11.1	55
B-4, B-1	0.3-1.5	85
B-4, S-1	3.0-3.4	99
B-4, S-3	7.6-7.9	68
B-5, B-1	1.5-3.0	64
B-7, R-1	1.5	80
B-10, R-1	1.5	52
B-14, B-1	0-1.2	76
B-15, S-1	3.0	28
B-16, S-1	1.5	31
B-18, B-1	0-1.0	68
B-19, R-1	1.5	27
B-19, S-1	3.0	44
B-19, S-2	6.1	84
B-19, S-4	10.7	36
B-21, B-1	1.8-3.0	56
TP-1, B-1	0.6-1.0	74
TP-3, B-1	0.8-1.0	45
TP-5, B-1	0-0.5	66

APPENDIX C (Continued)

Atterberg Limits

Atterberg Limits of selected samples were determined in accordance with ASTM Test Method D4318 and CT 204 for engineering classification of the fine-grained materials and presented on the table below. The results are also incorporated in the particle-size results for classification purposes.

Location/ Sample	Depth (m)	Plasticity Index	Liquid Limit (%)	Plastic Limit (%)	USCS Soil Classification
B-1, S-1	3.0-3.4	-	-	NP	ML
B-1, S-3	9.1-9.4	16	46	30	ML
B-2, S-4	10.7-11.1	45	79	34	CH
B-4, B-1	0.3-1.5	13	36	23	CL
B-7, R-1	1.5	15	41	26	CL
B-8, S-2	4.6	11	41	30	ML
B-10, R-1	1.5	23	41	18	CL
B-14, B-1	0-1.2	22	42	20	CL
B-16, S-1	1.5	5	31	26	ML
B-18, B-1	0-1.0	29	49	20	CL
B-21, B-1	1.8-3.0	15	36	21	CL
TP-1, B-1	0.6-1.0	35	56	21	CHs
TP-1, B-2	1.8-2.0	32	43	11	CL
TP-3, B-1	0.8-1.0	9	34	25	ML
TP-5, B-1	0-0.5	29	14	14	CL

APPENDIX C (Continued)

Consolidation Tests

Consolidation tests were performed on selected, relatively undisturbed ring samples in accordance with Modified ASTM Test Method D2435. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented on the attached figures. Where applicable, time-rates of consolidation were recorded and presented below:

Location / Sample	Depth (m)	Coefficient of Compression Index Cc	Coefficient of Recompression Index Cr
B-1, R-1	1.5-1.8	0.14	0.04
B-2, R-2	6.1-6.3	0.07	0.02
B-3, R-1	3.0-3.4	0.06	0.02
B-3, R-2	6.1-6.4	0.06	0.02
B-4, R-3	9.1-9.4	0.07	0.02
B-4, R-5	16.8-17.1	0.08	0.03
B-7, R-1	1.5	0.08	0.02
B-10, R-1	1.5	0.12	0.01
B-14, R-1	3.0	0.11	0.04
B-20, R-1	1.5	0.06	0.01
B-20, R-3	9.1	0.05	0.02

APPENDIX C (Continued)

Expansion Index

The expansion potential of selected materials was evaluated by the Expansion Index Test ASTM D 4829. Specimens are molded under a given compactive energy near 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.

Location / Sample	Depth (m)	Expansion Index	Expansion Potential
B-1, B-1	1.0-5.0	92	High
B-4, B-1	0.3-1.5	107	High
B-14, B-1	0.0-1.2	154	Very High
B-18, B-1	0.0-1.0	167	Very High
B-21, B-1	1.8-3.0	107	High
TP-1, B-1	0.6-1.0	174	Very High
TP-1, B-2	1.8-2.0	62	Medium
TP-3, B-1	0.8-1.0	64	Medium
TP-5, B-1	0.0-0.5	47	Low
TP-6, B-1	0.8-1.0	18	Very Low

APPENDIX C (Continued)

pH and Resistivity

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

Location / Sample	Depth (m)	pH	Minimum Resistivity (ohm-cm)
B-1, B-1	0.3-1.5	7.9	1850
B-1, R-4	10.7-11.0	7.9	1507
B-2, R-8	24.4-24.5	8.2	2672
B-4, B-1	0.3-1.5	7.9	2603
B-19, R-3	9.1	8.1	2398
B-19, S8&S9	22.9-24.4	8.1	3151
B-21, B-1	1.8-3.0	7.5	2398
TP-1, B-1	0.6-1.0	8.0	3151
TP-3, B-1	0.8-1.0	7.7	2398

APPENDIX C (Continued)

Soluble Sulfate

The soluble sulfate contents contained within selected samples of soil were determined by California Test Method 417. The test results are presented in the table below:

Location / Sample	Depth (m)	Soluble Sulfates (ppm)
B-1, B-1	0.3-1.5	600
B-1, R-4	10.7-11.0	<150
B-2, R-8	24.4-24.5	150
B-4, B-1	0.3-1.5	180
B-19, R-3	9.1	<150
B-19, S8&S9	22.9-24.4	<150
B-21, B-1	1.8-3.0	450
TP-1, B-1	0.6-1.0	300
TP-3, B-1	0.8-1.0	270

APPENDIX C (Continued)

Chloride Content

Chloride content within selected samples was determined by California Test Method 422. The test results are presented in the table below:

Location / Sample	Depth (m)	Chloride Content (ppm)
B-1, B-1	0.3-1.5	1980
B-1, R-4	10.7-11.0	642
B-2, R-8	24.4-24.5	647
B-4, B-1	0.3-1.5	120
B-19, R-3	9.1	1510
B-19, S8&S9	22.9-24.4	435
B-21	1.8-3.0	680
TP-1, B-1	0.6-1.0	200
TP-3, B-1	0.8-1.0	1730

Collapse Potential

Collapse testing of undisturbed and remolded samples was performed in accordance with ASTM D5333 at the load indicated in the table below on select samples to assess collapse potential.

Location / Sample	Depth (m)	Sample Type	Test Load (kPa)	Degree of Specimen Collapse
B-2, B-1	1.5-3.0	Remolded 95% of CT 216	117	None
B-4, R-1	1.5-1.8	Ring	151	None
B-4, R-2	4.6-4.9	Ring	201	None

APPENDIX C (Continued)

Swell

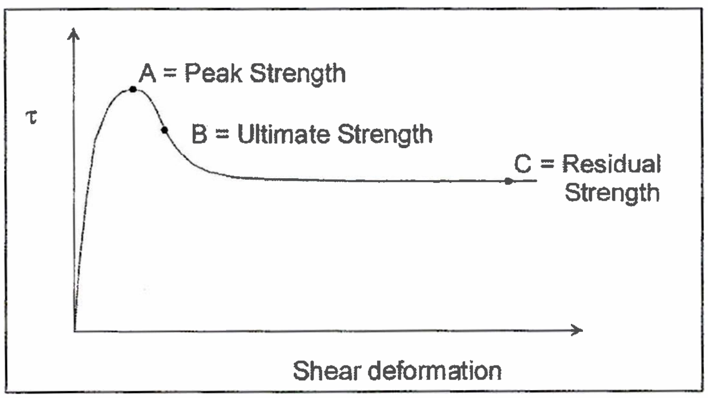
Swell testing of undisturbed and remolded samples was performed in accordance with ASTM D4546 on select samples to assess swell.

Location / Sample	Depth (m)	Sample Type	Vertical Pressure (kPa)	Swell (%)
B-1, R-1	1.5-1.8	Ring	52.2	0.19
B-2, R-2	6.1-6.3	Ring	52.2	-0.07
B-3, R-1	3.0-3.4	Ring	52.2	0.00
B-3, R-2	6.1-6.4	Ring	52.2	0.20
B-4, R-3	9.1-9.4	Ring	52.2	0.74
B-4, R-5	16.8-17.1	Ring	52.2	0.29
B-7, R-1	1.5	Ring	33.5	0.05
B-10, R-1	1.5	Ring	29.4	0.42
B-14. R-1	3.0	Ring	57.5	-0.60
B-20. R-1	1.5	Ring	33.5	0.11

APPENDIX C (Continued)

Direct Shear

Direct shear tests were performed in accordance with ASTM D3080 on selected samples that were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus. The rate of shearing used for the tests was between 0.0043 cm/min and 0.0084 cm/min, depending on material type. Plots of the individual test results are provided within this appendix along with composite summary plots of the tests. Strength envelopes are provided on each of the individual plots. Those envelopes correspond to the peak shear resistance and the shear resistance at the end of the test. The graphic below illustrates the summarized points.



APPENDIX C (Continued)

Consolidated Undrained Triaxial

Consolidated undrained triaxial compression tests were performed in accordance with ASTM D4767. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The samples were then saturated by applying a back pressure. The axial load and chamber pressure were increased in small increments until the change in chamber pressure was within tolerance to the measured change in sample pore fluid pressure, indicating that the sample was fully saturated. Once the sample was fully saturated and had completed primary consolidation, the samples were loaded axially strain rates between 0.15 and 0.23 cm/min. Total and effective strength Mohr cycles are provided on the plot summaries in this appendix. The coefficient of consolidation is summarized below.

Location / Sample	Depth (m)	Coefficient of Consolidation (m2/yr)
B-2, R-1	3.0-3.4	1044
B-2, R-3	9.1-9.3	451
B-2, R-5	15.2-15.4	179
B-4, R-6	19.8-20.1	725
B-4, R-7	24.4-24.7	1586
B-19, R-6	18.3	58
B-19, R-7	21.3	331

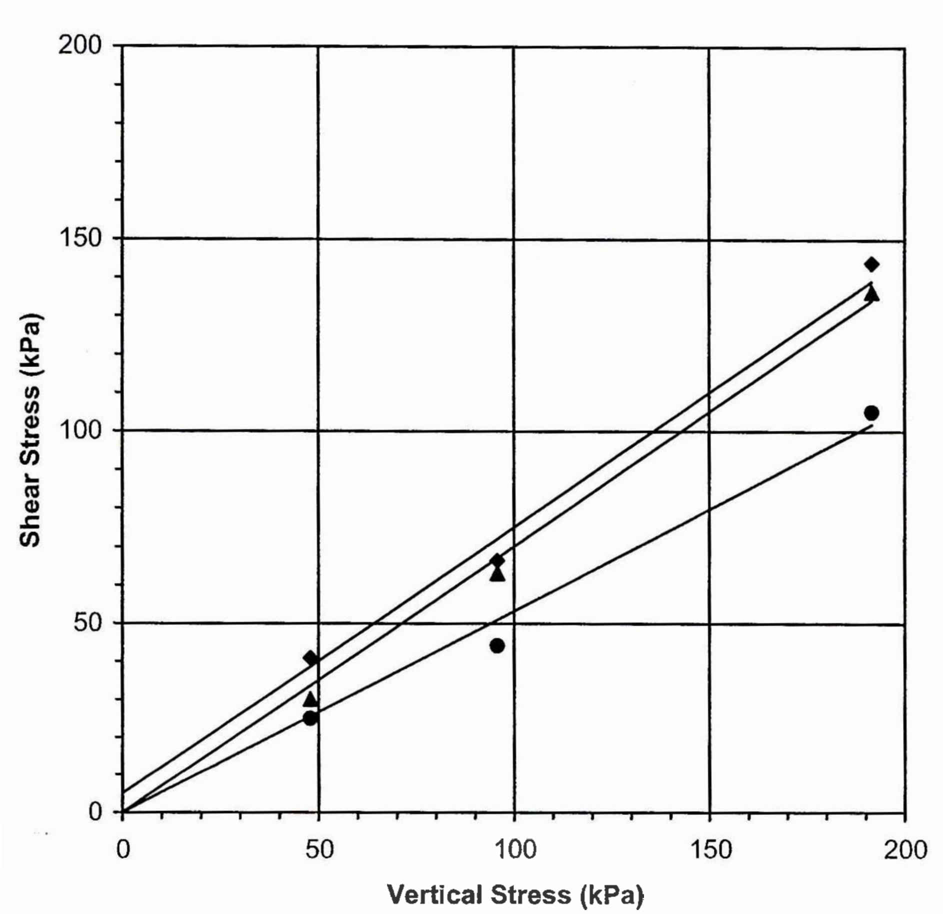
Unconsolidated Undrained Triaxial

Unconsolidated undrained triaxial compression tests were performed in accordance with ASTM D2850. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The samples were then saturated by applying a back pressure. The axial load and chamber pressure were increased in small increments until the change in chamber pressure was within tolerance to the measured change in sample pore fluid pressure, indicating that the sample was fully saturated. Once the sample was fully saturated, the samples were loaded axially strain rates between 0.15 and 0.23 cm/min.

APPENDIX C (Continued)

Unconfined Compressive Strength

Unconfined compressive tests were performed in accordance with ASTM D2166. Samples were placed in the testing device and a small seating load was applied, to secure the sample in the testing device. The axial load was then increased in small increments with associated strain rates between 1/2 and 2.0 %/min.



Location	Sample No.	Depth (m)	USCS	Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
				Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-1	**R-2**	**4.6 - 4.9**	**ML**	**5**	**35**	**0**	**35**	**0**	**28**
Sample Description: Gray-brown clayey siltstone									

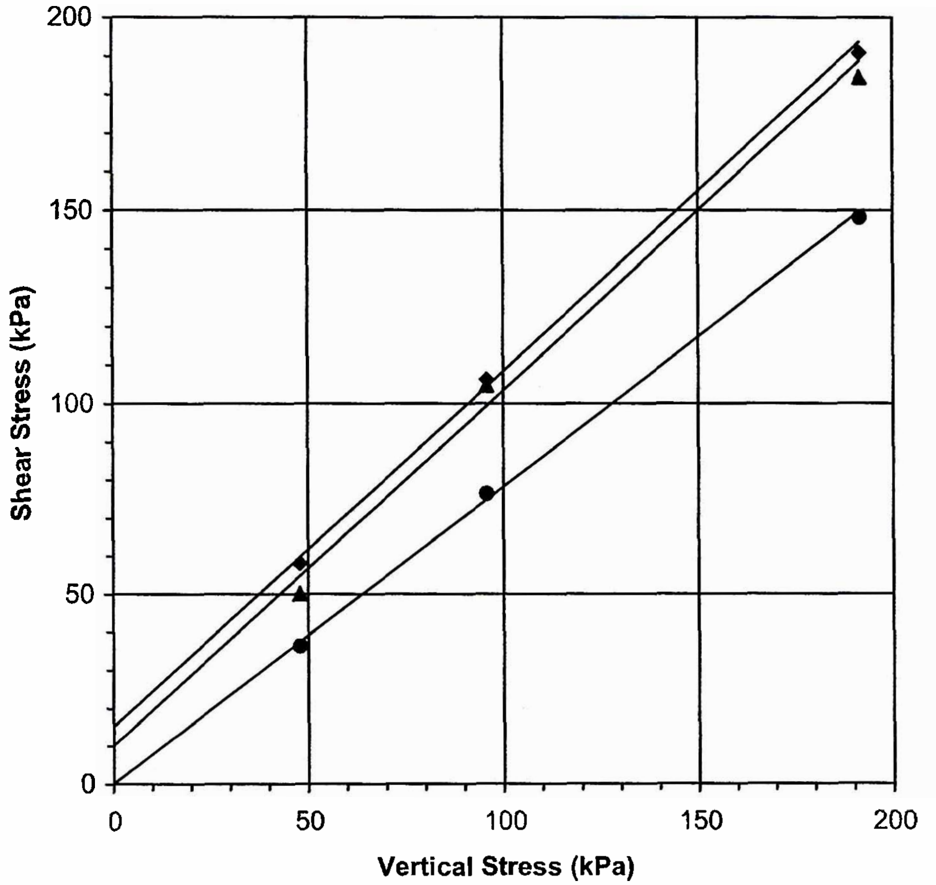
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



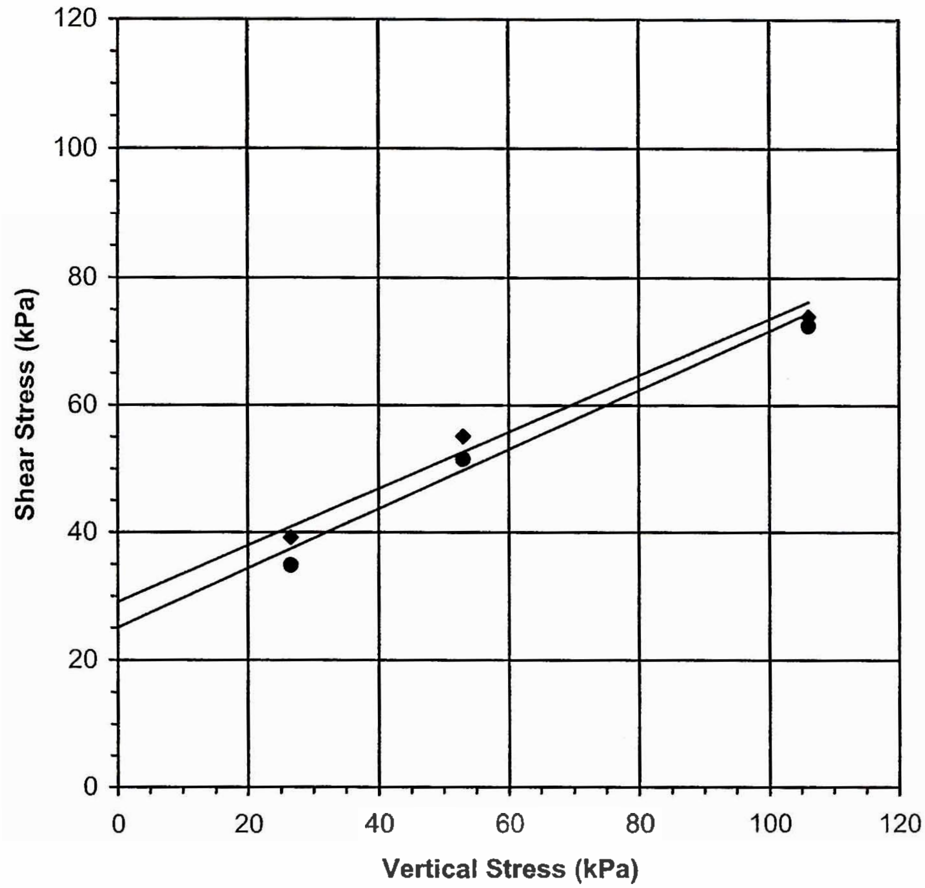
				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-1	**R-3**	**7.6 - 7.9**	**ML**	**15**	**43**	**10**	**43**	**0**	**38**
Sample Description: Light Brownish gray, fine sandy siltstone									

Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring
ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**B-1**	**1.5 - 3.0**	**CL**	**29**	**24**	**-**	**-**	**25**	**25**
Sample Description: Brown lean clay w/ sand (Remolded 90%)									

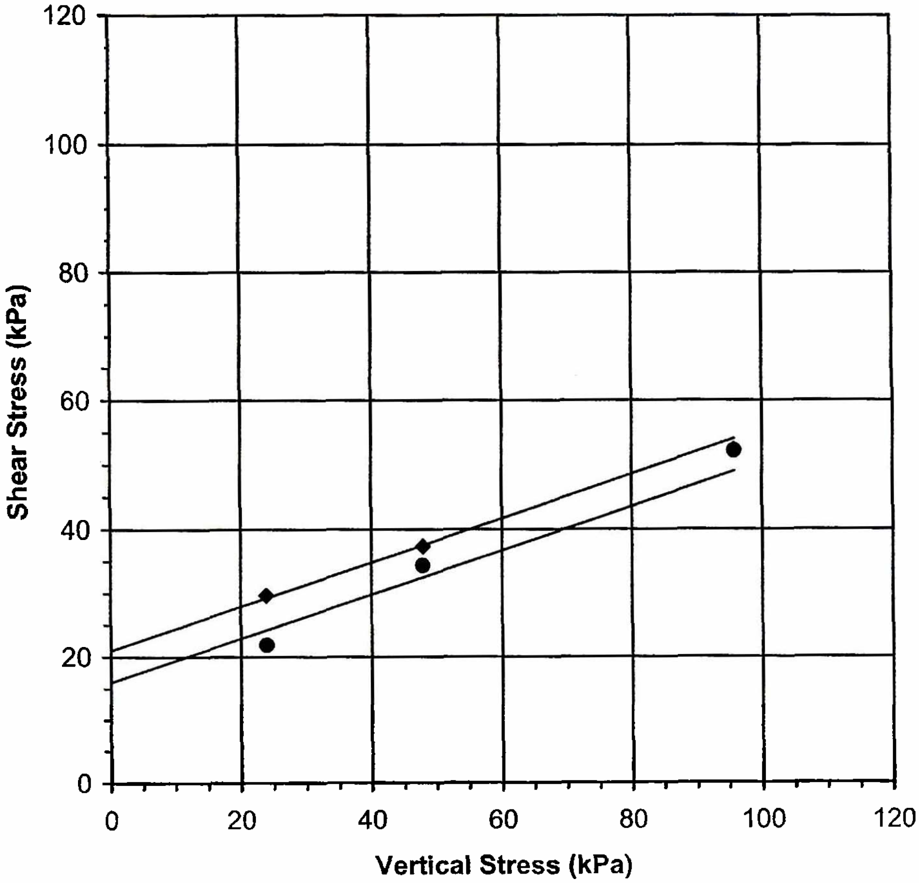
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.7mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**B-1**	**5.0 - 10.0**	**CL**	**21**	**19**			**16**	**19**
Sample Description: Brown lean clay (Remolded 90%)									

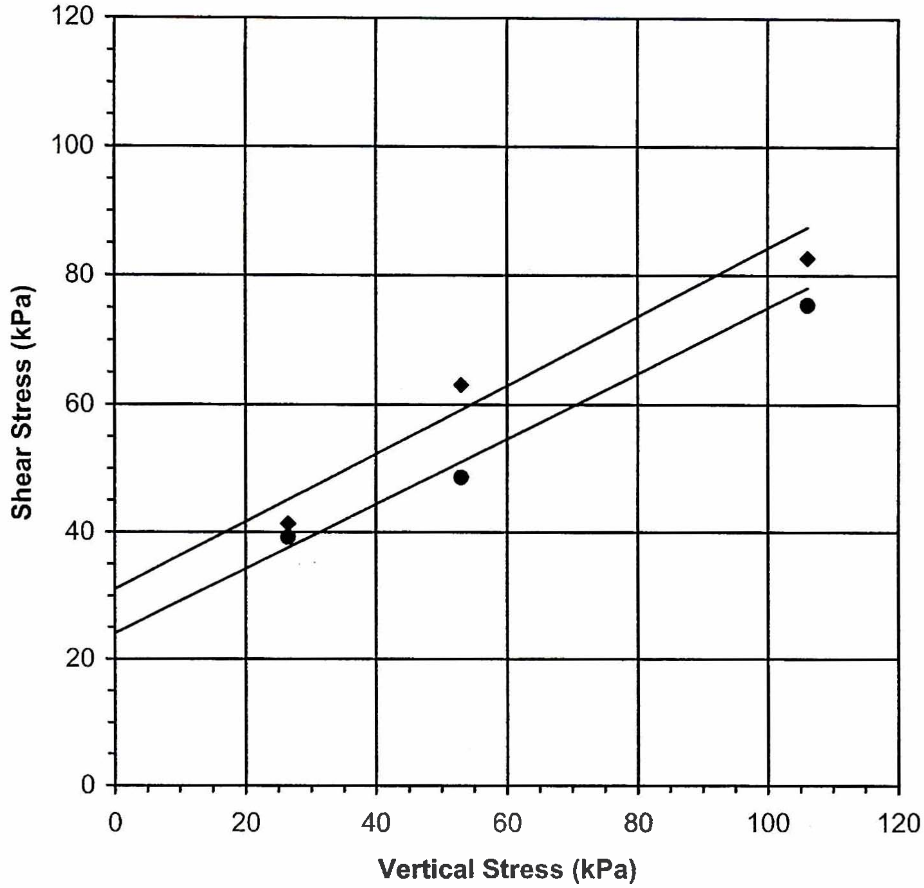
Strain Rate = 0.0043 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



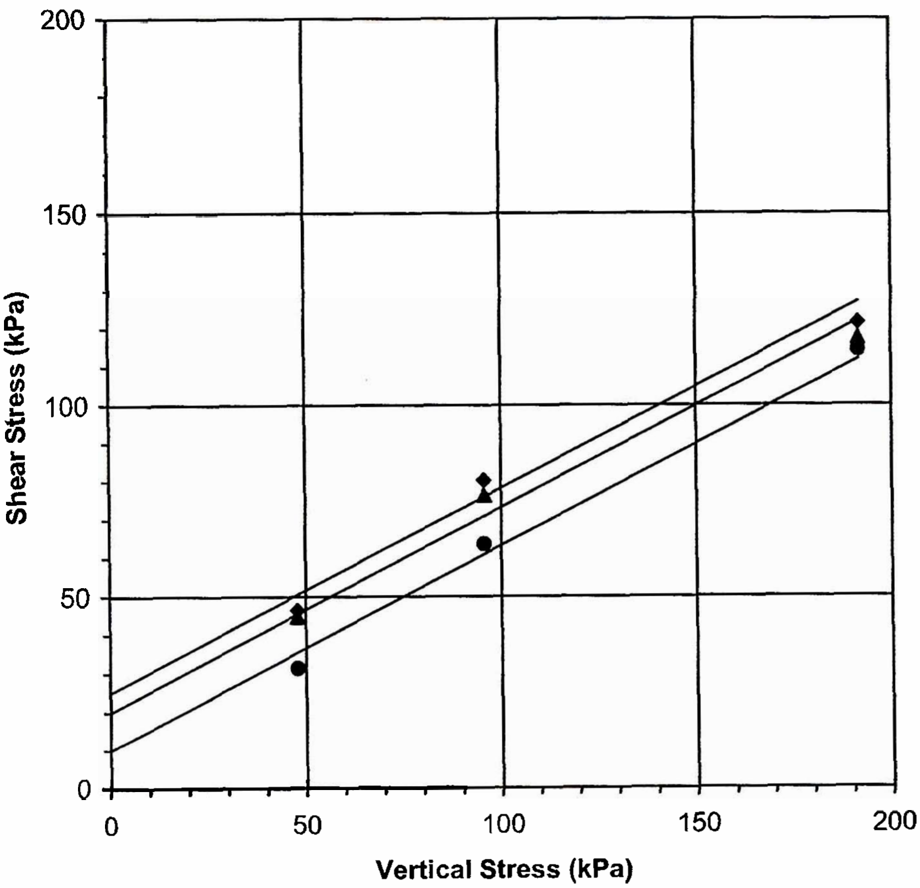
				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**B-1**	**1.5 - 3.0**	**CL**	**31**	**28**			**24**	**27**
Sample Description: Brown lean clay w sand (Remolded 95%)									

Strain Rate = 0.0254 cm/min
Sample Type: Bulk
ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-2	**R-7**	**21.3 - 21.6**	**SM**	**25**	**28**	**20**	**28**	**10**	**28**
Sample Description: Olive-brown to light brown, silty sandstone									

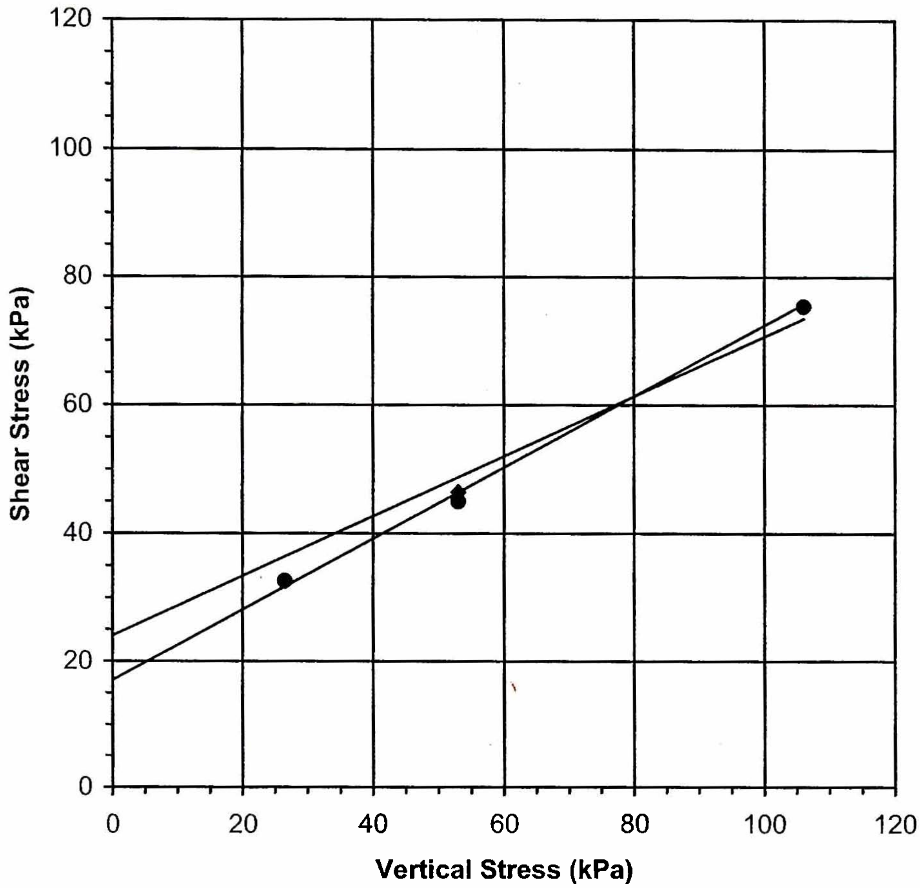
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-4	**B-1**	**0.3 - 1.5**	**ML**	**24**	**25**			**17**	**29**
Sample Description: Light gray-brown, clayey silt (Remolded 90%)									

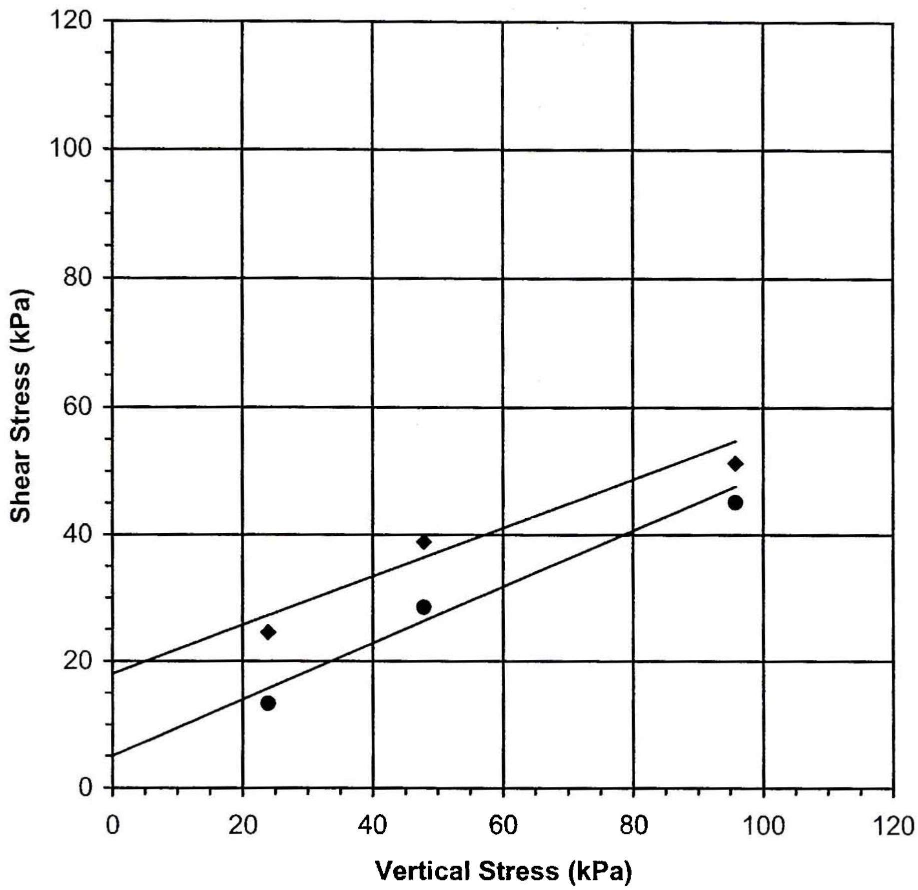
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

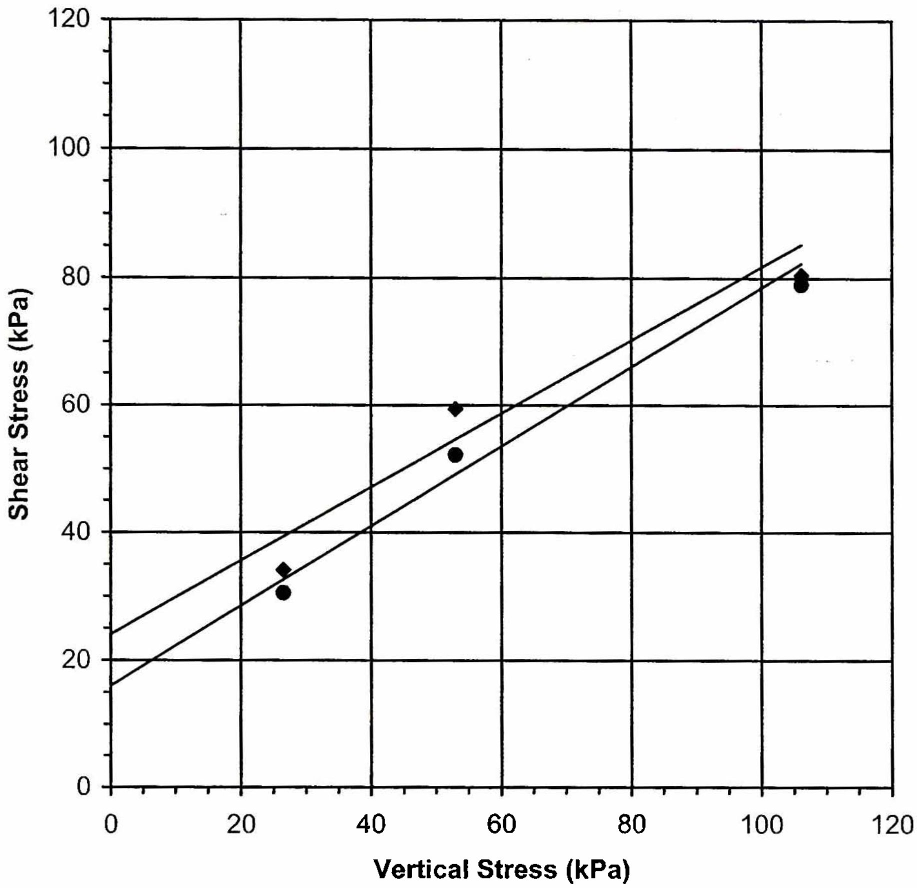
Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.7mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-4	**B-1**	**1.0 - 5.0**	**CL**	**18**	**21**			**5**	**24**
Sample Description: Brown lean clay (Remolded 90%)									

Strain Rate = 0.0043 cm/min
Sample Type: Bulk
ASTM D 3080

DIRECT SHEAR SUMMARY	Project No. 600158-905 Project Name SR125 / SR905	Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 5.1mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-4	**B-1**	**0.3 - 1.5**	**ML**	**24**	**30**		**-**	**16**	**32**
Sample Description: Light gray-brown, clayey silt (Remolded 95%)									

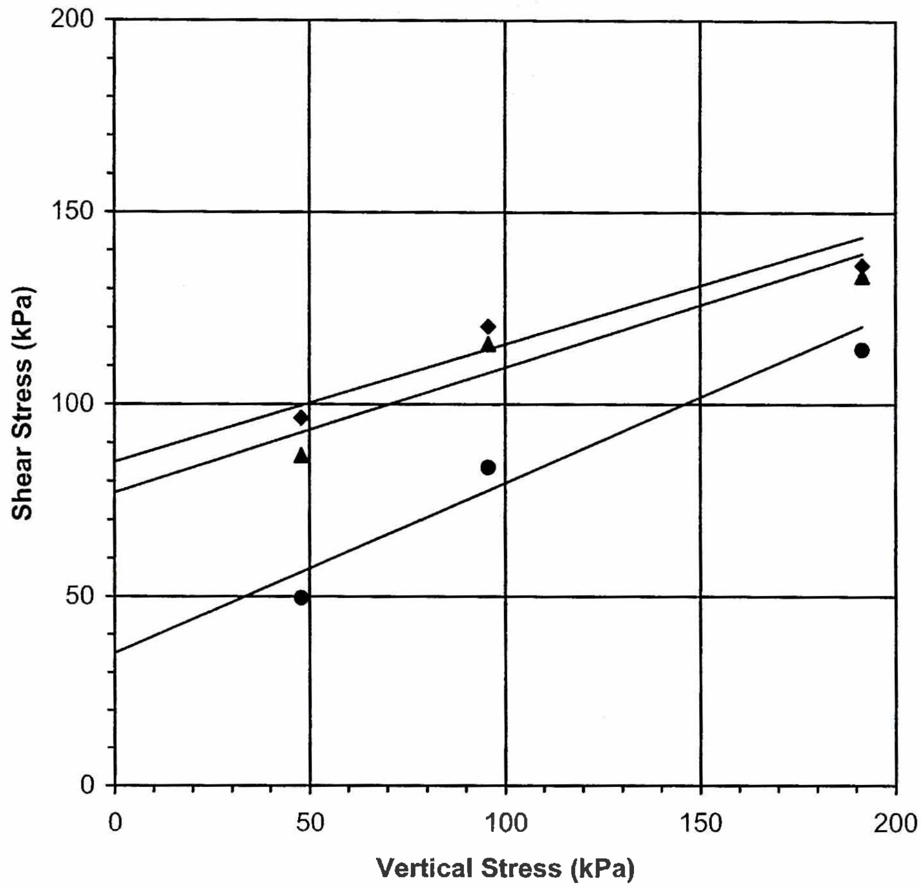
Strain Rate = 0.0254 cm/min
Sample Type: Bulk

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-1**	**3.1 - 3.5**	**SM**	**85**	**17**	**77**	**18**	**35**	**24**
Sample Description: Light brown to light olive-brown, silty sandstone									

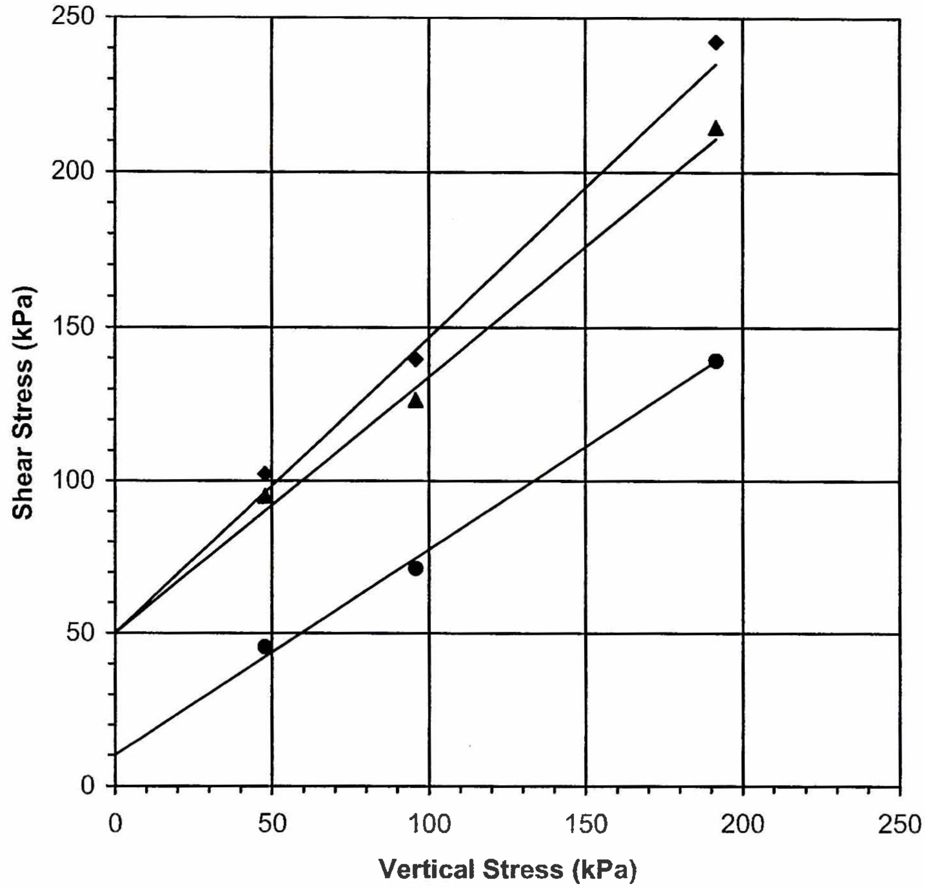
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-2**	**6.1 - 6.4**	**SC**	**50**	**44**	**50**	**40**	**10**	**34**
Sample Description: Light brownish-gray silty to clayey sandstone									

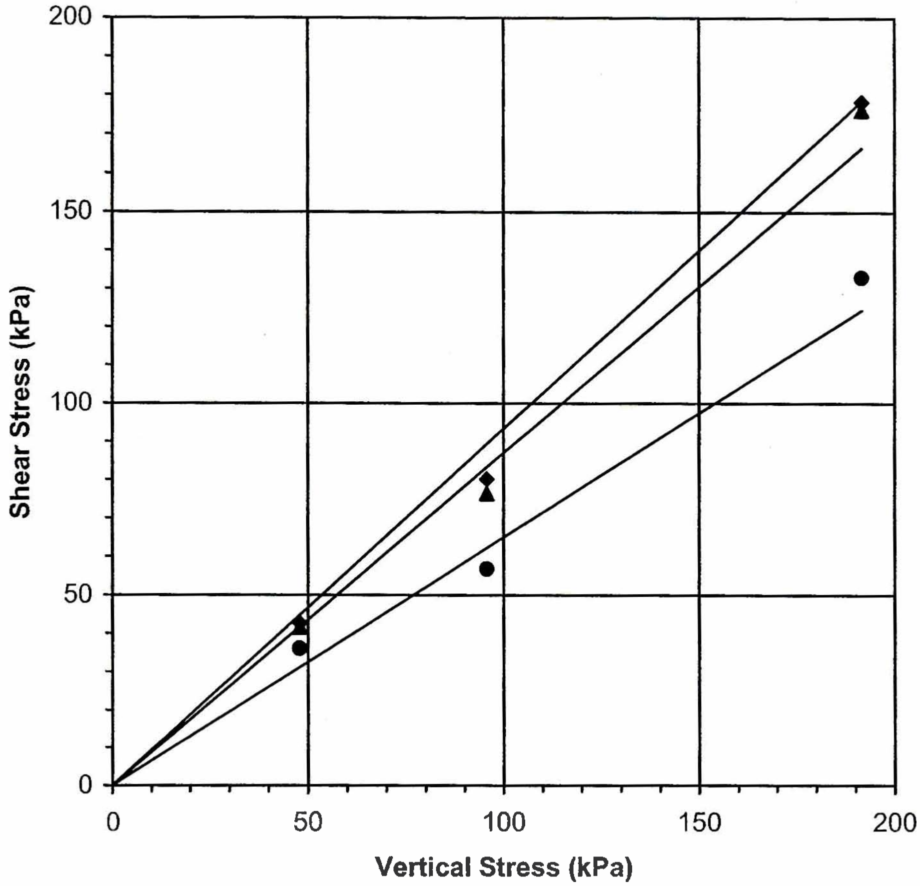
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-5	**R-5**	**15.2 - 15.4**	**SC**	**0**	**43**	**0**	**41**	**0**	**33**
Sample Description: Light gray-brown, very fine sandy siltstone									

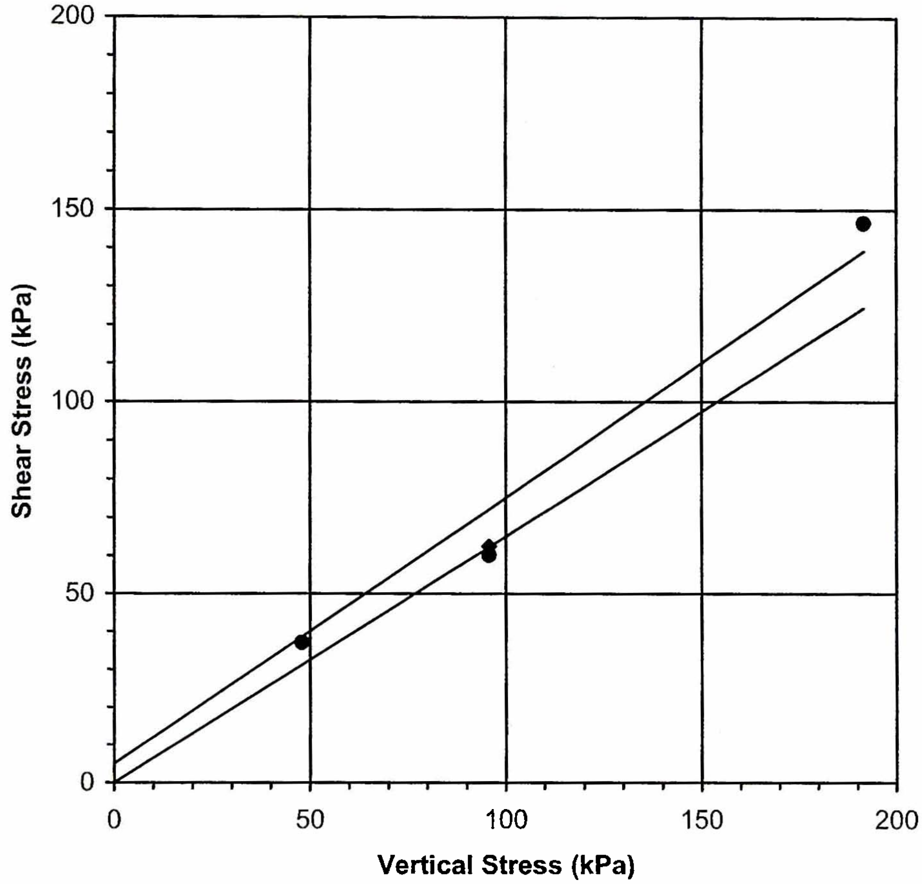
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-9	**R-1**	**3**	**ML**	**5**	**35**	**-**		**0**	**33**
Sample Description: Light olive-brown sandy silt									

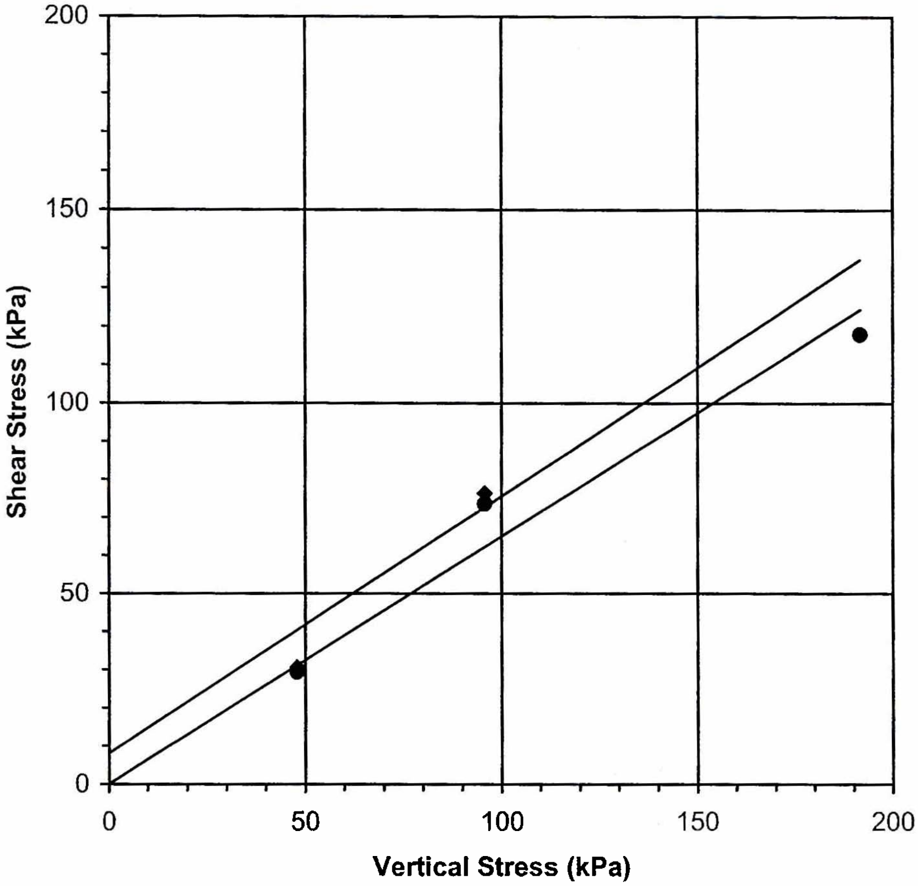
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-9	**R-2**	**6.1**	**SC/CL**	**8**	**34**			**0**	**33**
Sample Description: Light brown clayey sand, with some interlayered, red-brown clays									

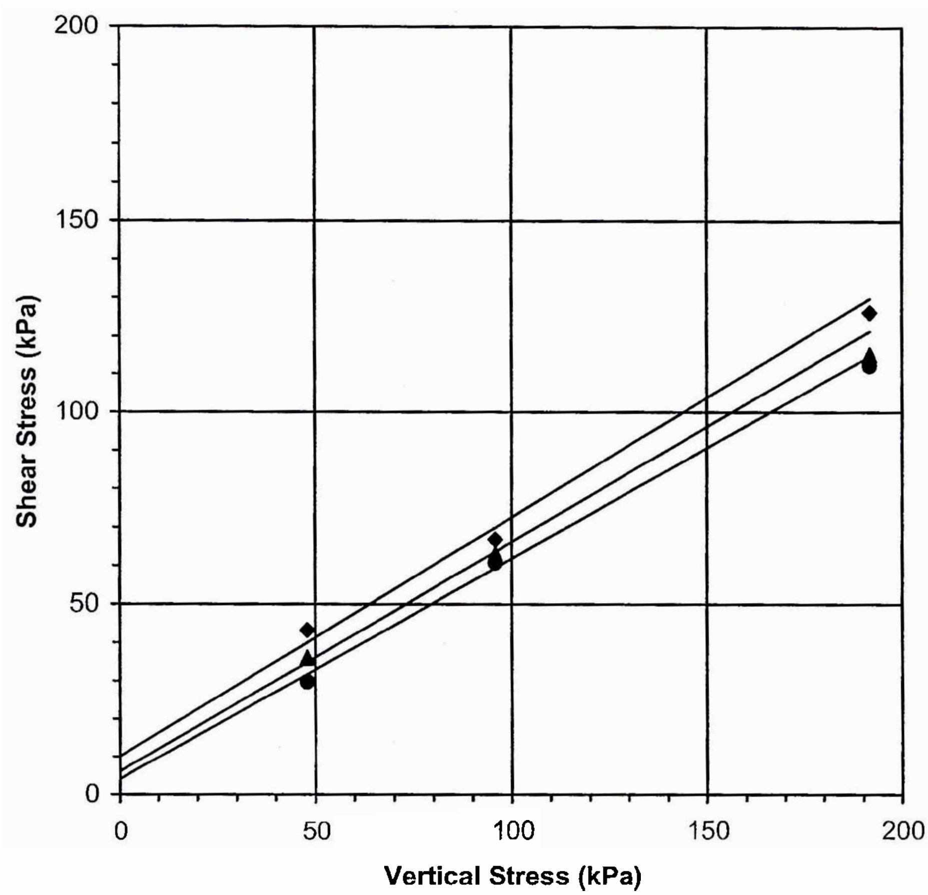
Strain Rate = 0.0043 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-15	**R-1**	**1.5**	**SM**	**10**	**32**	**6**	**31**	**4**	**30**
Sample Description: Light brown to light pinkish-brown silty sandstone									

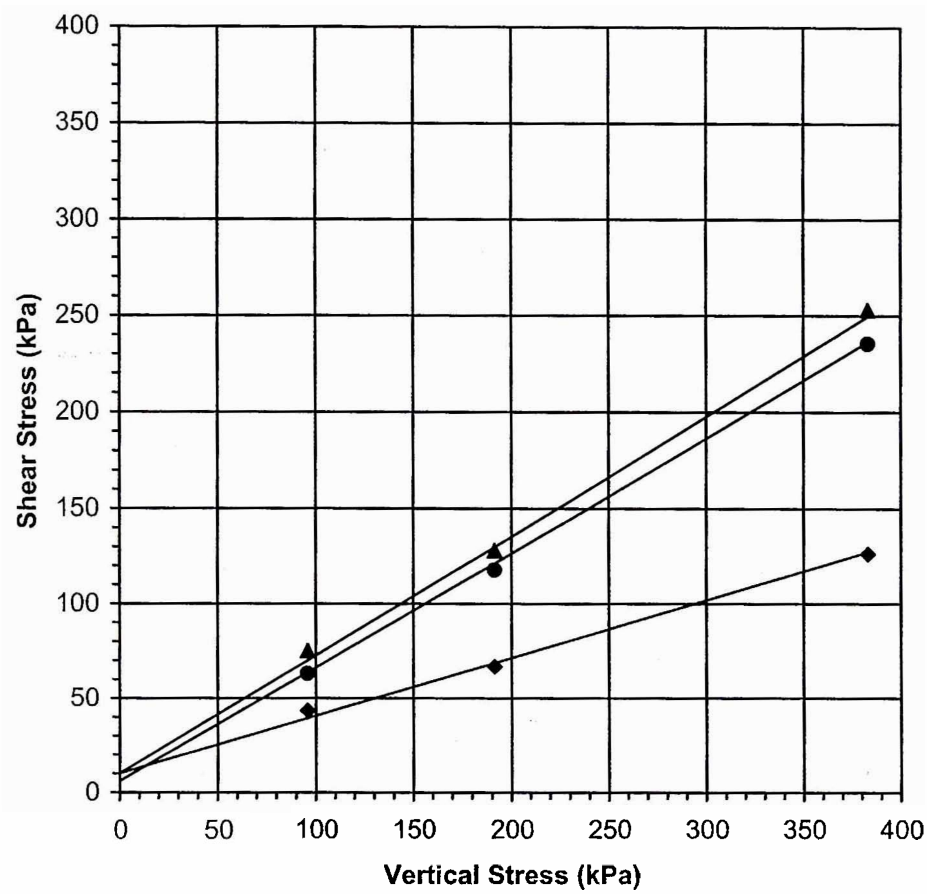
Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-15	**R-2**	**4.6**	**SM**	**10**	**32**	**6**	**31**	**10**	**17**
Sample Description: Brown silty sandstone									

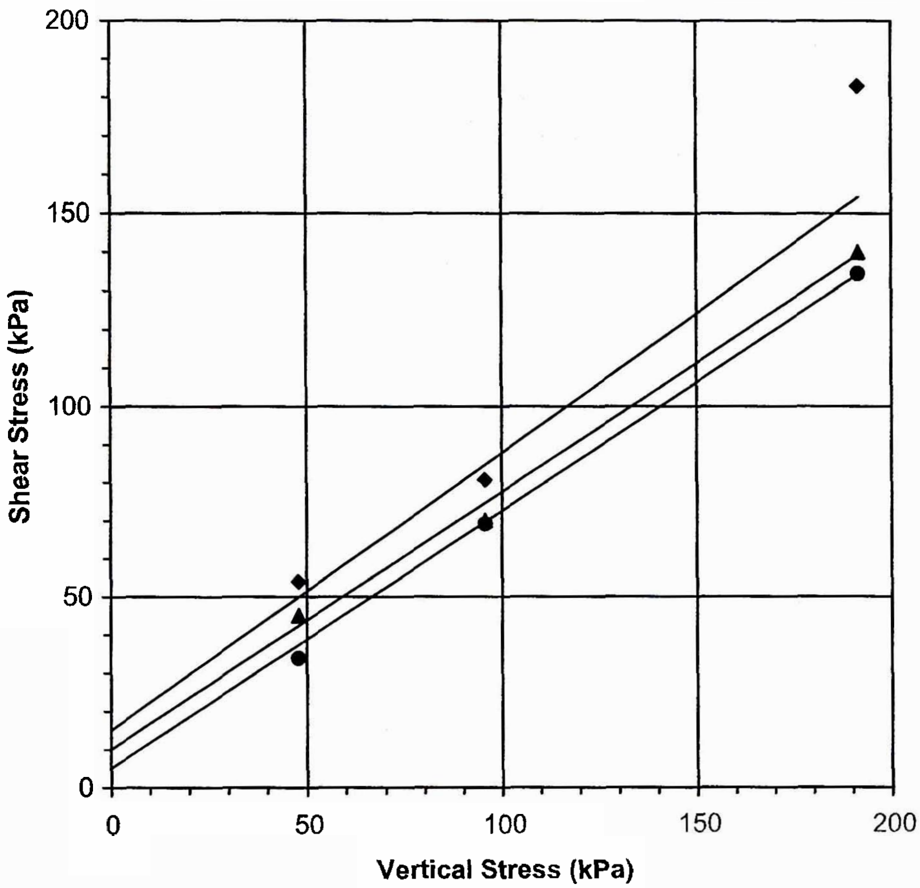
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-19	**R-2**	**4.6**	**SM**	**15**	**36**	**10**	**34**	**5**	**34**
Sample Description: Light brown silty sandstone									

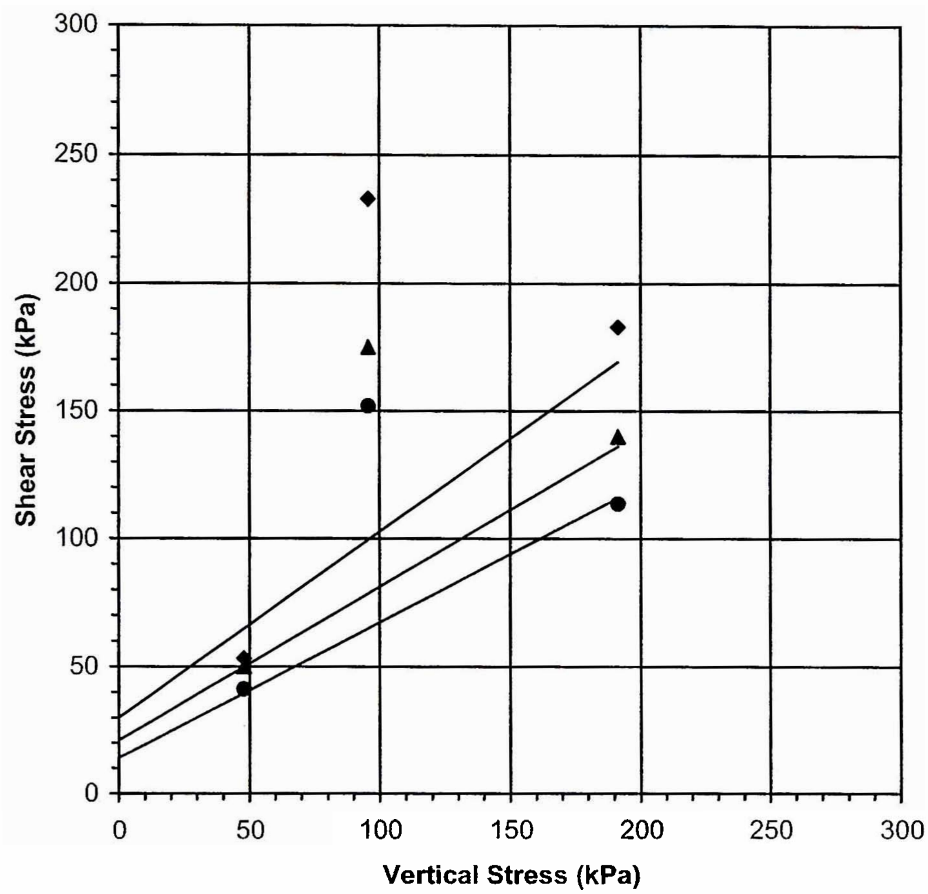
Strain Rate = 0.0064 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-21	**R-1**	**1.5**	**SM**	**30**	**36**	**21**	**31**	**14**	**28**
Sample Description: Light brown silty sandstone									

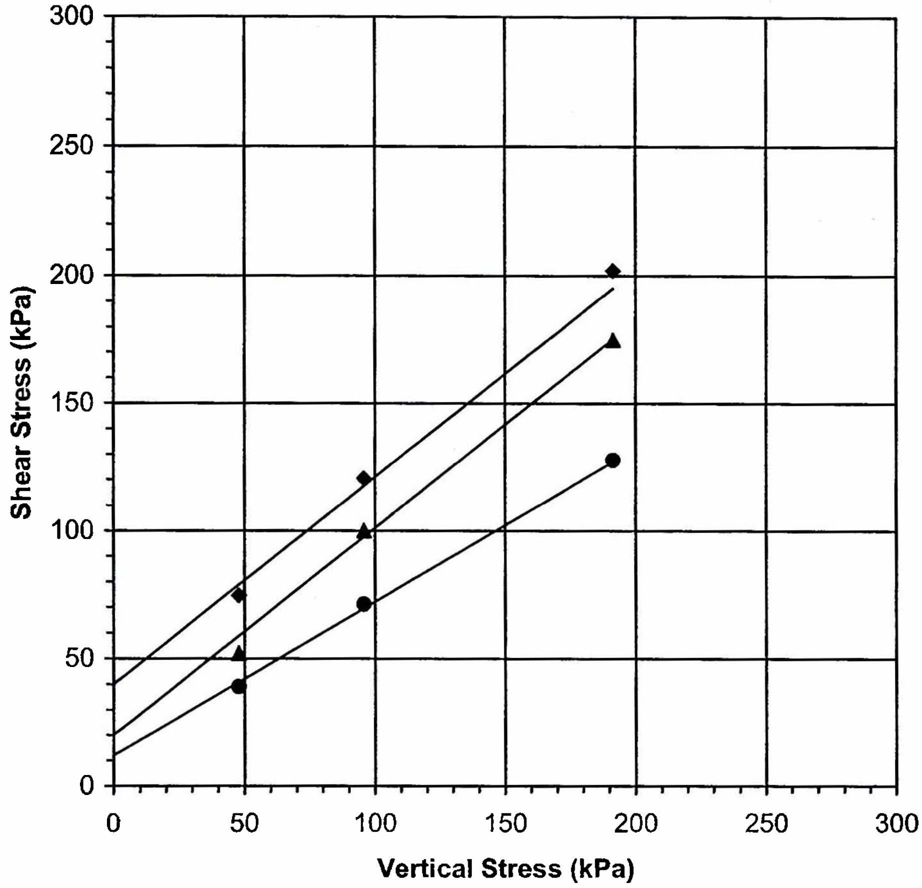
Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



				Interpreted Shear Strength					
				Peak		Ultimate		Residual @ 7.6mm	
Location	Sample No.	Depth (m)	USCS	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)	Cohesion (kPa)	Friction Angle (deg)
B-20	**R-2**	**4.6**	**SM**	**40**	**39**	**20**	**39**	**12**	**31**
Sample Description: Brownish-gray sandstone									

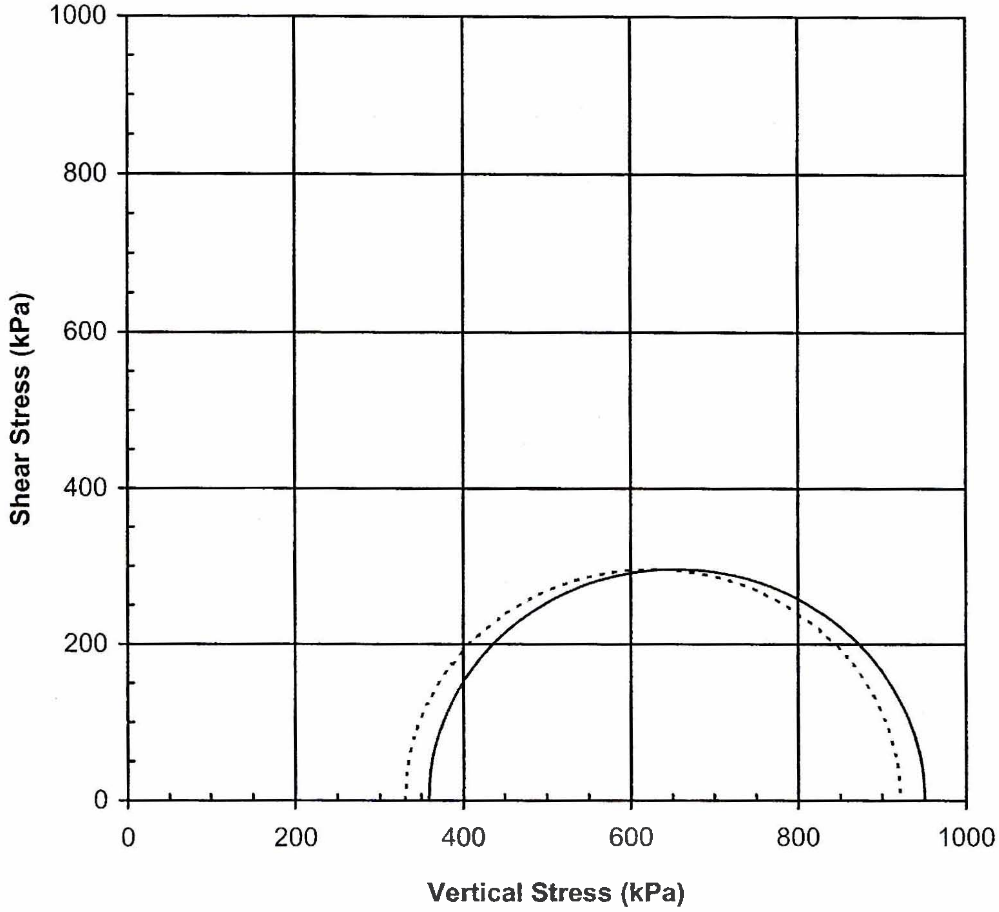
Strain Rate = 0.0084 cm/min
Sample Type: Driven Ring

ASTM D 3080

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Boring Location	**B-19, R-6**
Sample Depth	**18.3m**

Consolidated Undrained Strength Test Data

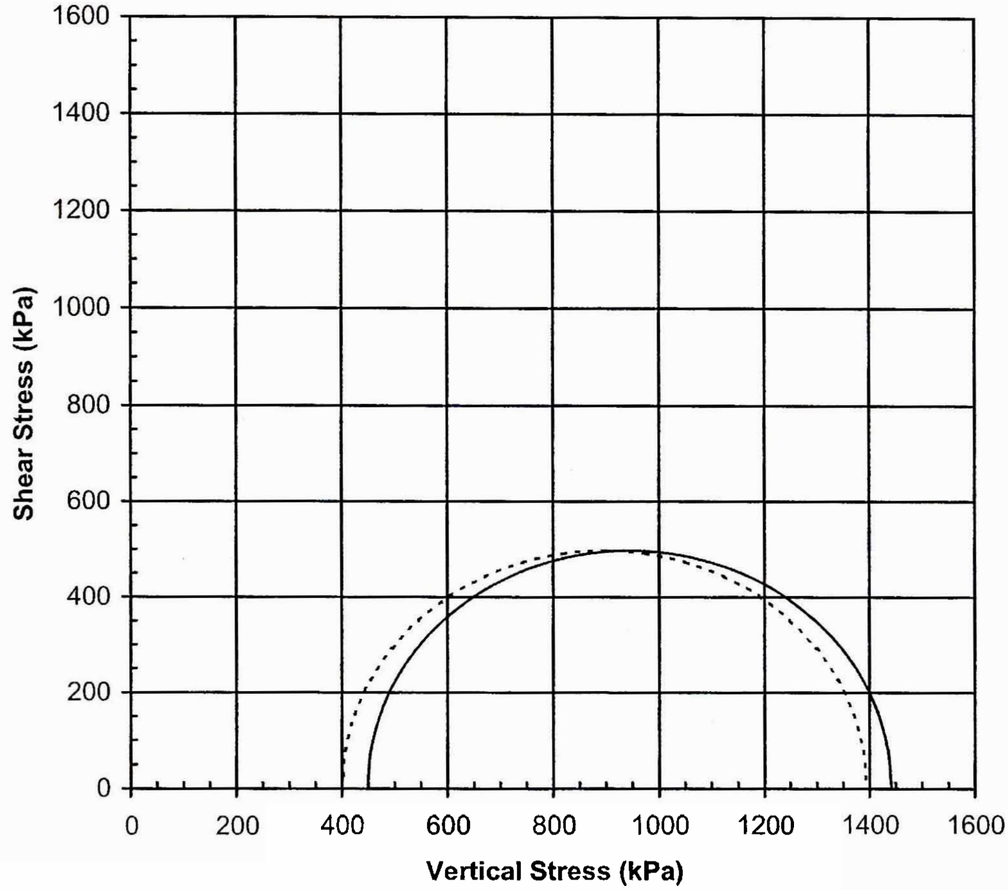
Vertical Stress (kPa)	**922**
Shear Stress (kPa)	**296**
Confining Pressure (kPa)	**359**

Total Stress Mohr Circle — Effective Stress Mohr Circle (dashed)

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-19, R-7**
Sample Depth	**21.3m**

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	**1395**
Shear Stress (kPa)	**497**
Confining Pressure (kPa)	**448**

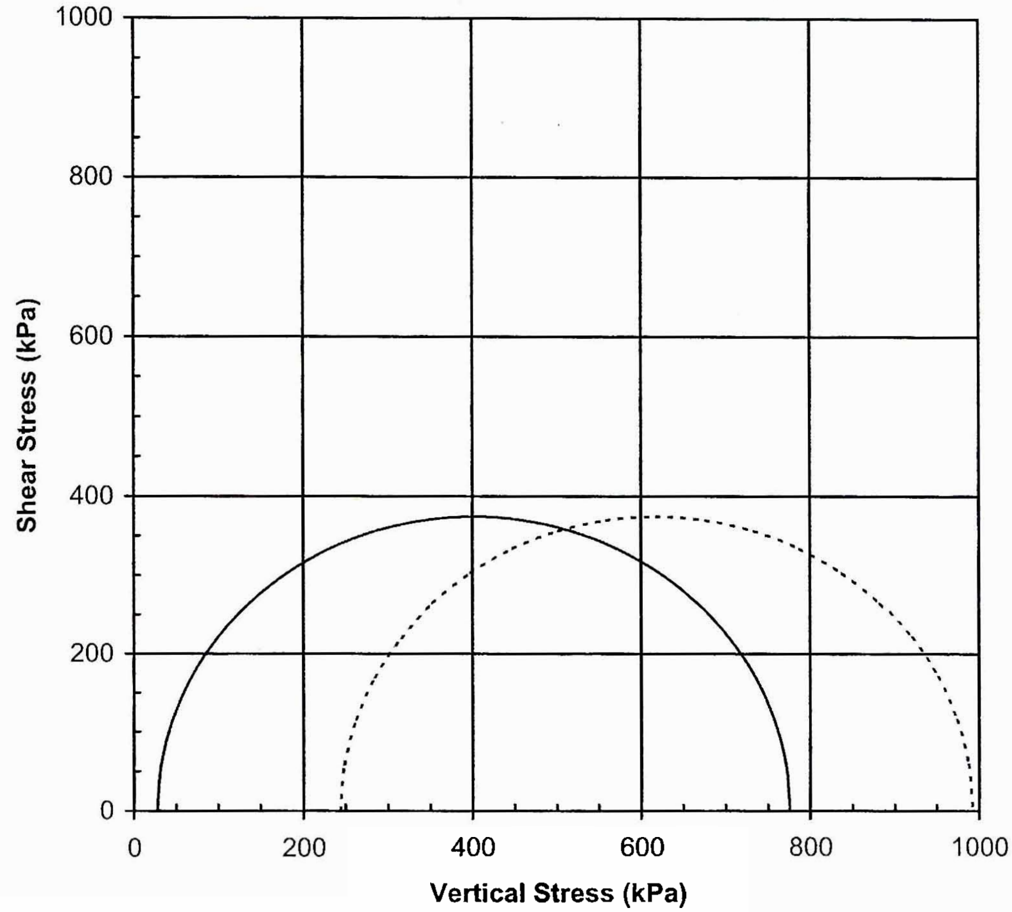
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-2, R-1**
Sample Depth	**3.0m - 3.4m**

Consolidated Undrained Strength Test Data

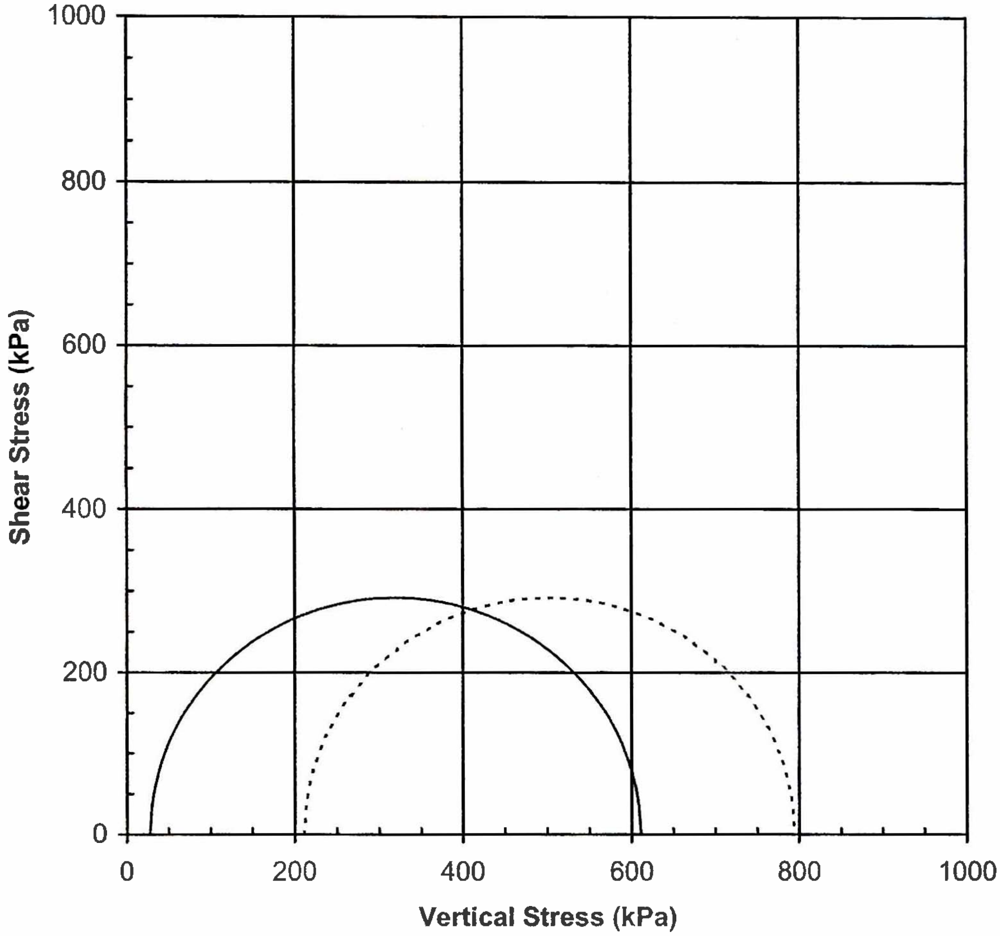
Vertical Stress (kPa)	**993**
Shear Stress (kPa)	**374**
Confining Pressure (kPa)	**28**

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-2, R-3**
Sample Depth	**9.1m - 9.3m**

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	**795**
Shear Stress (kPa)	**292**
Confining Pressure (kPa)	**28**

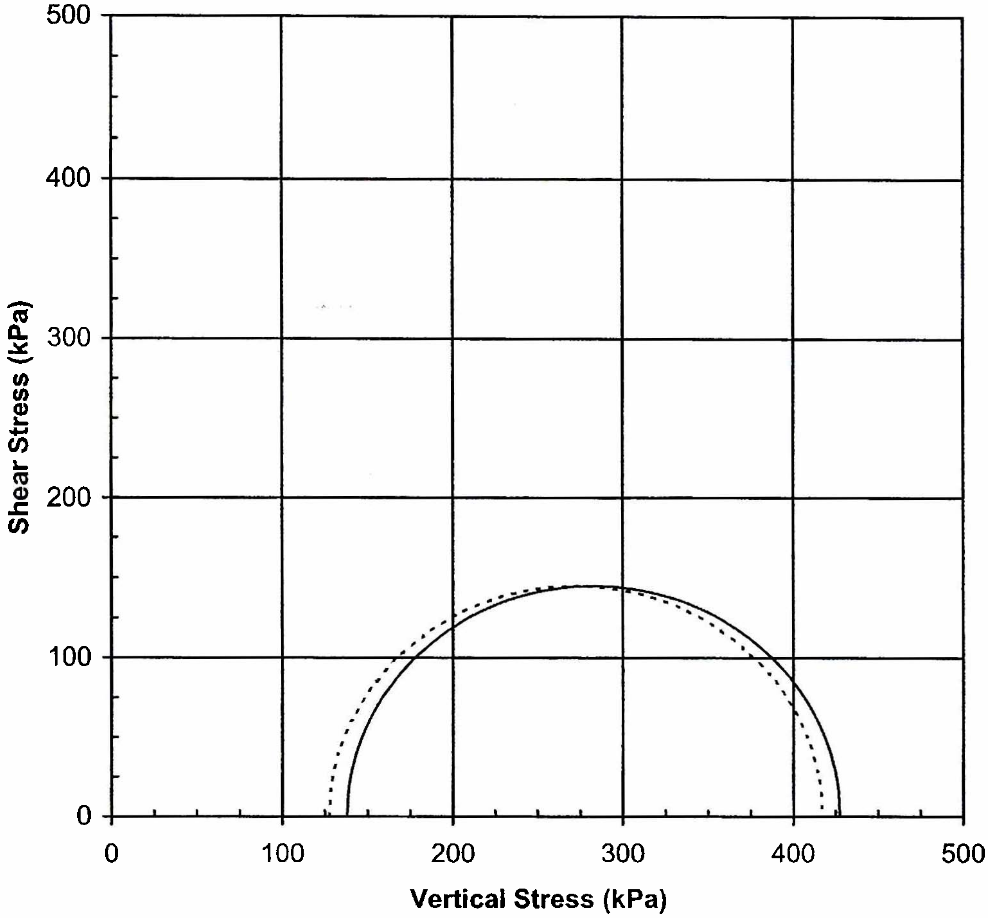
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-2, R-5
Sample Depth	15.2m - 15.4m

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	417
Shear Stress (kPa)	145
Confining Pressure (kPa)	138

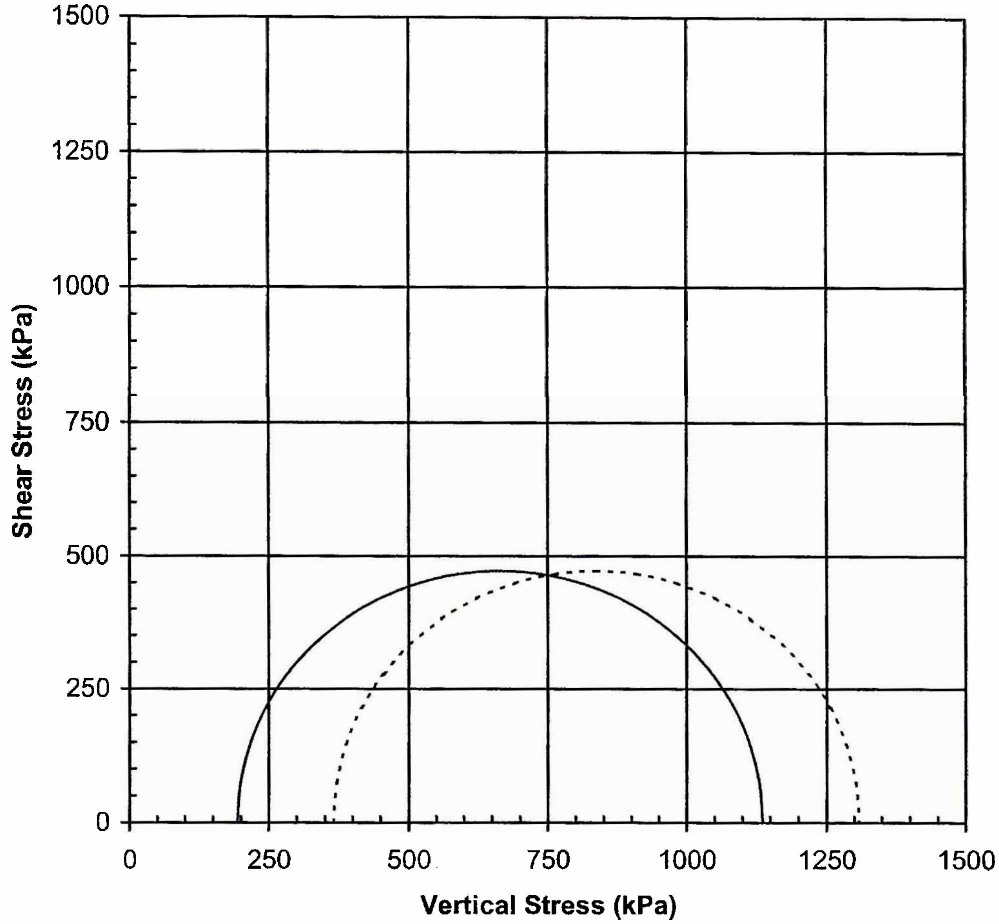
Total Stress Mohr Circle — solid line

Effective Stress Mohr Circle — dashed line

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-4, R-6
Sample Depth	18.3m - 20.1m

Consolidated Undrained Strength Test Data

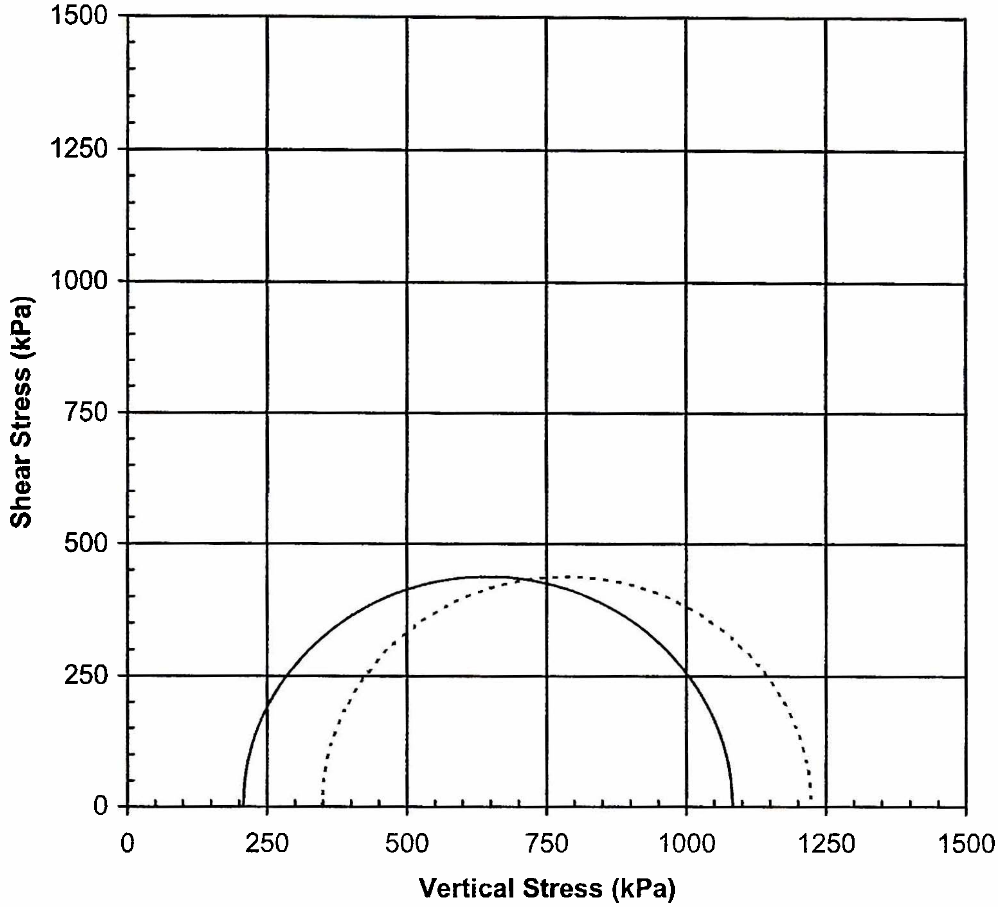
Vertical Stress (kPa)	1309
Shear Stress (kPa)	472
Confining Pressure (kPa)	172

Total Stress Mohr Circle — Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-4, R-7
Sample Depth	24.4m - 24.7m

Consolidated Undrained Strength Test Data

Vertical Stress (kPa)	1224
Shear Stress (kPa)	438
Confining Pressure (kPa)	207

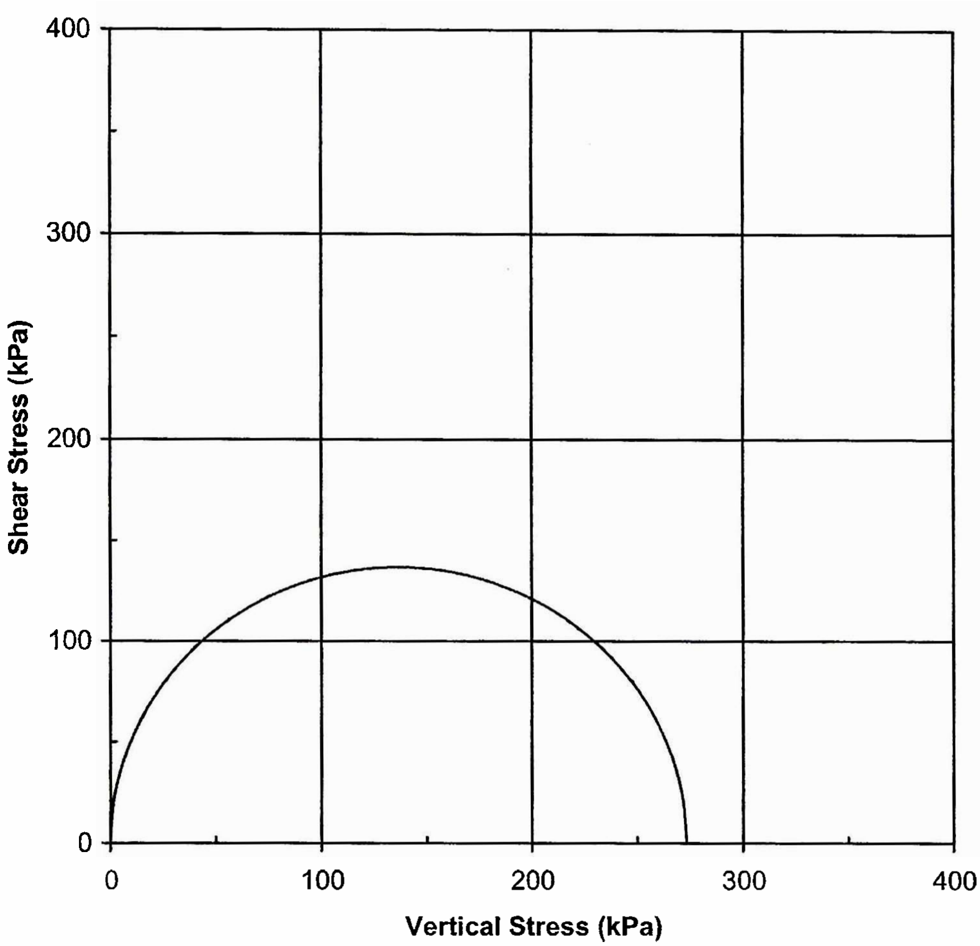
Total Stress Mohr Circle

Effective Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	B-16, R-1
Sample Depth	3.0m

Unconfined Compression Strength Test Data

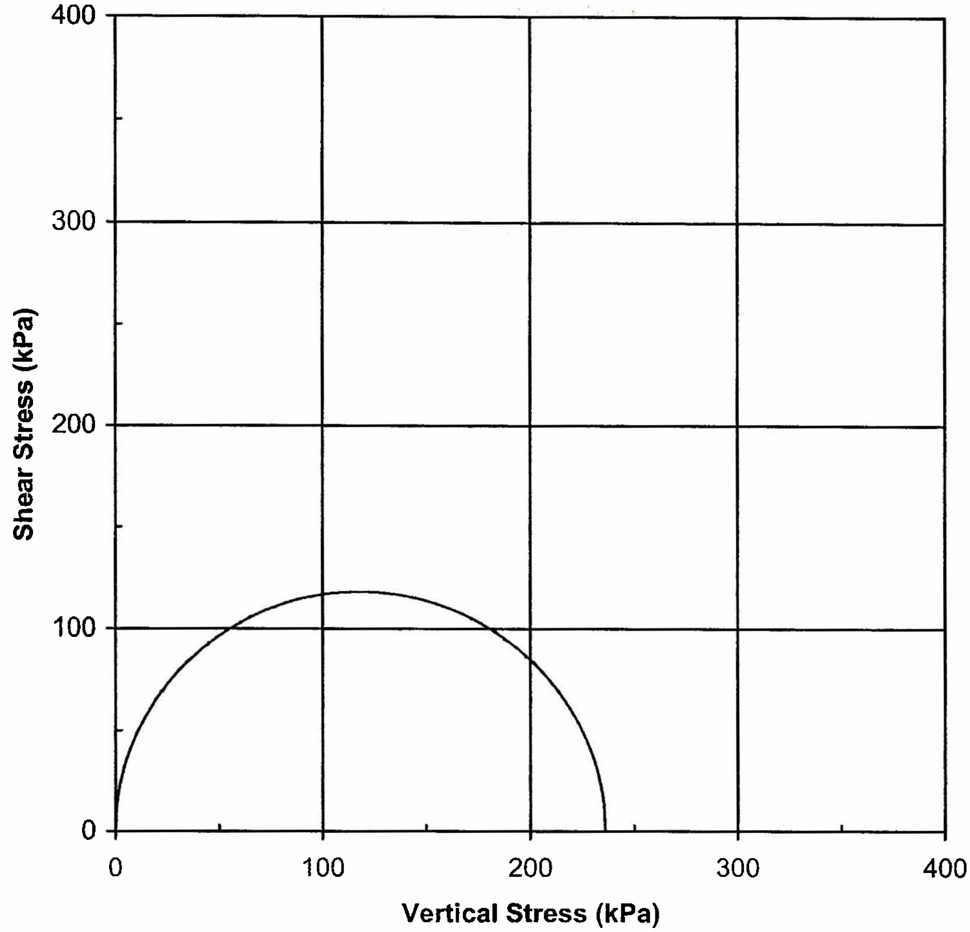
Vertical Stress (kPa)	273
Shear Stress (kPa)	137
Confining Pressure (kPa)	0

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-16, R-2**
Sample Depth	**6.1m**

Unconfined Compression Strength Test Data

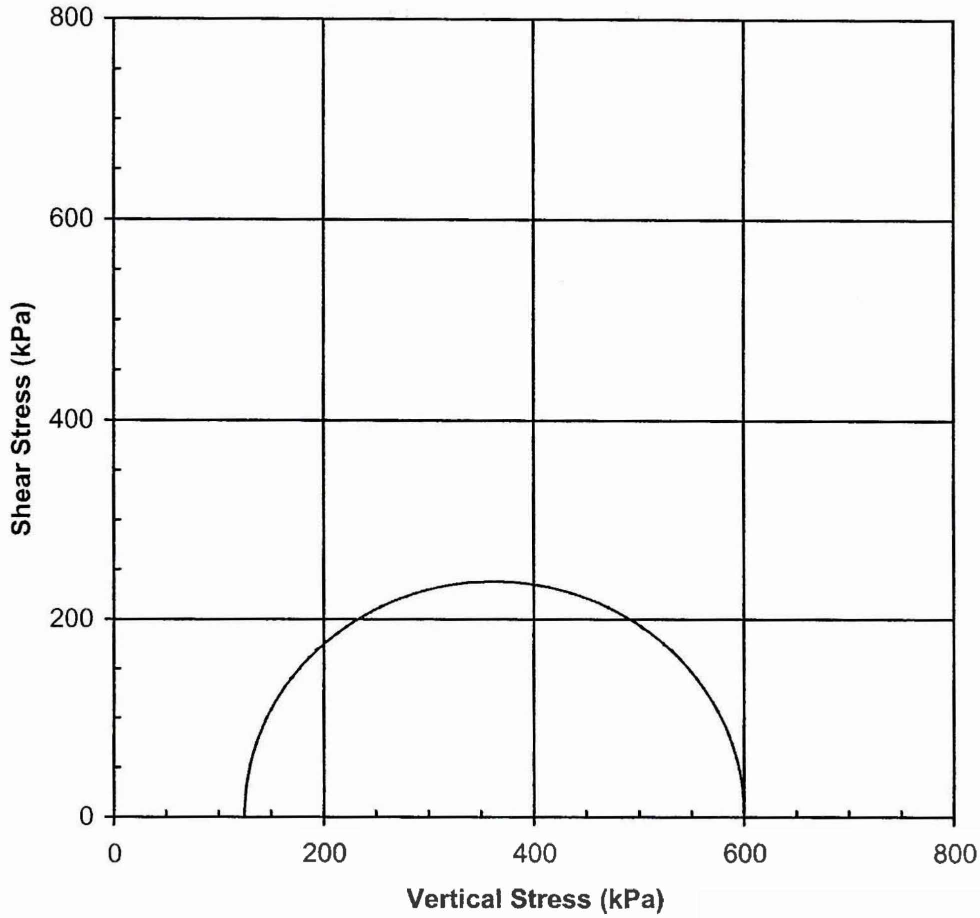
Vertical Stress (kPa)	**236**
Shear Stress (kPa)	**118**
Confining Pressure (kPa)	**0**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-14, R-2**
Sample Depth	**6.0m**

Unconsolidated Undrained Strength Test Data

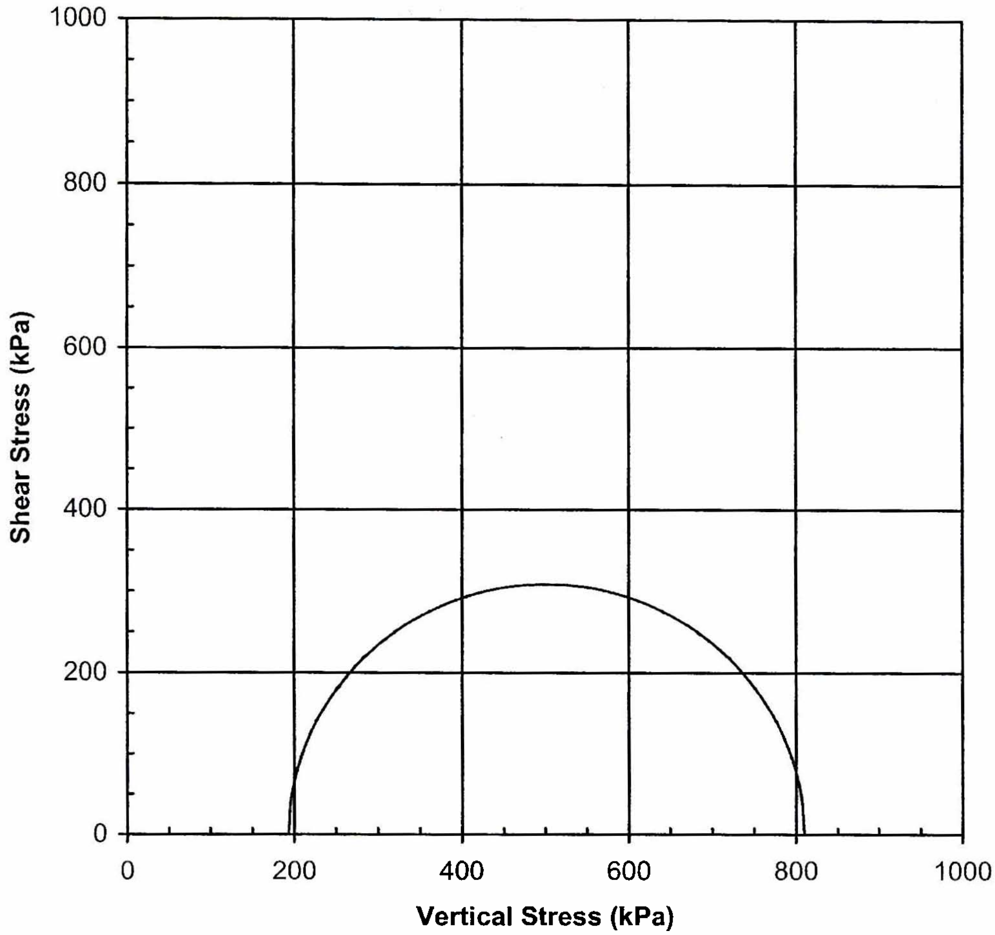
Vertical Stress (kPa)	**600**
Shear Stress (kPa)	**238**
Confining Pressure (kPa)	**124**


Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton



Boring Location	**B-14, R-3**
Sample Depth	**9.1m**

Unconsolidated Undrained Strength Test Data

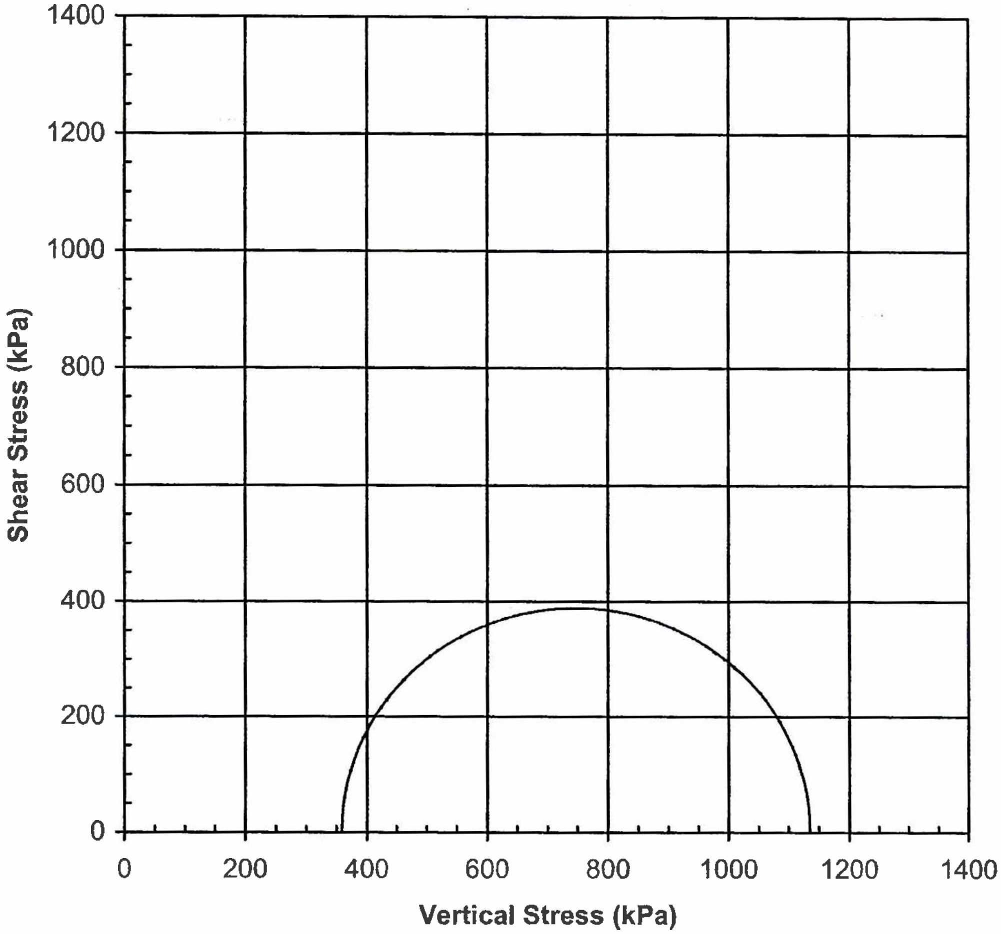
Vertical Stress (kPa)	**810**
Shear Stress (kPa)	**308**
Confining Pressure (kPa)	**193**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-17, R-3**
Sample Depth	**18.2m**

Unconsolidated Undrained Strength Test Data

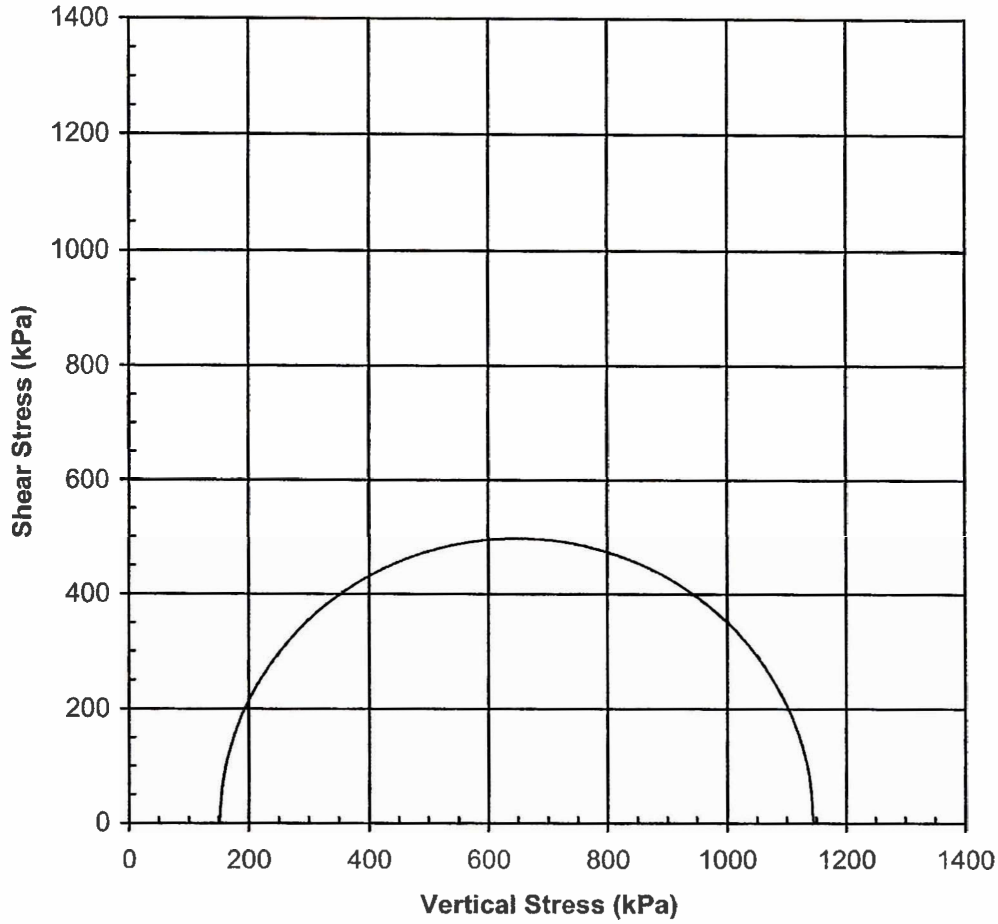
Vertical Stress (kPa)	**1136**
Shear Stress (kPa)	**388**
Confining Pressure (kPa)	**359**

Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton



Boring Location	**B-19, R-1**
Sample Depth	**1.5m**

Unconsolidated Undrained Strength Test Data

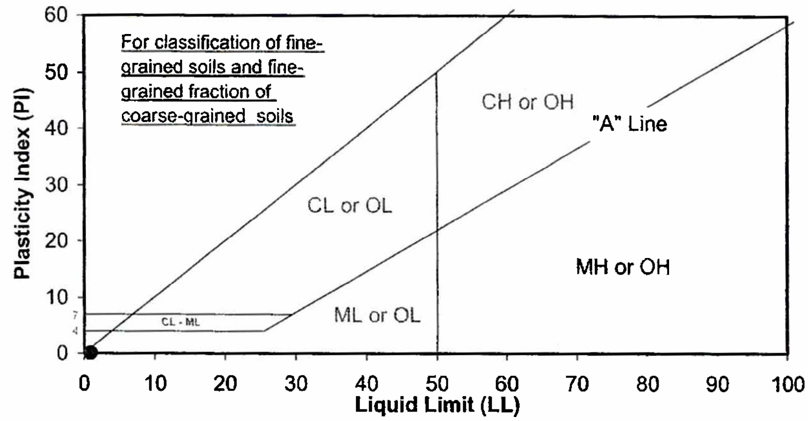
Vertical Stress (kPa)	**1145**
Shear Stress (kPa)	**497**
Confining Pressure (kPa)	**152**

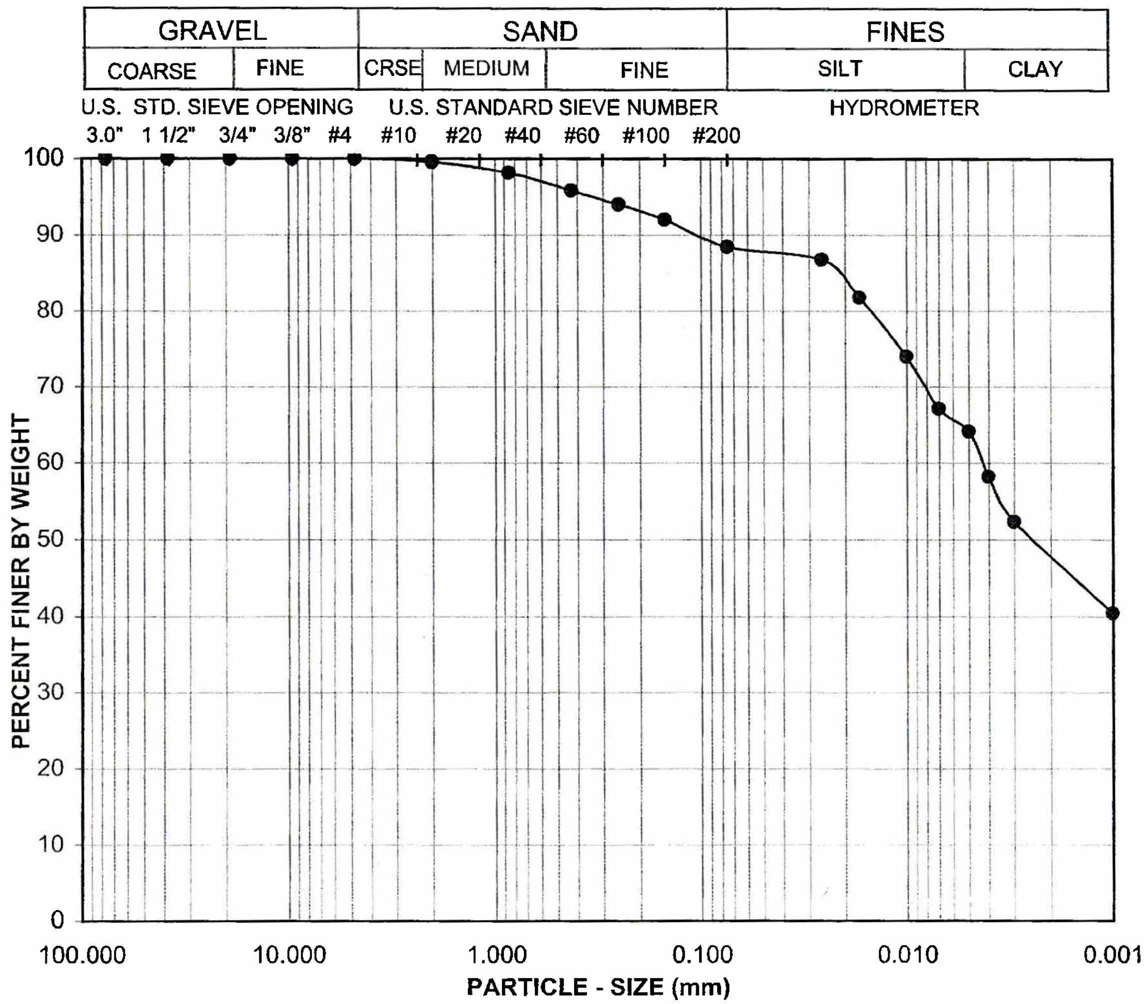
Total Stress Mohr Circle

TRIAXIAL SHEAR SUMMARY

Project No.	600158-905
Project Name	SR125 / SR905

Leighton





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-1	B-1	0.3-1.5	(CL-ML)	0:12:88	**

Sample Description:
(CL-ML), PALE BROWN SILTY LEAN CLAY WITH FEW TO LITTLE SAND.

Leighton

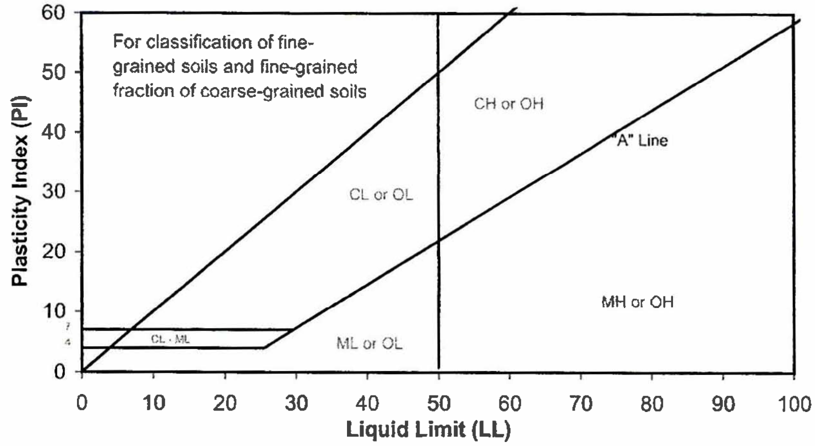
Project No.: 600158-905

SR-125 / 905

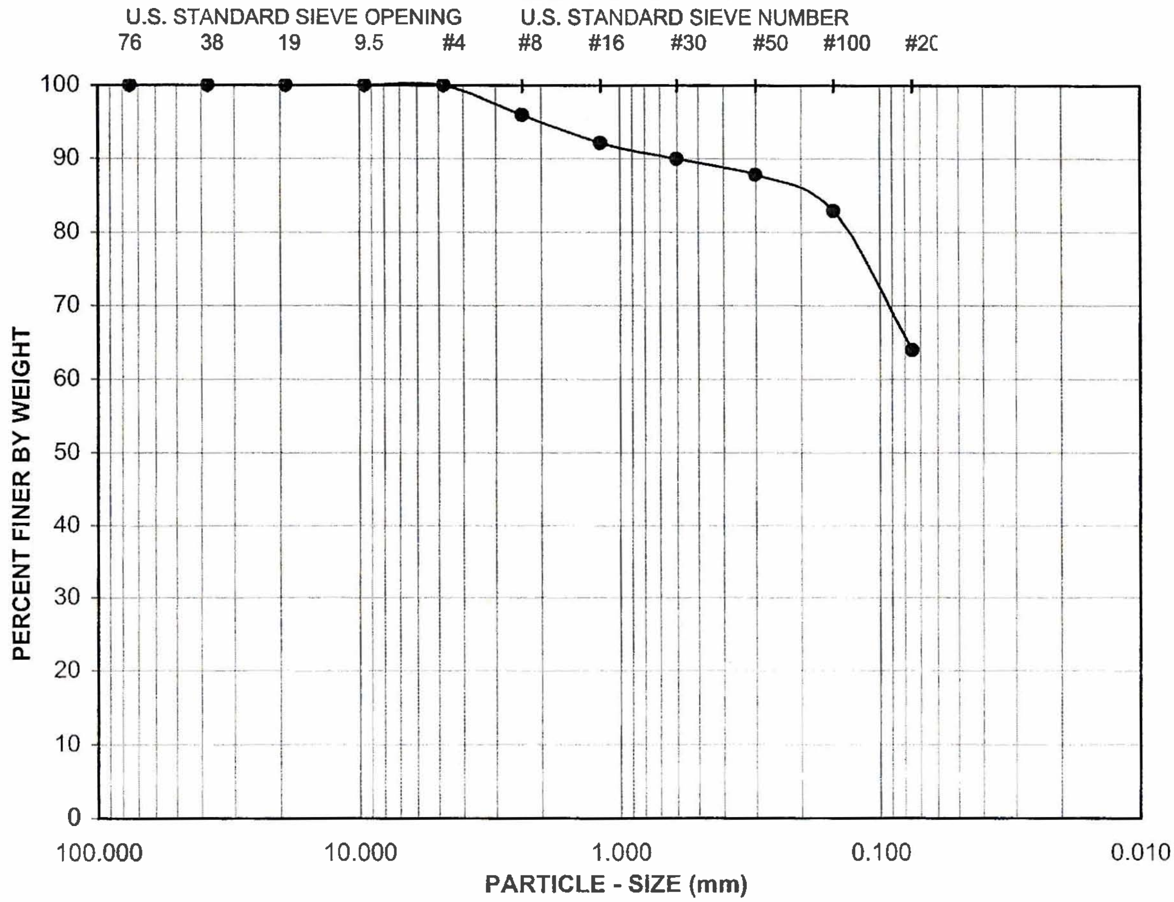
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S1	3.0-3.4	s(ML)	0 : 36 : 64	NP

Project No.: 600158-905

SR-125 / 905

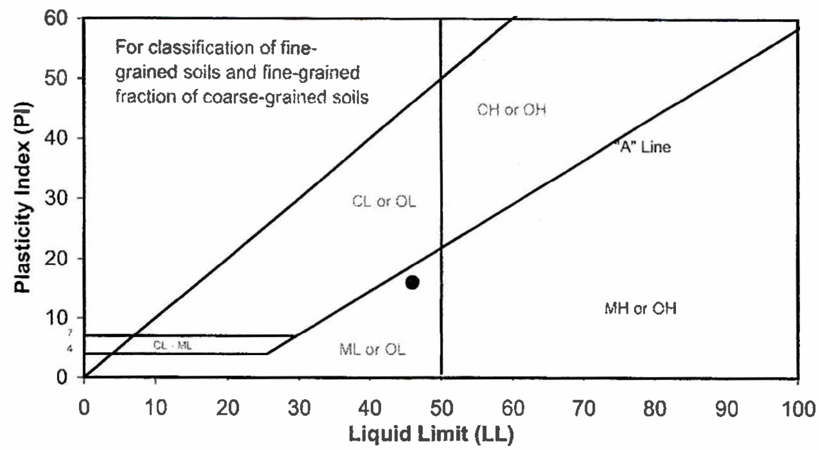
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

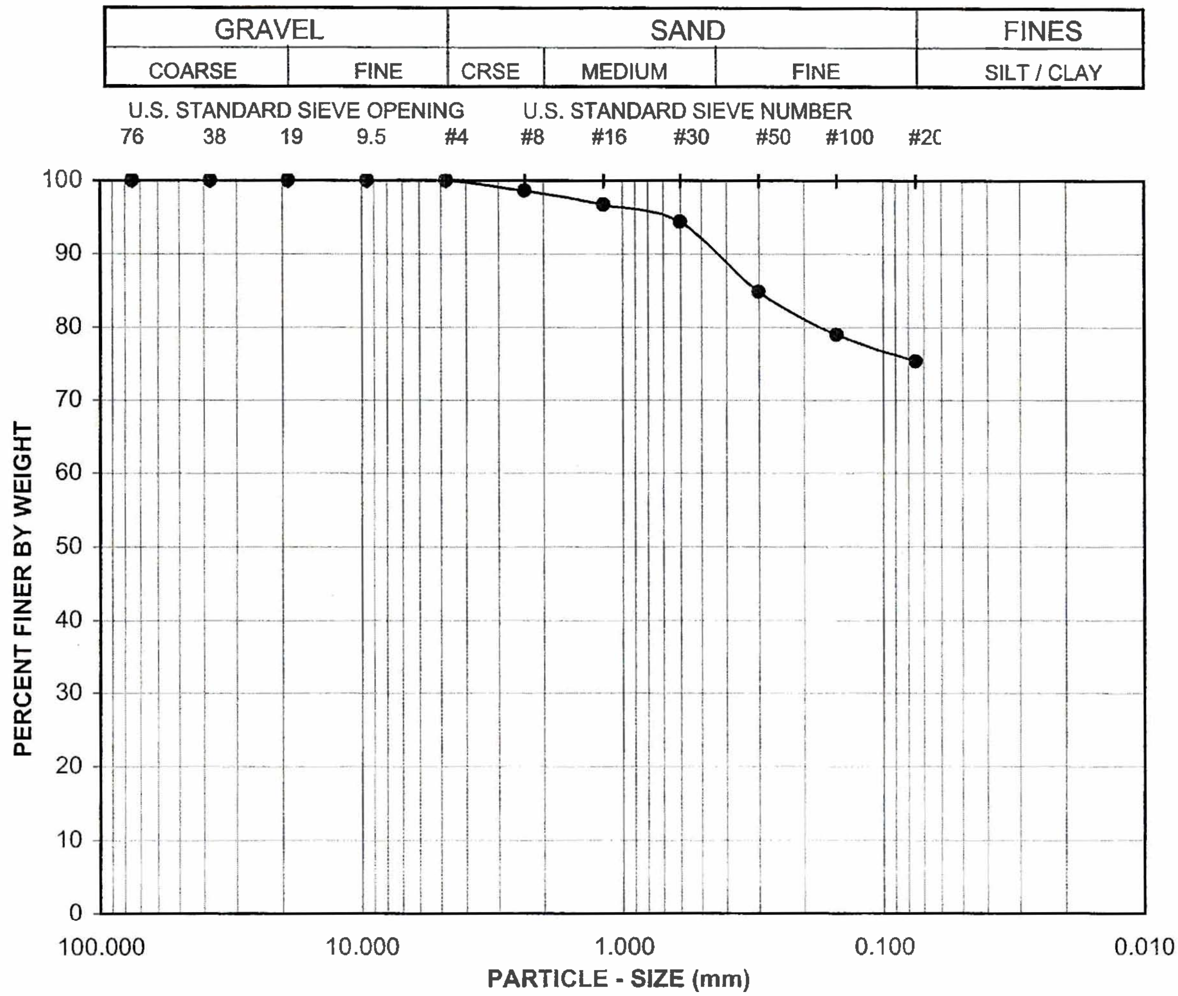
Leighton

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

Rev. 8-07

SIEVE B-1,S1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S3	9.1-9.4	(ML)s	0 : 25 : 75	N/A

Project No.: 600158-905

SR-125 / 905

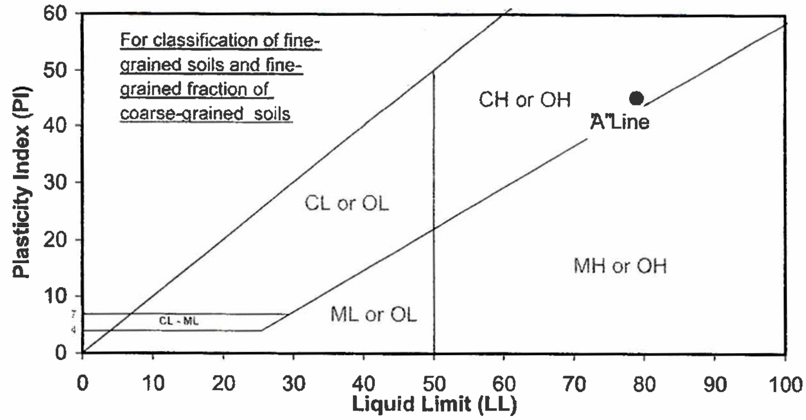
Visual Sample Description:
(ML)s: PALE BROWN LEAN SILT WITH SAND

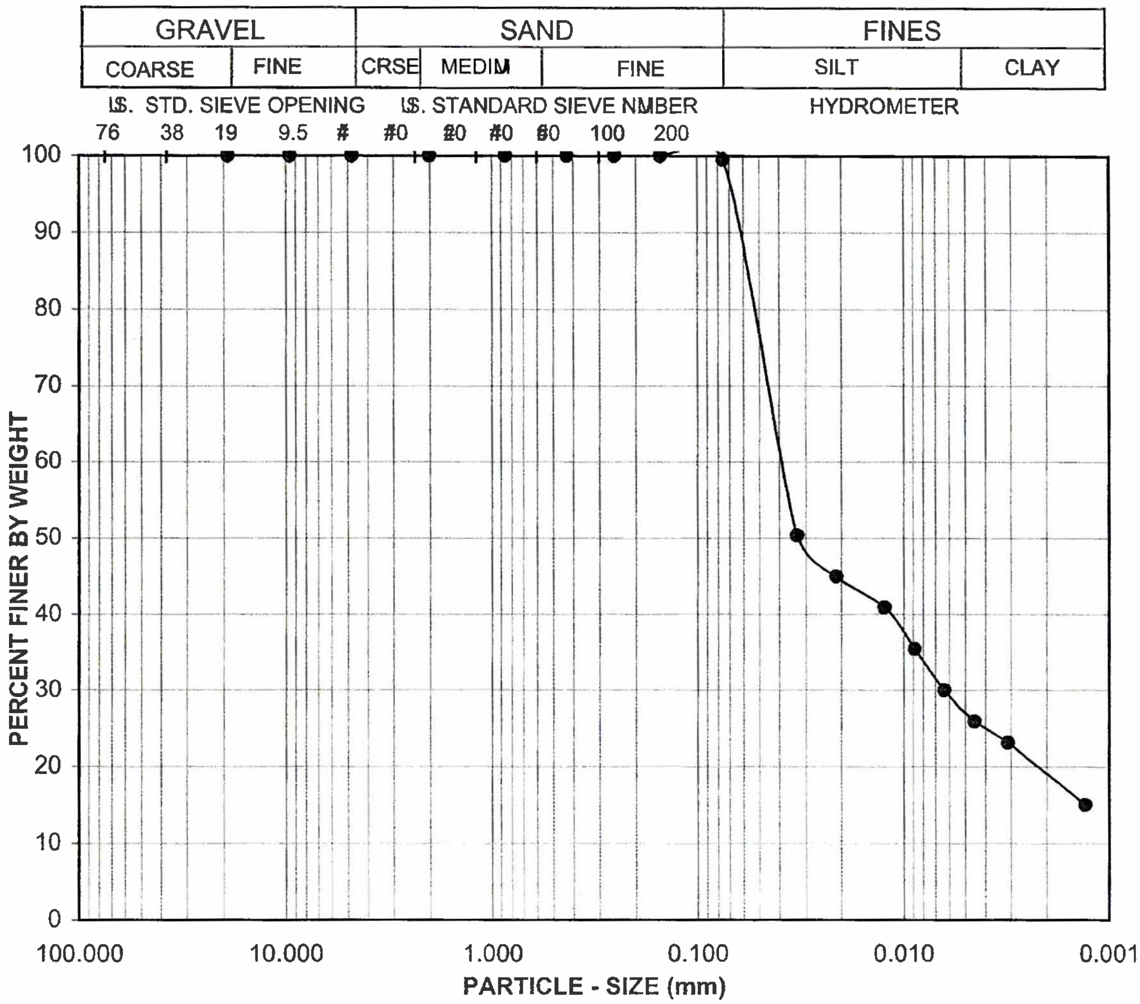
Leighton

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

Rev. 8-07

SIEVE B-1,S3





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S4	10.7-11.1	CH	0:0:100	79:34:45

Sample Description:
CH: PALE BROWN HEAVY CLAY

Leighton

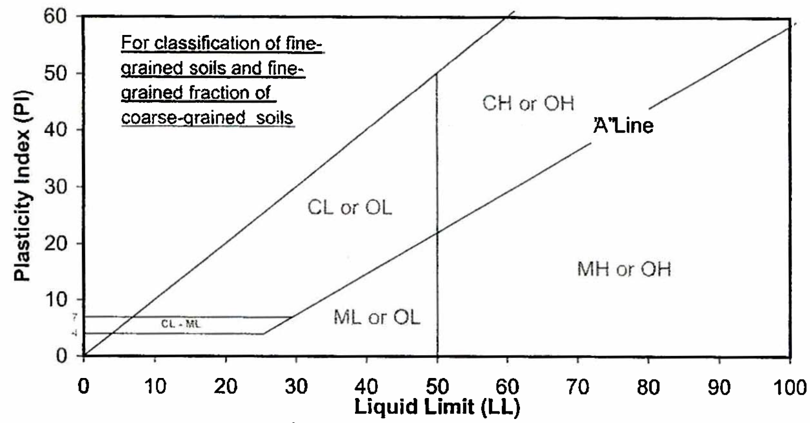
Project No.: 600158-905

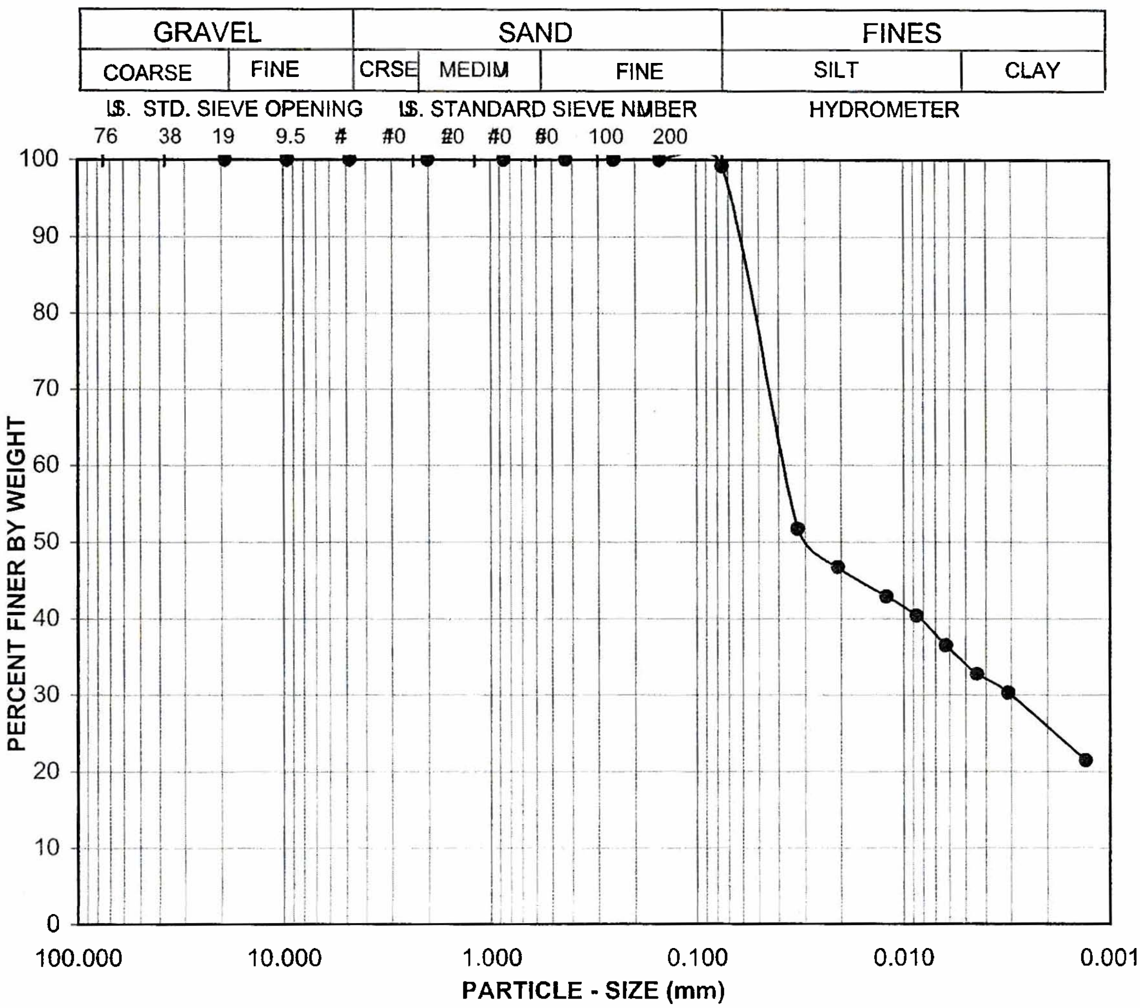
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S6	16.8-17.2	CL	0:0:100	N/A

Sample Description:
CL: PALE RED-BROWN LEAN CLAY

Leighton

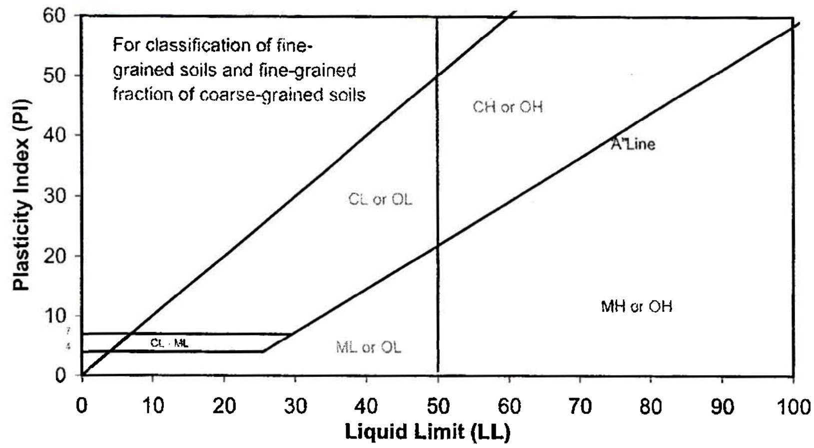
Project No.: 600158-905

SR-125 / 905

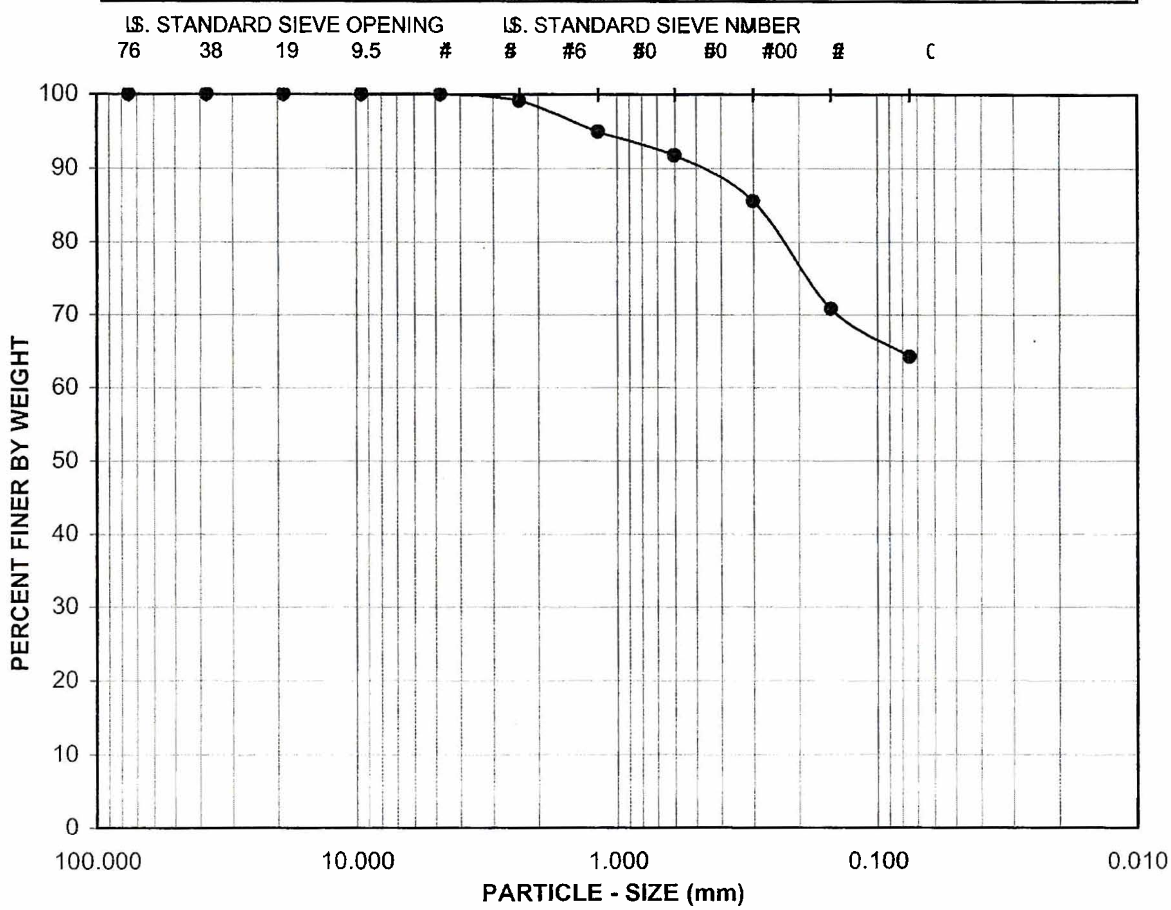
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-2	S8	22.9-23.2	s(ML)	0 : 36 : 64	N/A

Project No.: 600158-905

SR-125 / 905

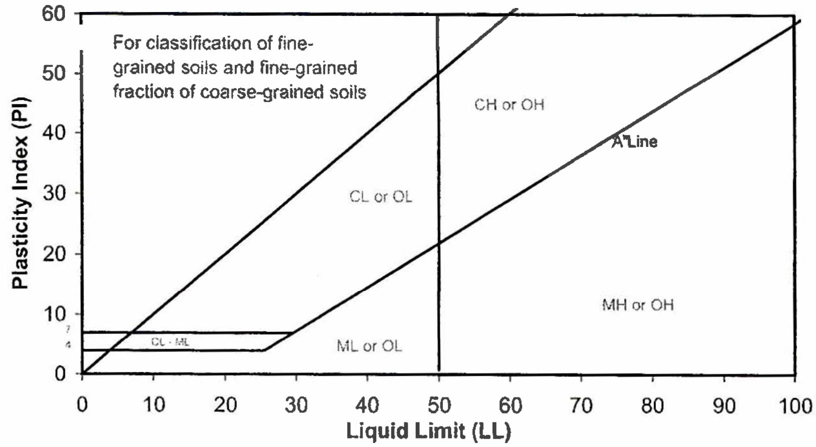
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

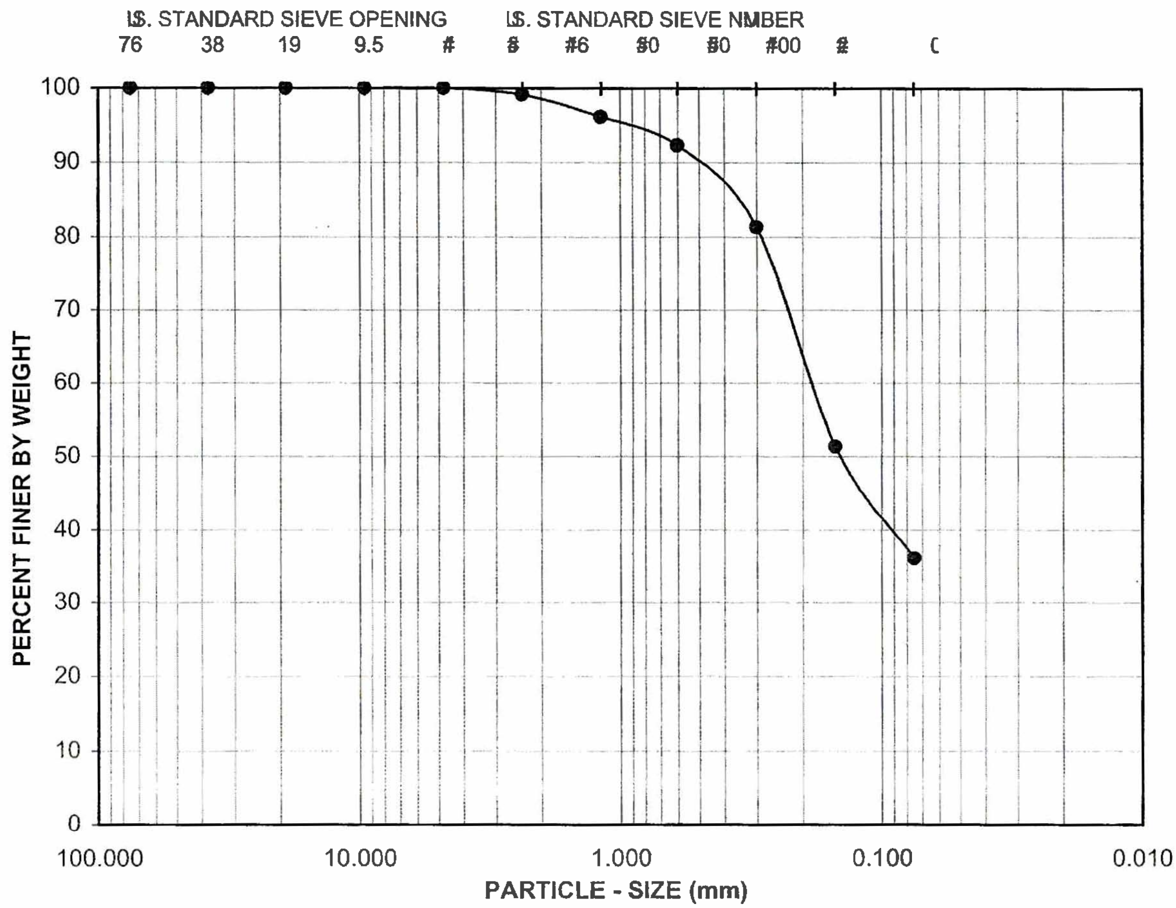
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Rev. 8-07

SIEVE B-2,S8



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S1	4.6-5.0	SM	0 : 64 : 36	N/A

Project No.: 600158-905

SR-125 / 905

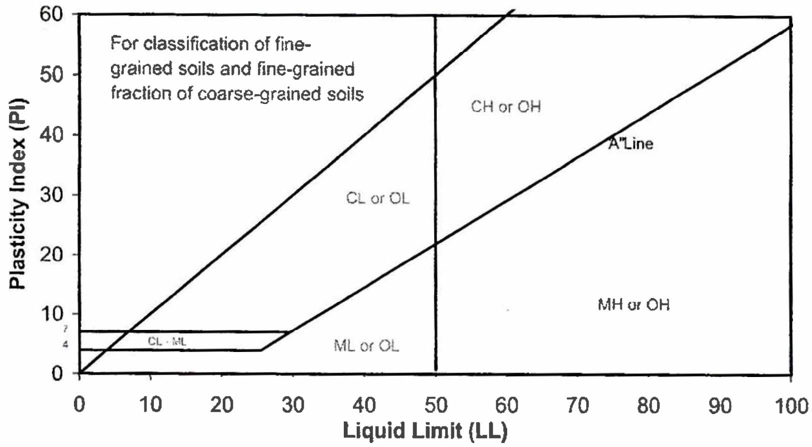
Visual Sample Description:
SM: PALE BROWN SILTY SAND

ATTERBERG LIMITS, PARTICLE - SIE CEVE
ASTM D 4318, D 422

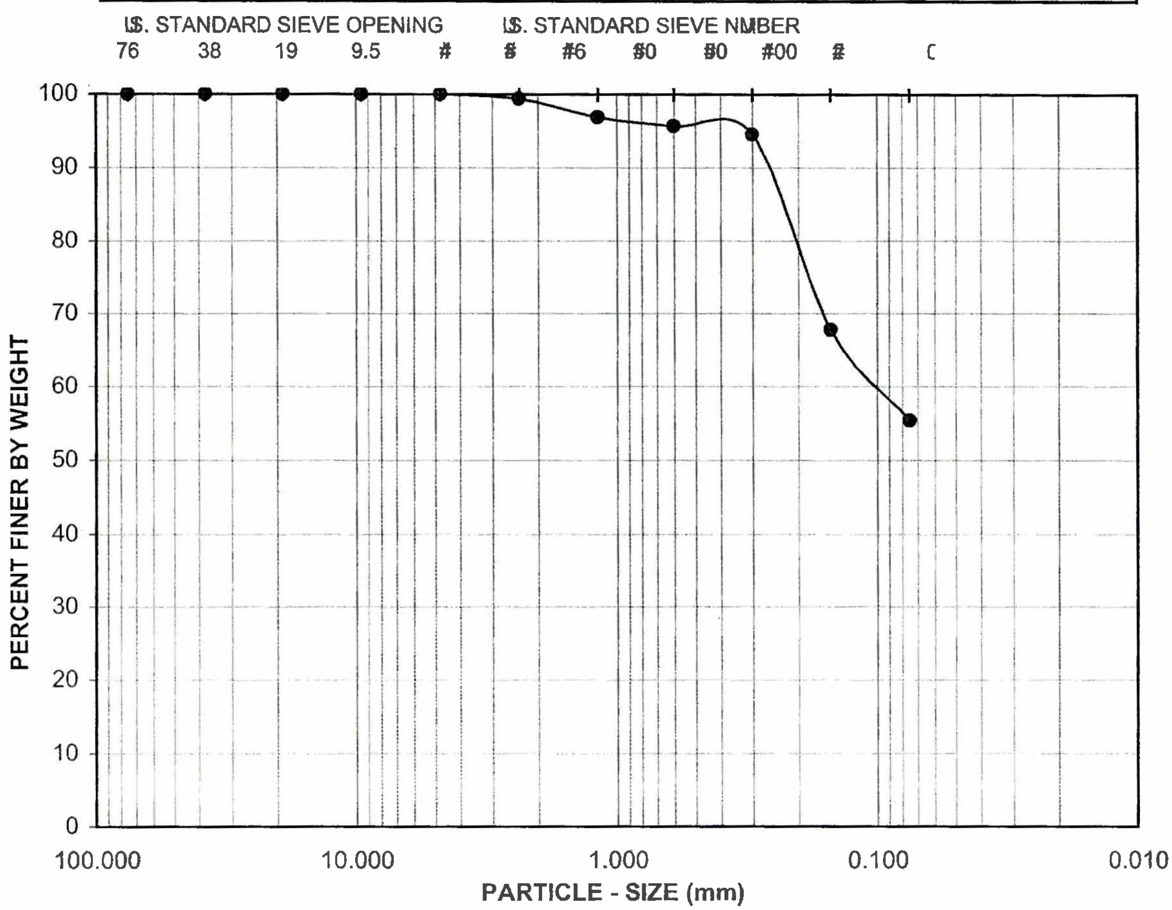
Leighton

Rev. 8-07

SIEVE B-3,S1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S3	10.7-11.1	s(ML)	0 : 45 : 55	N/A

Project No.: 600158-905

SR-125 / 905

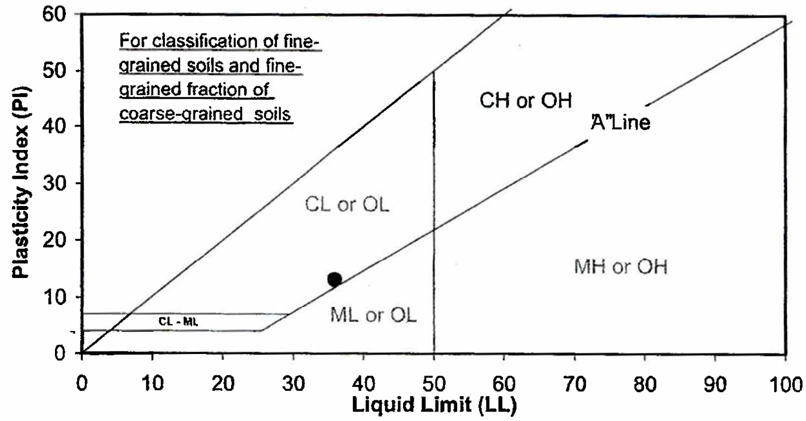
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

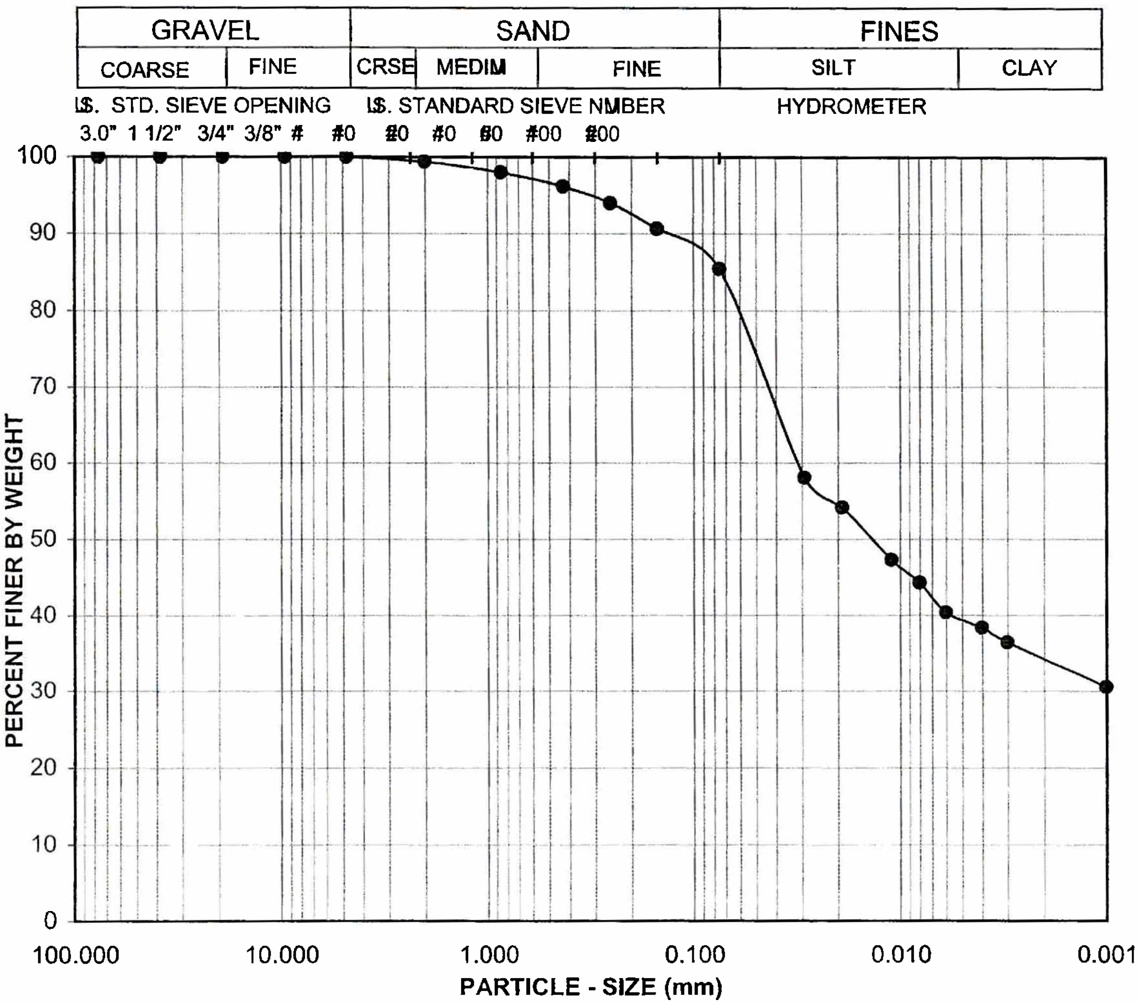
Leighton

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

Rev. 8-07

SIEVE B-3,S3





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	B-1	0.3-1.5	(ML-CL)s	0:15:85	36:23:13

Sample Description:
(ML-CL)s, DARK OLIVE BROWN CLAYEY SILT WITH SAND.

Leighton

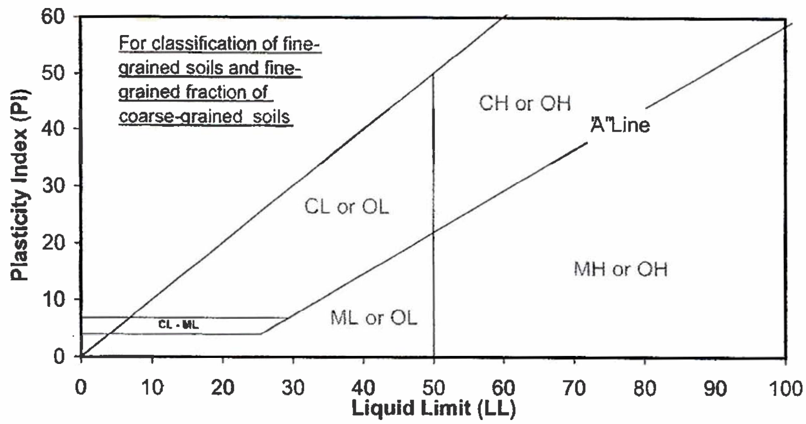
Project No.: 600158-905

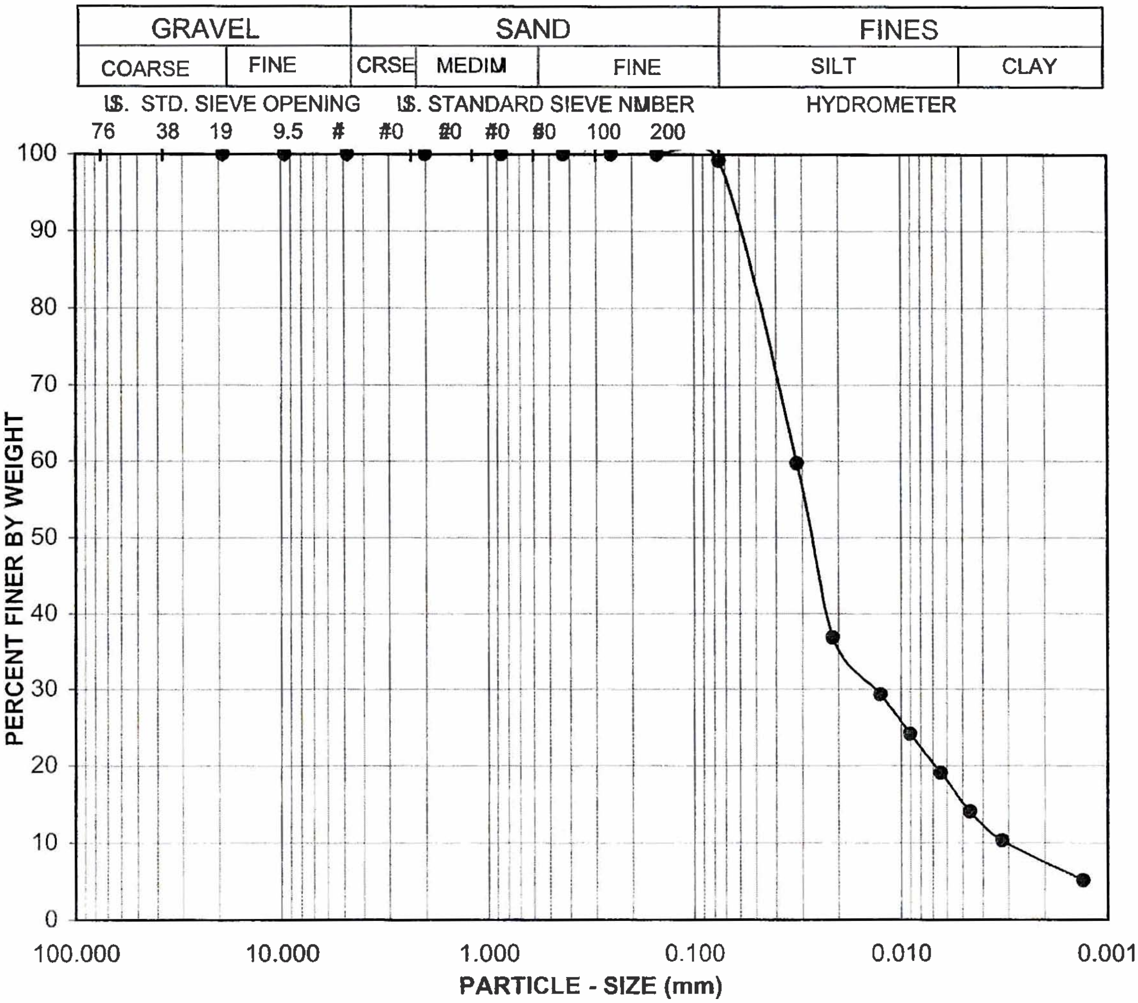
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	S1	3.0-3.4	ML-CL	0:0:100	N/A

Sample Description:
ML-CL: PALE BROWN CLAYEY LEAN SILT

Leighton

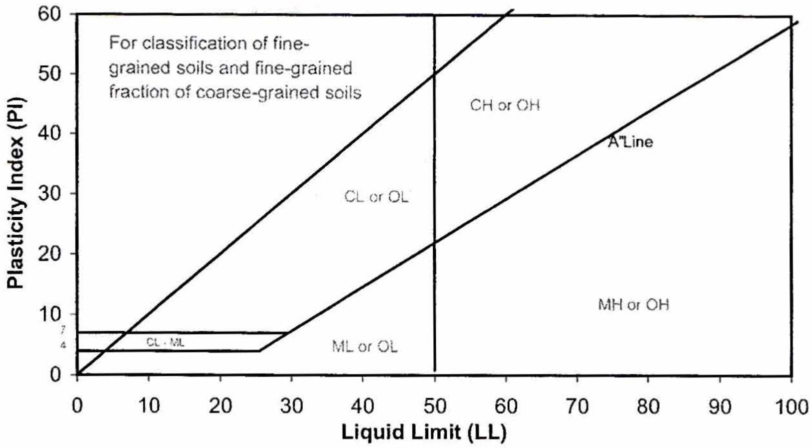
Project No.: 600158-905

SR-125 / 905

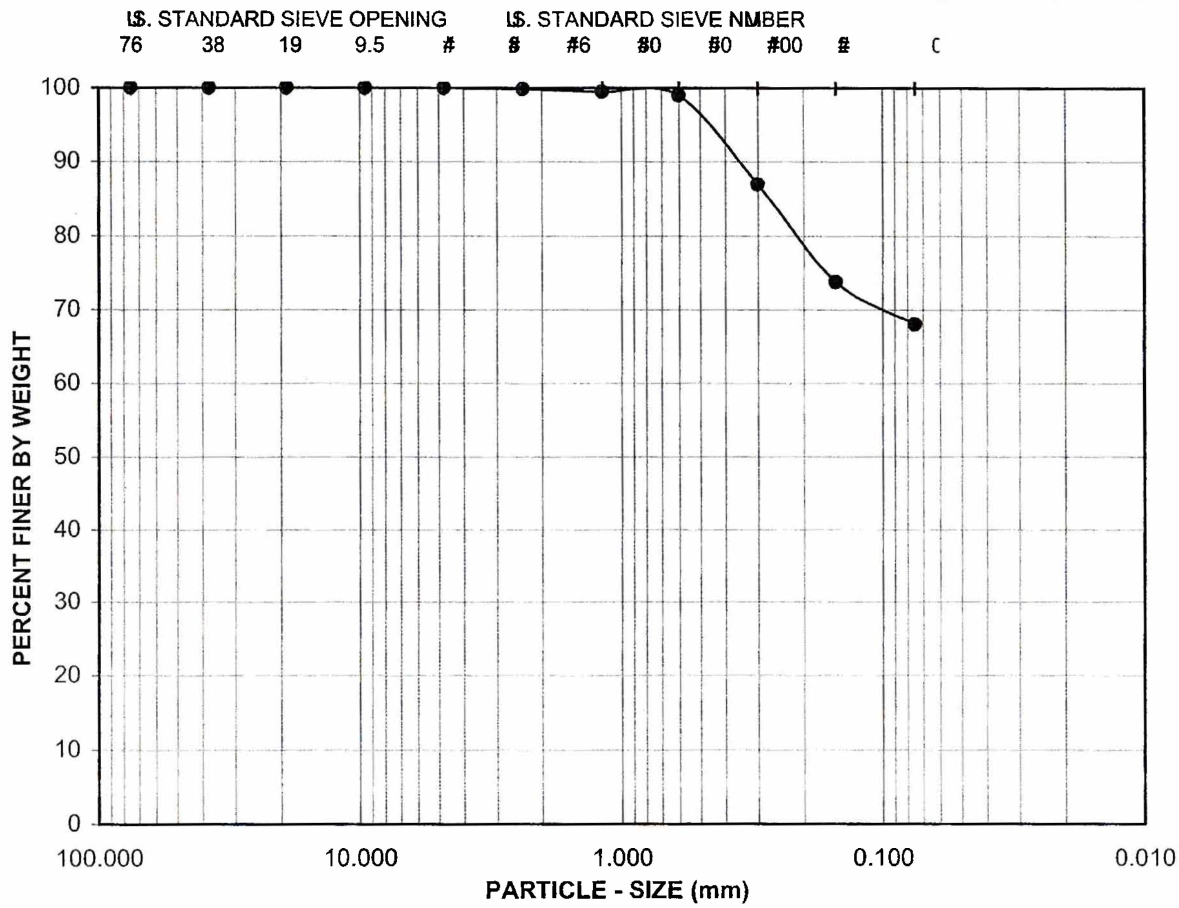
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-4	S3	7.6-7.9	s(ML)	0 : 32 : 68	N/A

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

Project No.: 600158-905

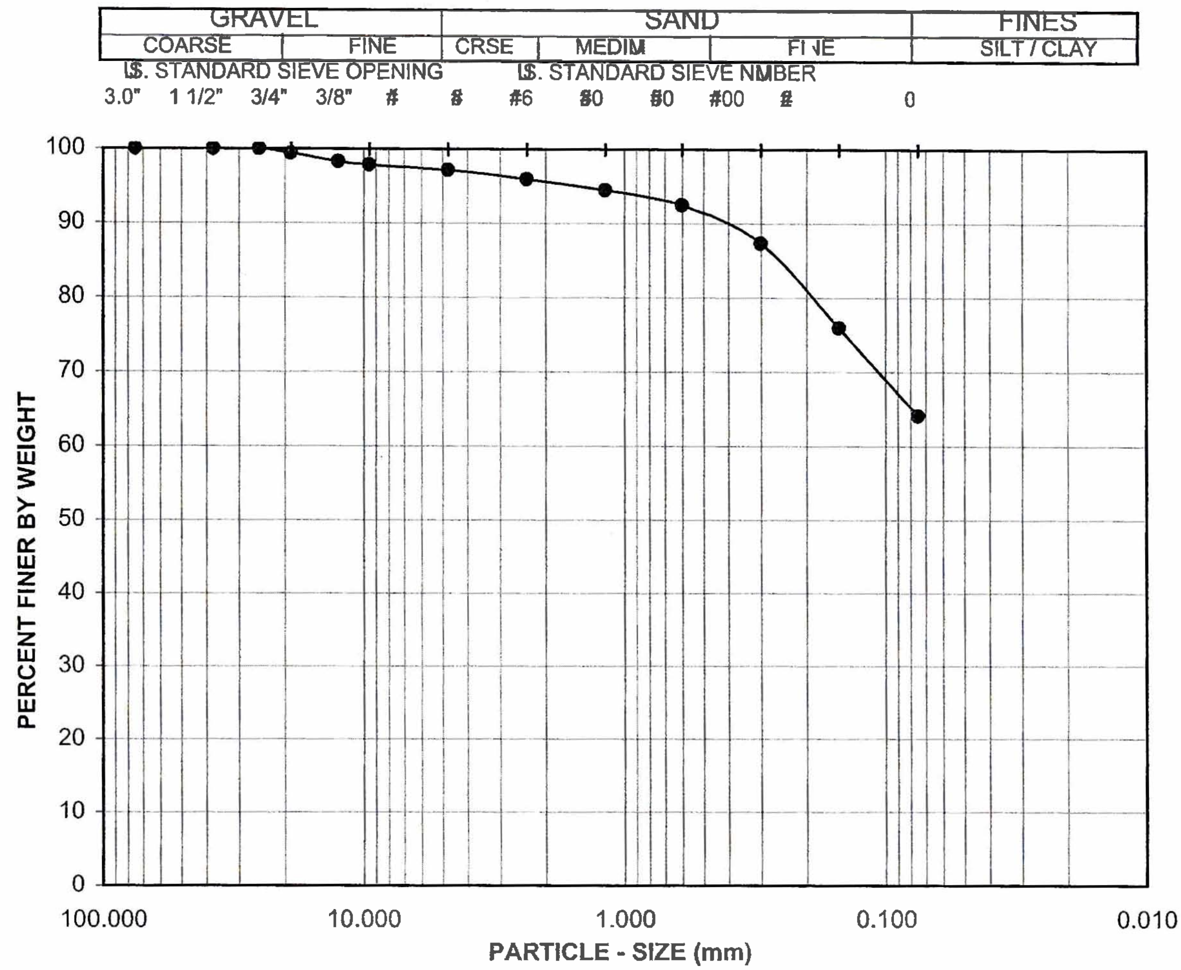
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-4,S3



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI
B-5	B-1	5-10.0	s(CL)	3 : 33 : 64

Visual Sample Description:
s(CL), DARK BROWN SANDY LEAN CLAY WITH TRACE GRAVEL.

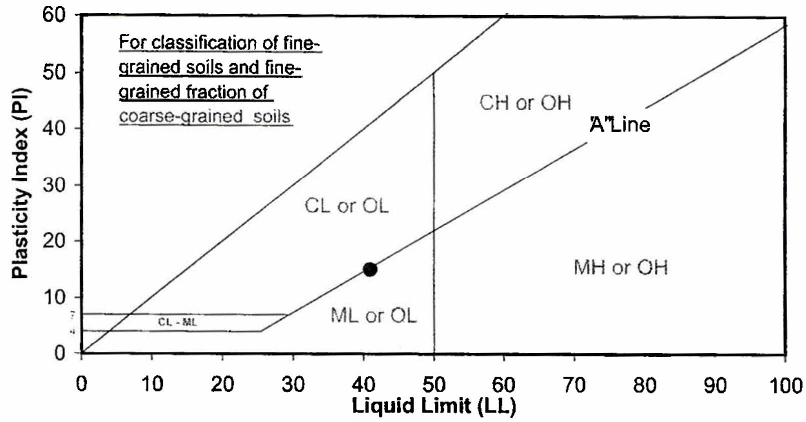
Leighton

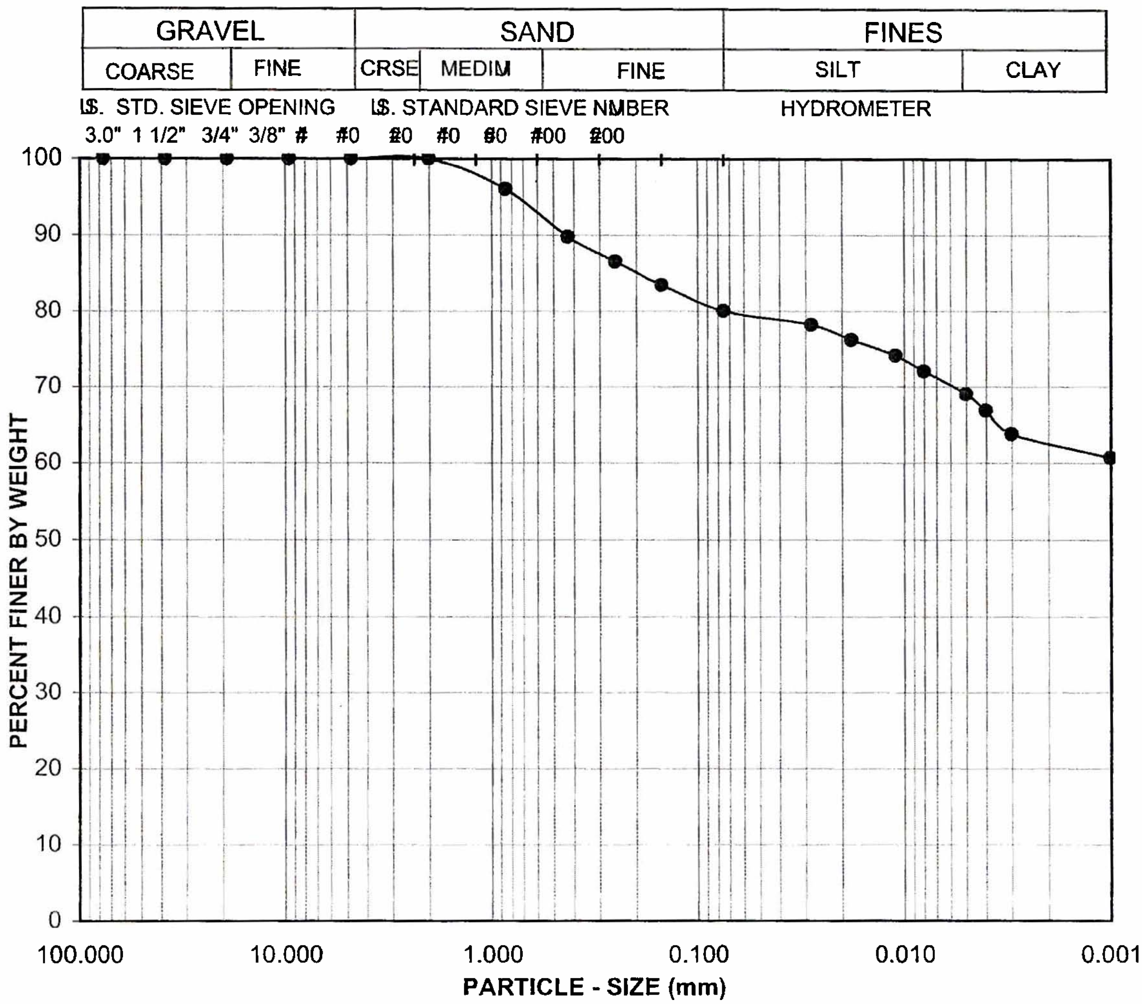
Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-5;B-1





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7	R-1	1.5	(CL)s	0:20:80	41:26:15

Sample Description:
(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

Leighton

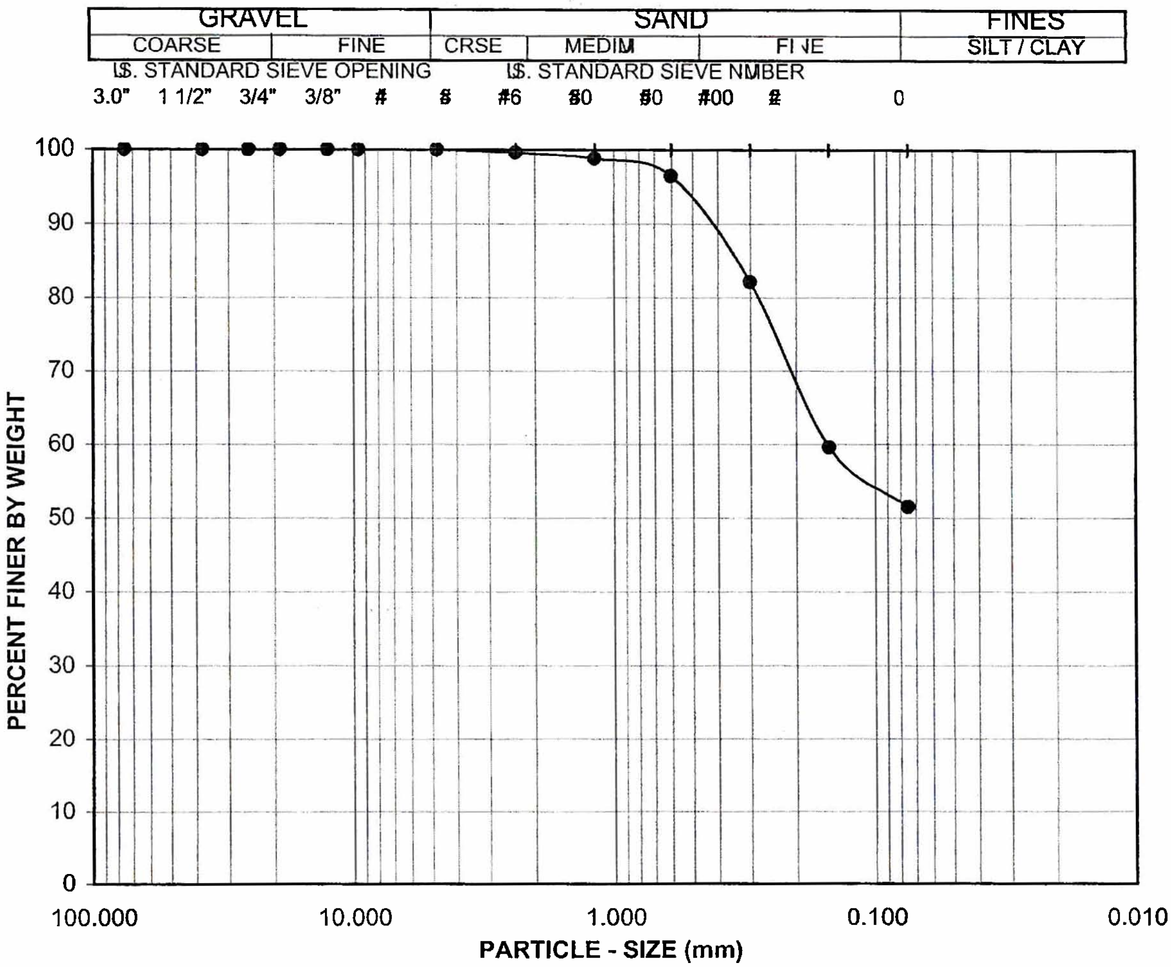
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-10	R-1	1.5	s(CL)	0 : 48 : 52

Visual Sample Description:
s(CL), LIGHT BROWN SANDY LEAN CLAY.

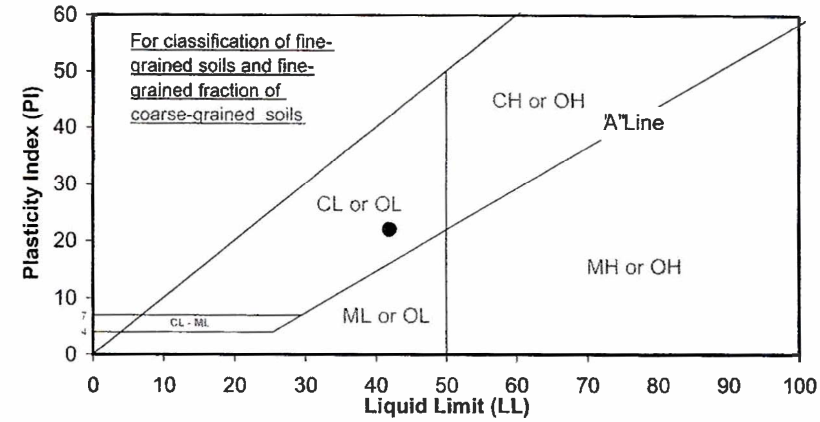
Leighton

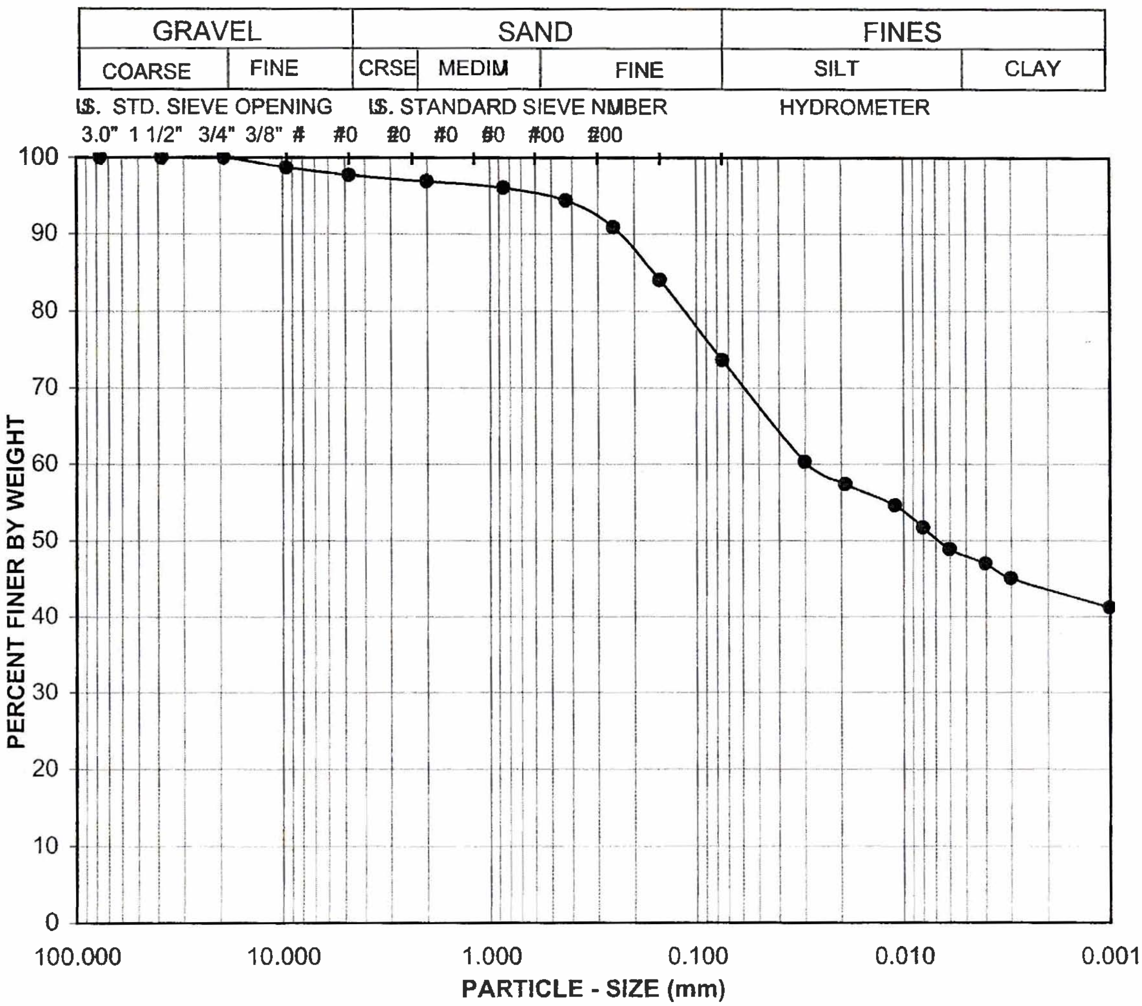
Project No.:	600158-905
	SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-10,R-1





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	B-1	0-1.2	(CL)s	2:24:74	42:20:22

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND AND TRACE GRAVEL.

Leighton

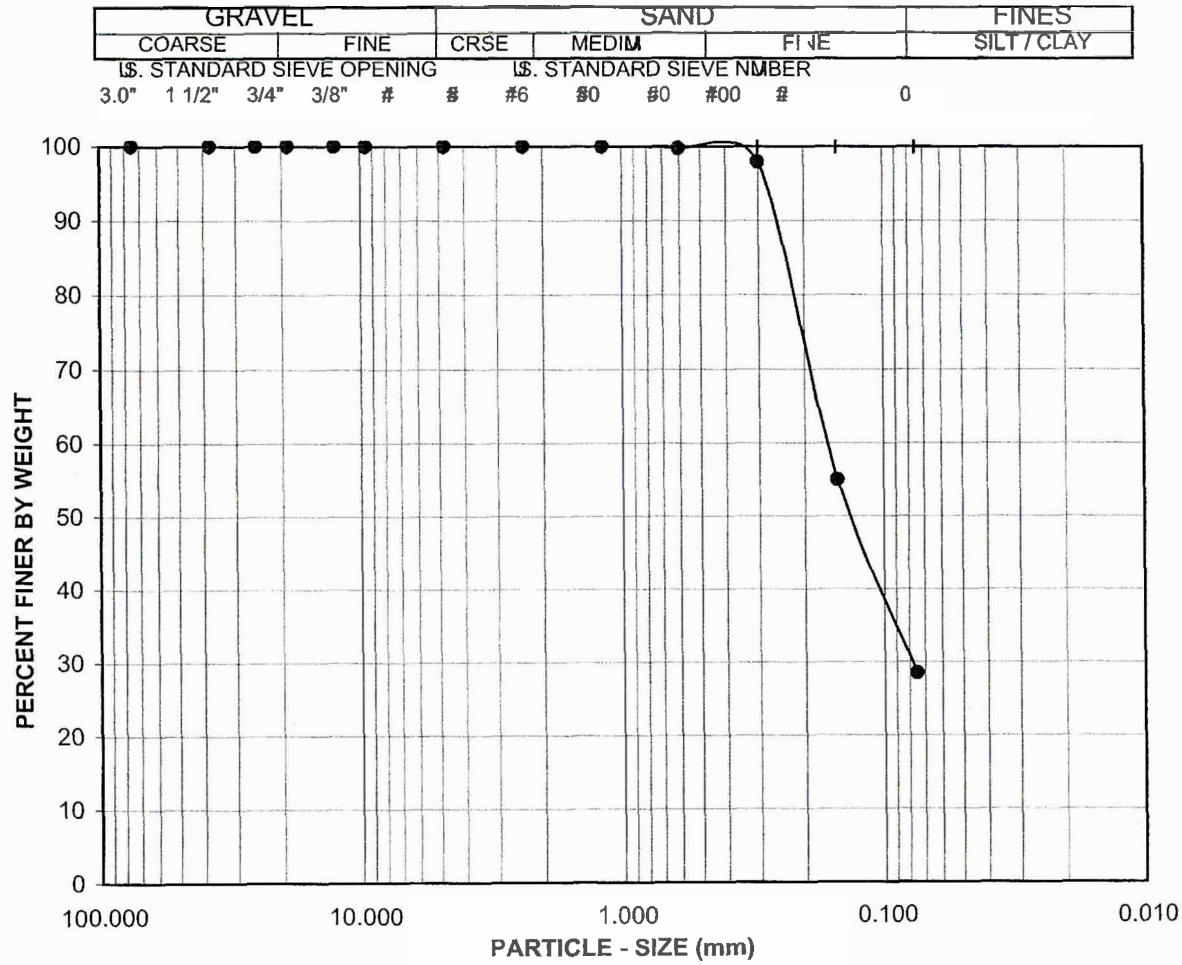
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-15	S-1	3.0	SM	0 : 72 : 28

Project No.: 600158-905
SR-125 / 905

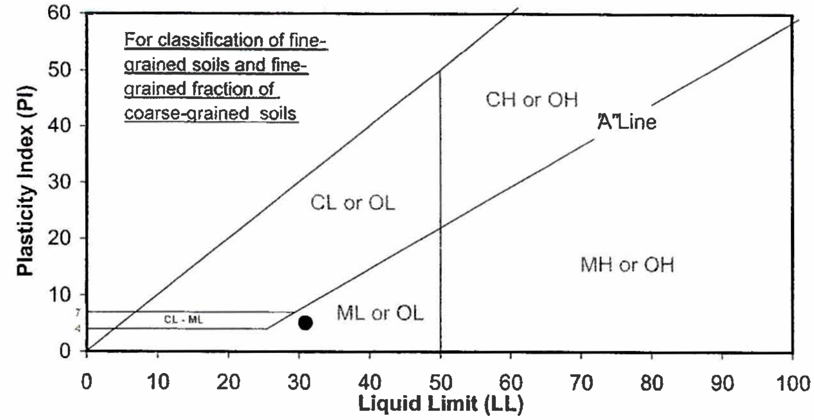
Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

Leighton

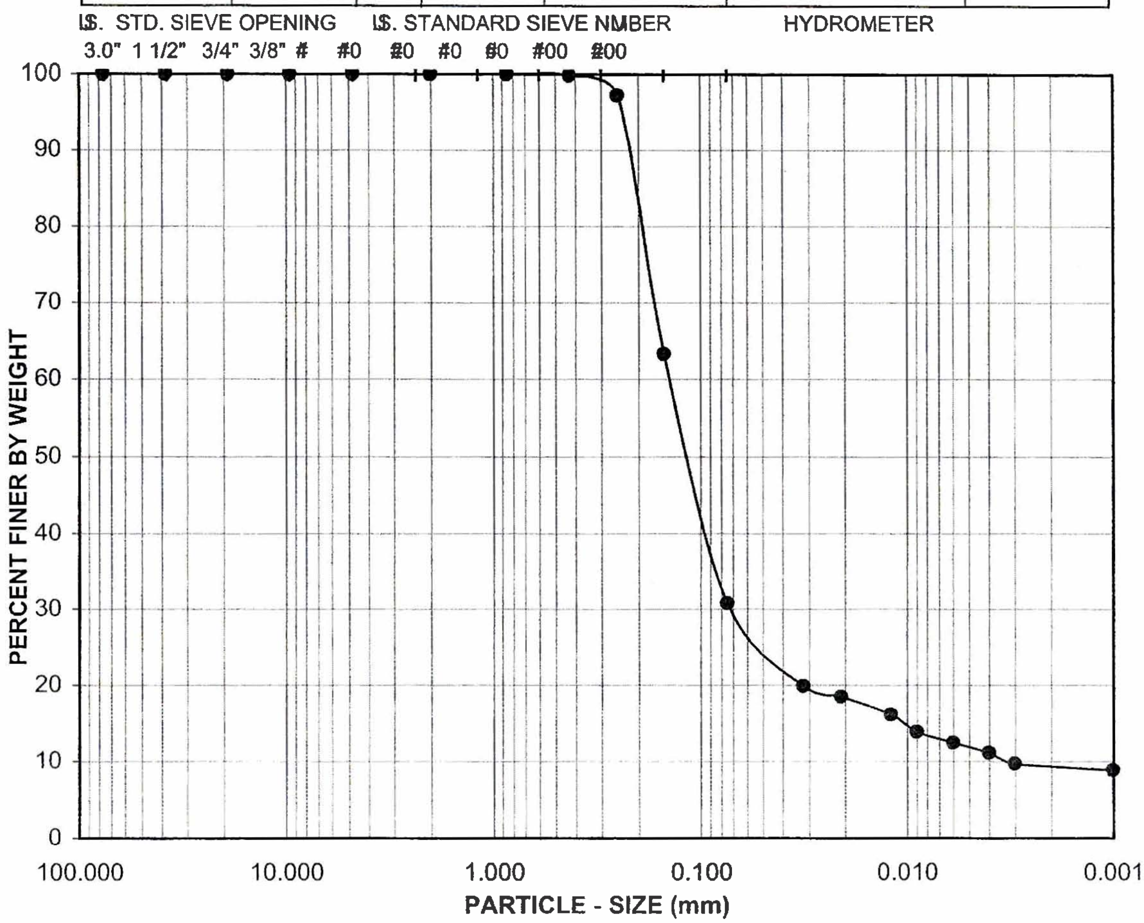
CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-15 S-1



GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIM	FINE	SILT	CLAY



Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-16	S-1	1.5	SM	0:69:31	31:26:5

Sample Description:
SM, BROWN SILTY SAND.

Project No.: 600158-905

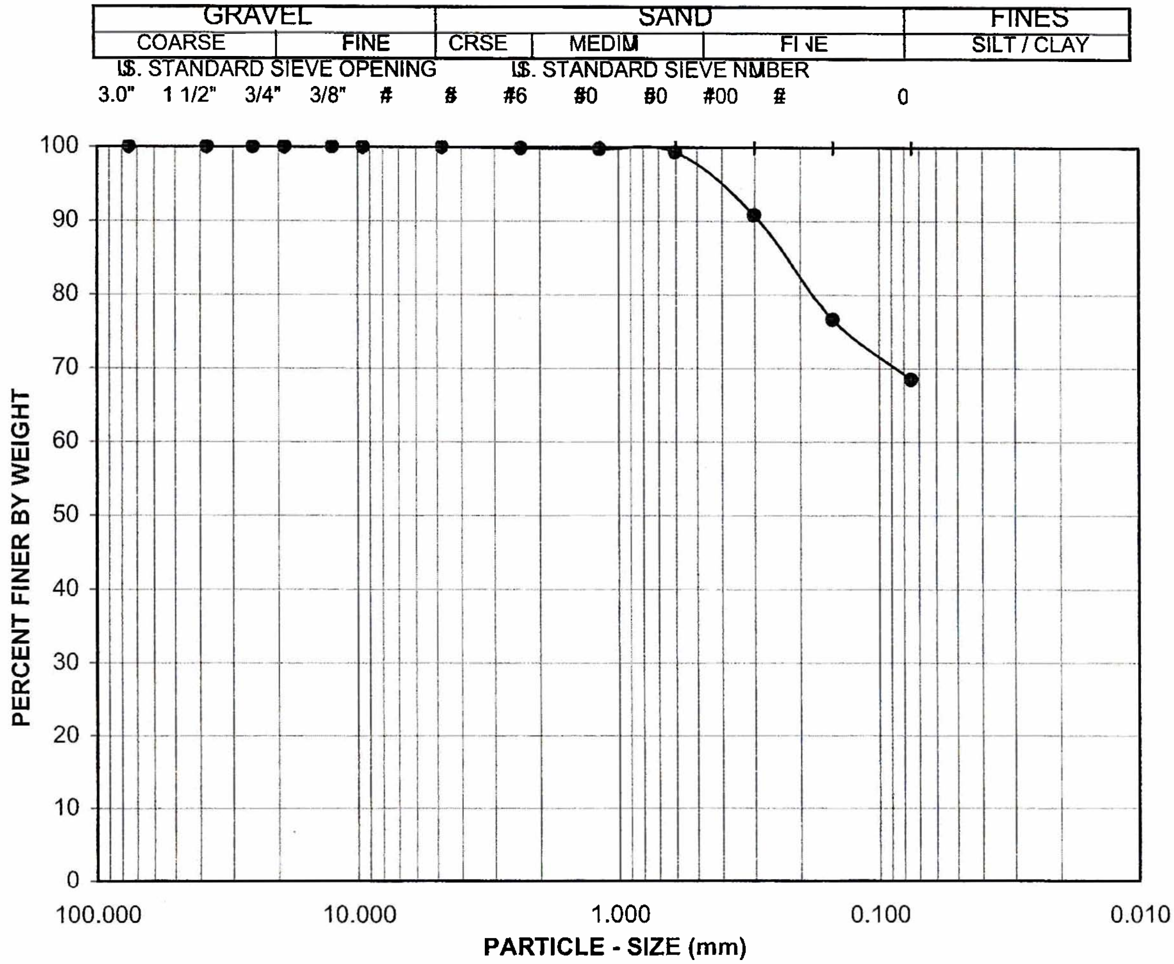
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Leighton

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-18	B-1	0-1.0	s(CL)	0 : 32 : 68

Visual Sample Description:

s(CL), DARK OLIVE BROWN SANDY LEAN CLAY.

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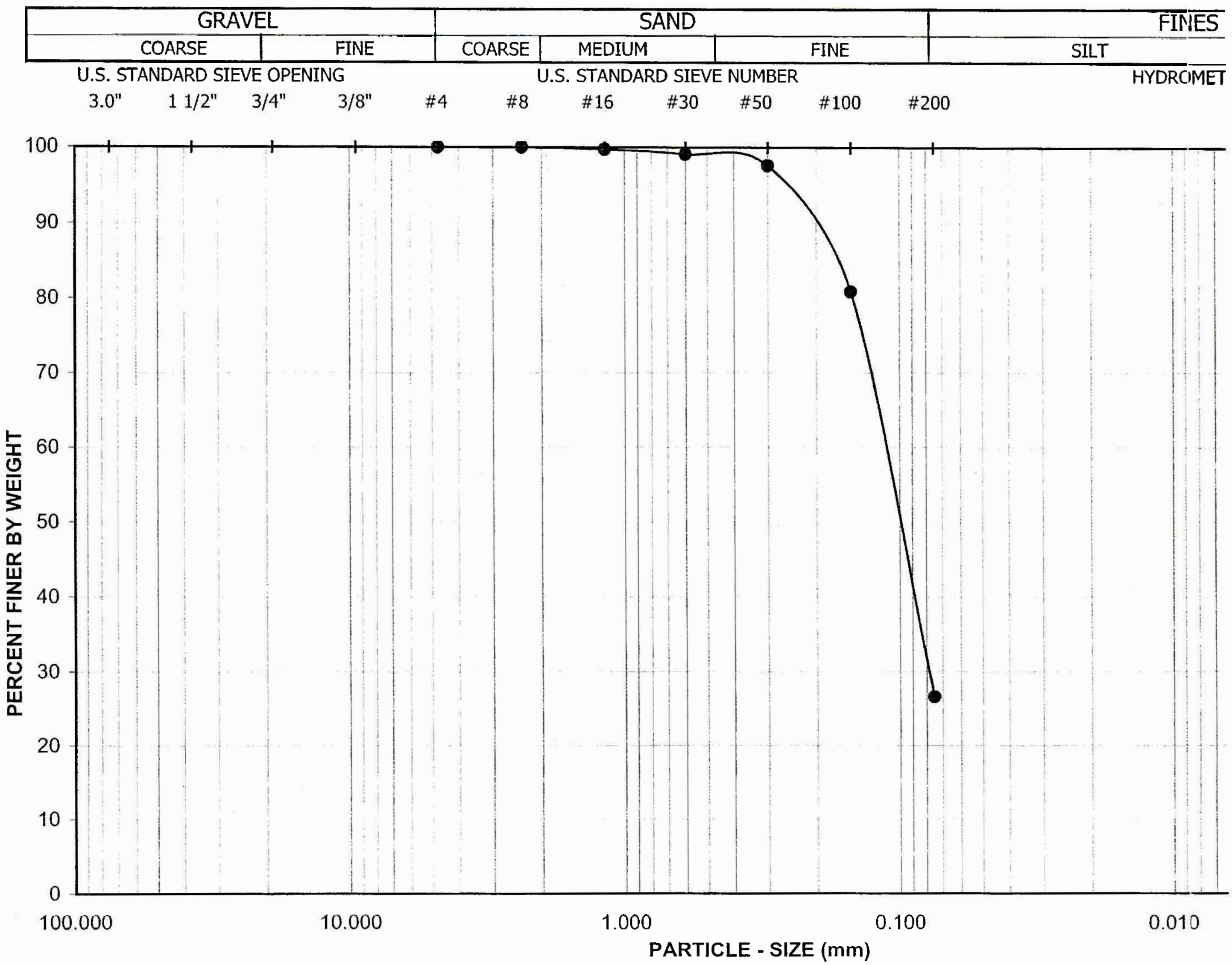
Project No.:	600158-905
	SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-18,B-1



Project Name: SR 125 / 905 Interchange

Project No.: 600158-905

Exploration No.: B-19

Sample No.: F

Depth (m): 1.5

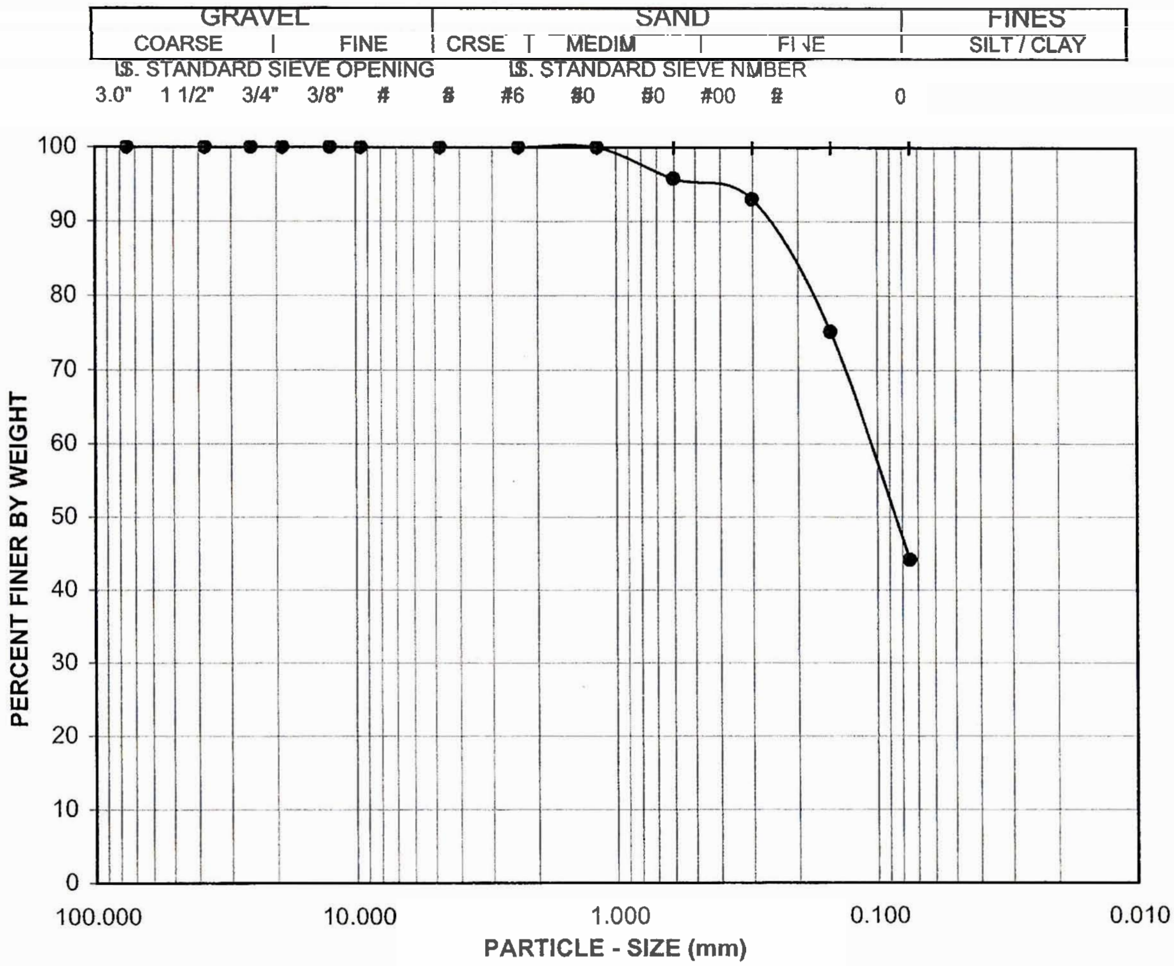
Soil Type : S

Soil Identification: Very pale brown silty sand (SM)

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

GR:SA:FI : (%) 0 : 73 : 27



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-1	3.0	SM	0 : 56 : 44

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

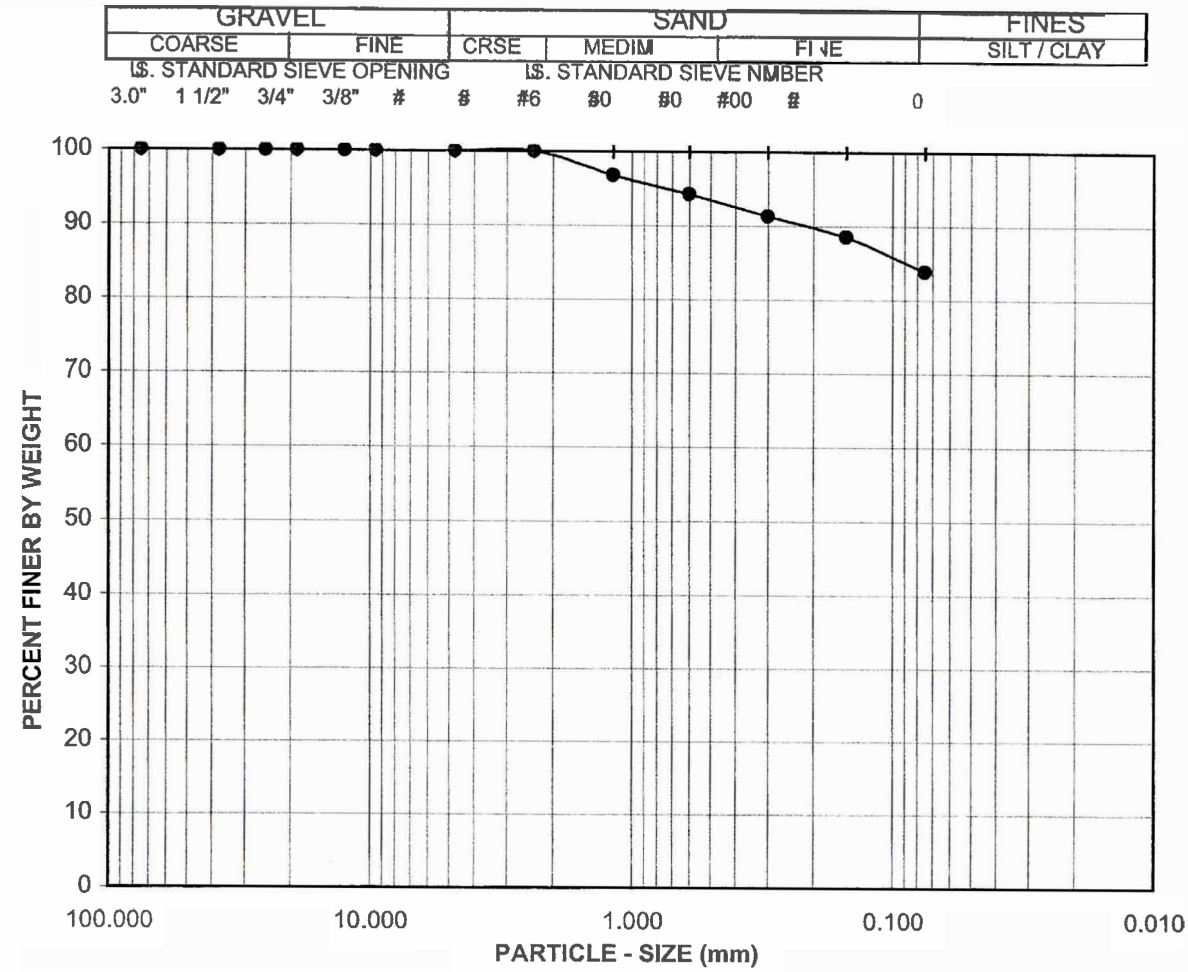
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-2	6.1	(ML)s	0 : 16 : 84

Project No.: 600158-905
SR-125 / 905

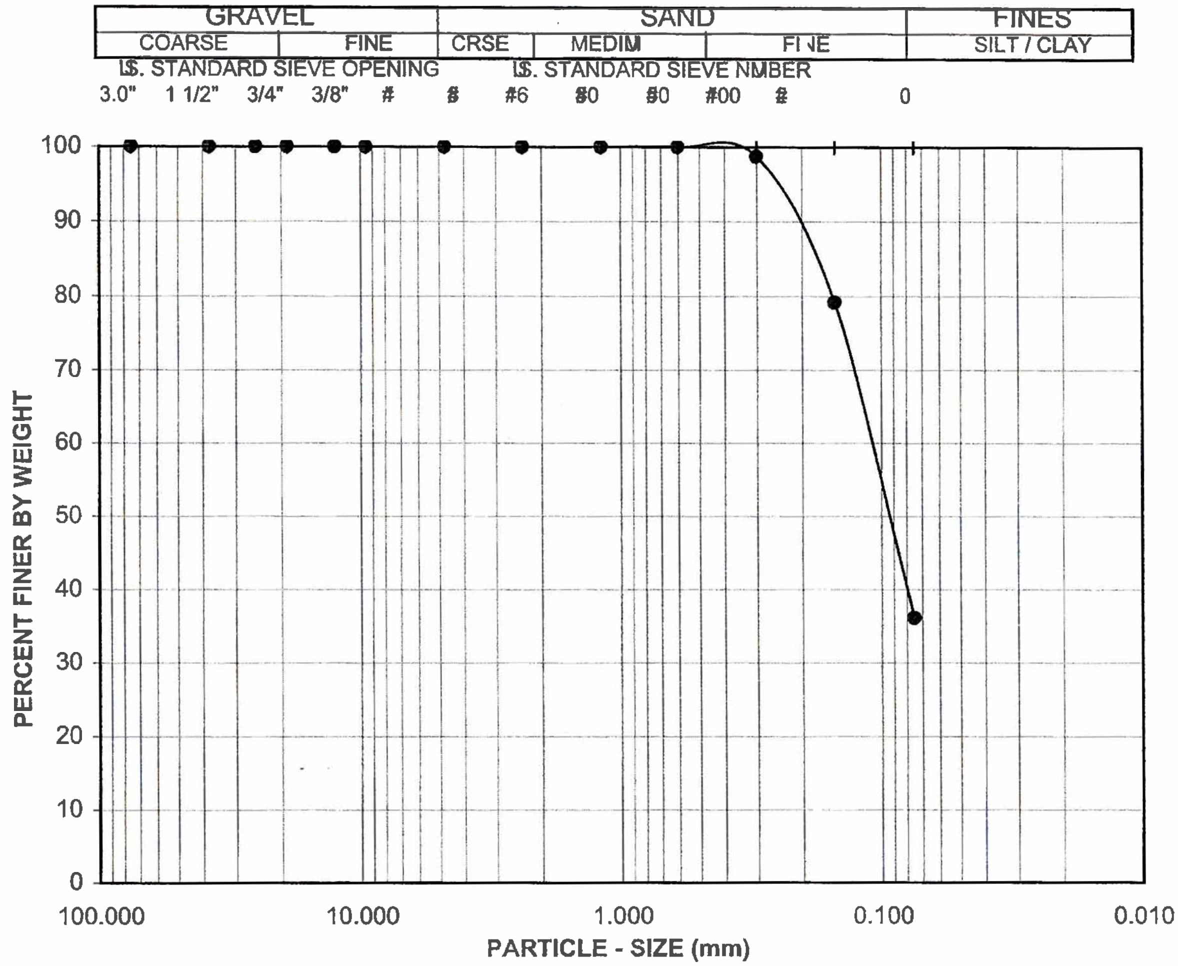
Visual Sample Description:
(ML)s, LIGHT BROWN SILT WITH SAND.

Leighton

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-2



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-4	10.7	SM	0 : 64 : 36

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

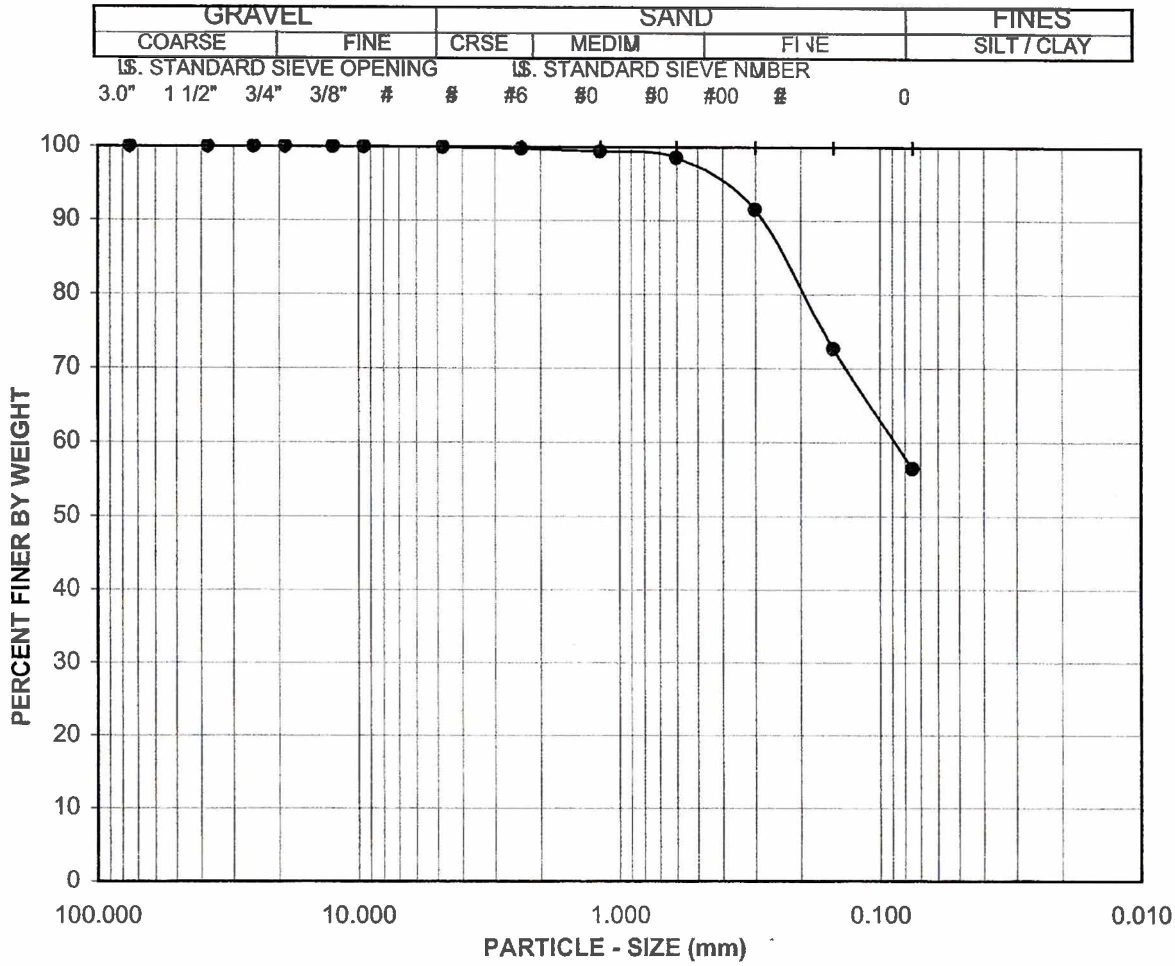
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-4



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-21	B-1	1.8-3.0	s(CL)	0 : 44 : 56

Visual Sample Description:
s(CL), LIGHT OLIVE BROWN SANDY LEAN CLAY.

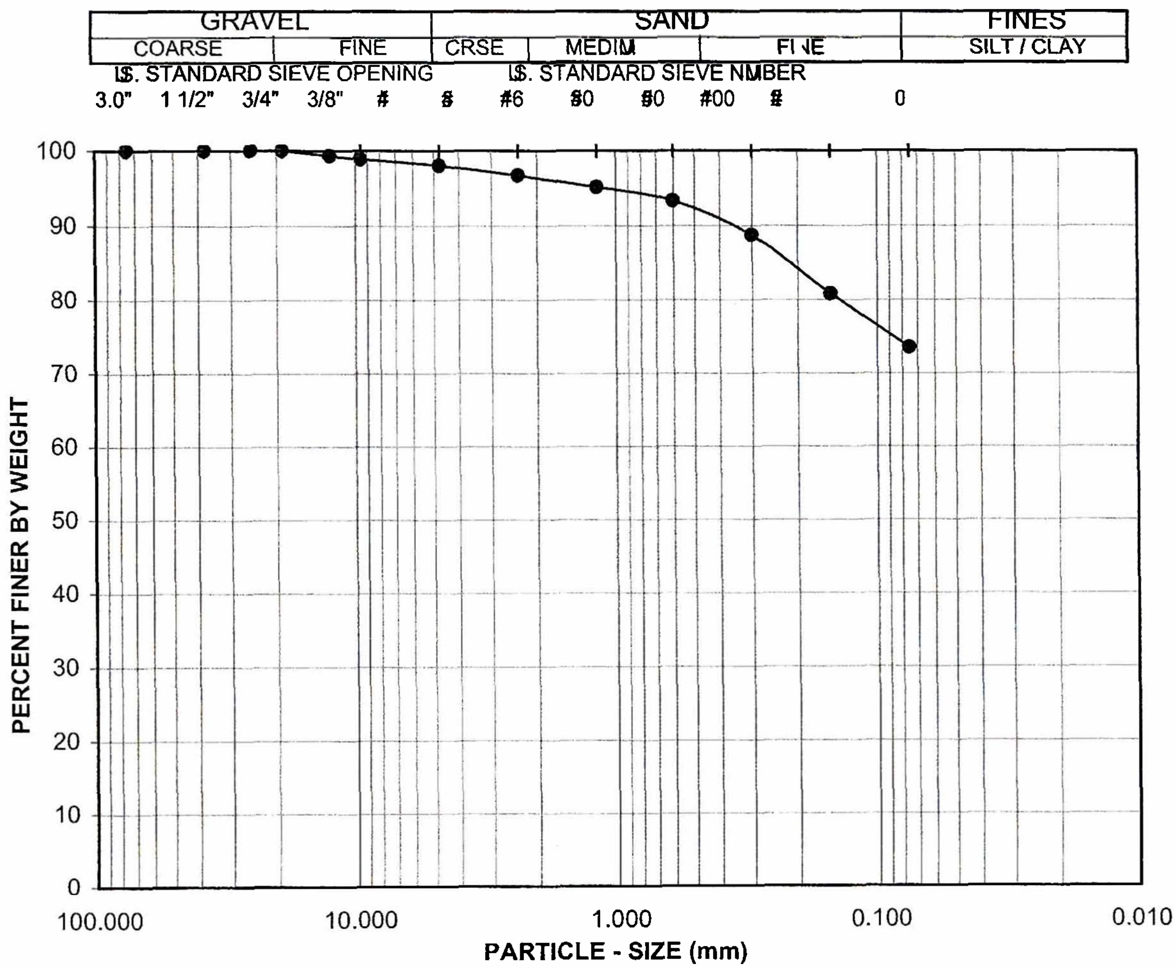
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-21,B-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
TP-1	B-1	0.6-1.0	(CH)s	2 : 24 : 74

Visual Sample Description:
(CH)s, GRAYISH BROWN FAT CLAY WITH SAND AND TRACE GRAVEL.

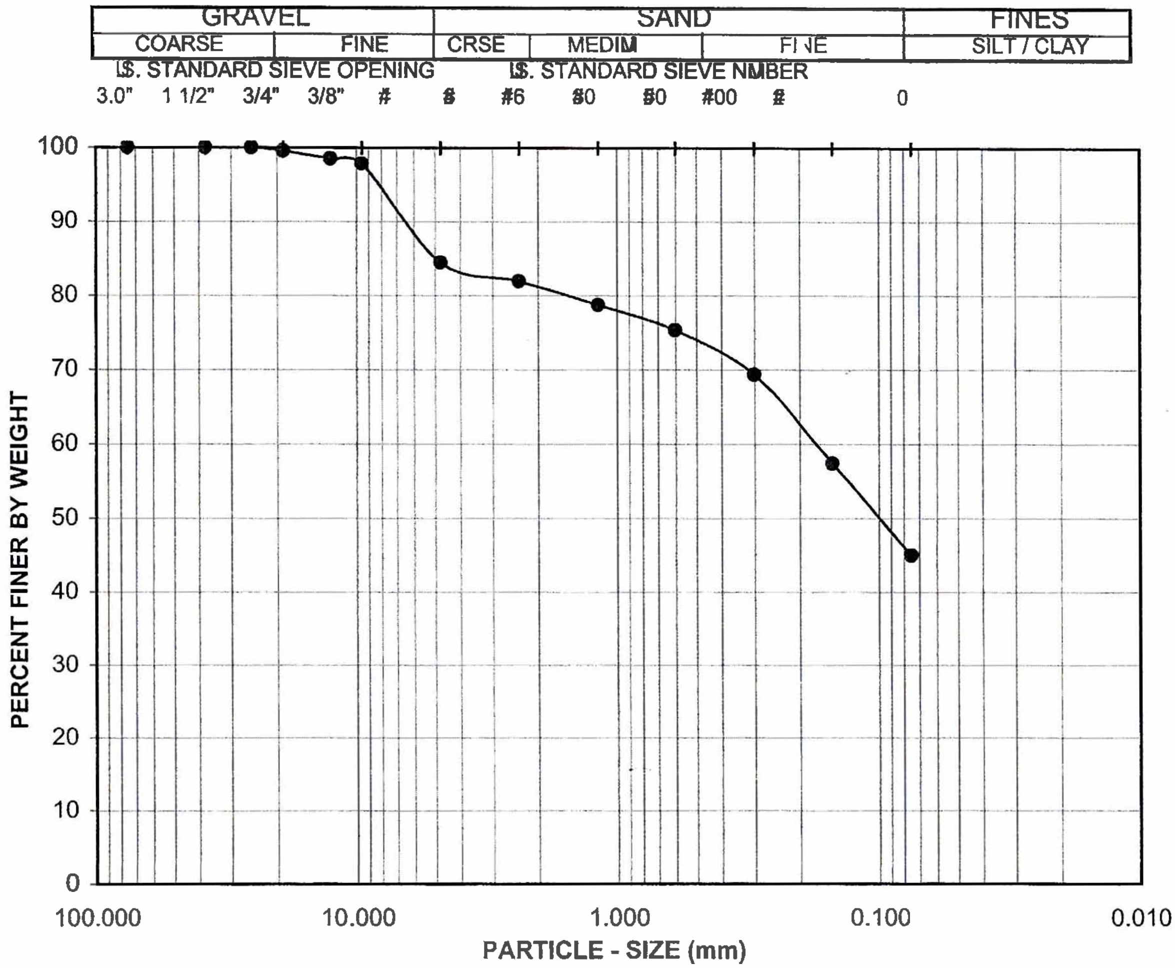
Leighton

Project No.:	600158-905 SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-1,B-1



Boring No.:	Sample No.:	Depth (m.):	Soil Type	GR:SA:FI
TP-3	B-1	0.8-1.0	SC	16 : 39 : 45

Visual Sample Description:

SC, LIGHT BROWN CLAYEY SAND WITH GRAVEL.

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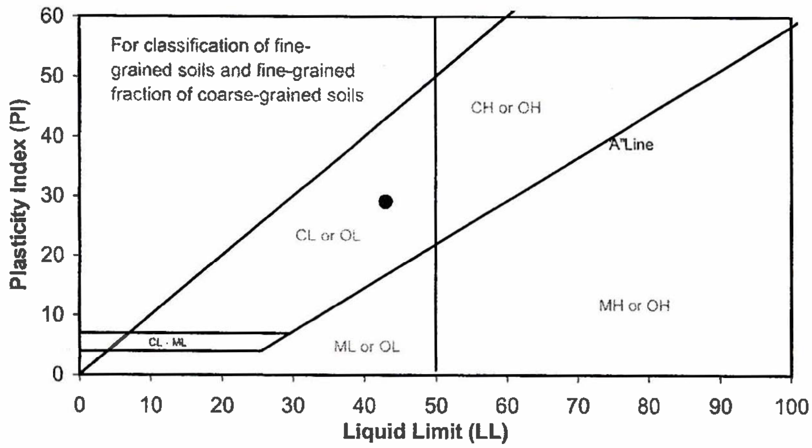
Project No.:	600158-905 SR-125 / 905

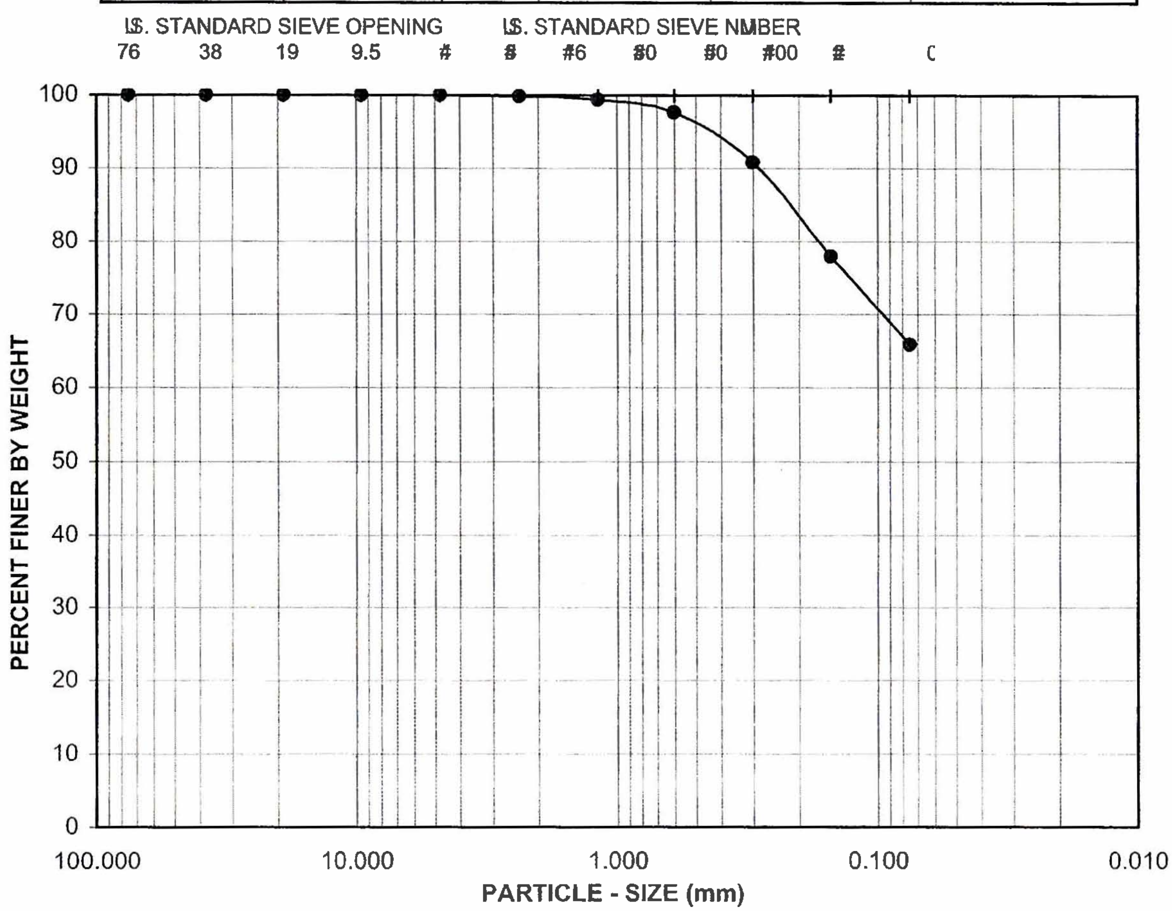
CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-3,B-1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
TP-5	B1	0.0-0.5	s(CL)	0 : 34 : 66	29

Project No.: 600158-905

SR-125 / 905

Visual Sample Description:
s(CL): BROWN SANDY LEAN CLAY

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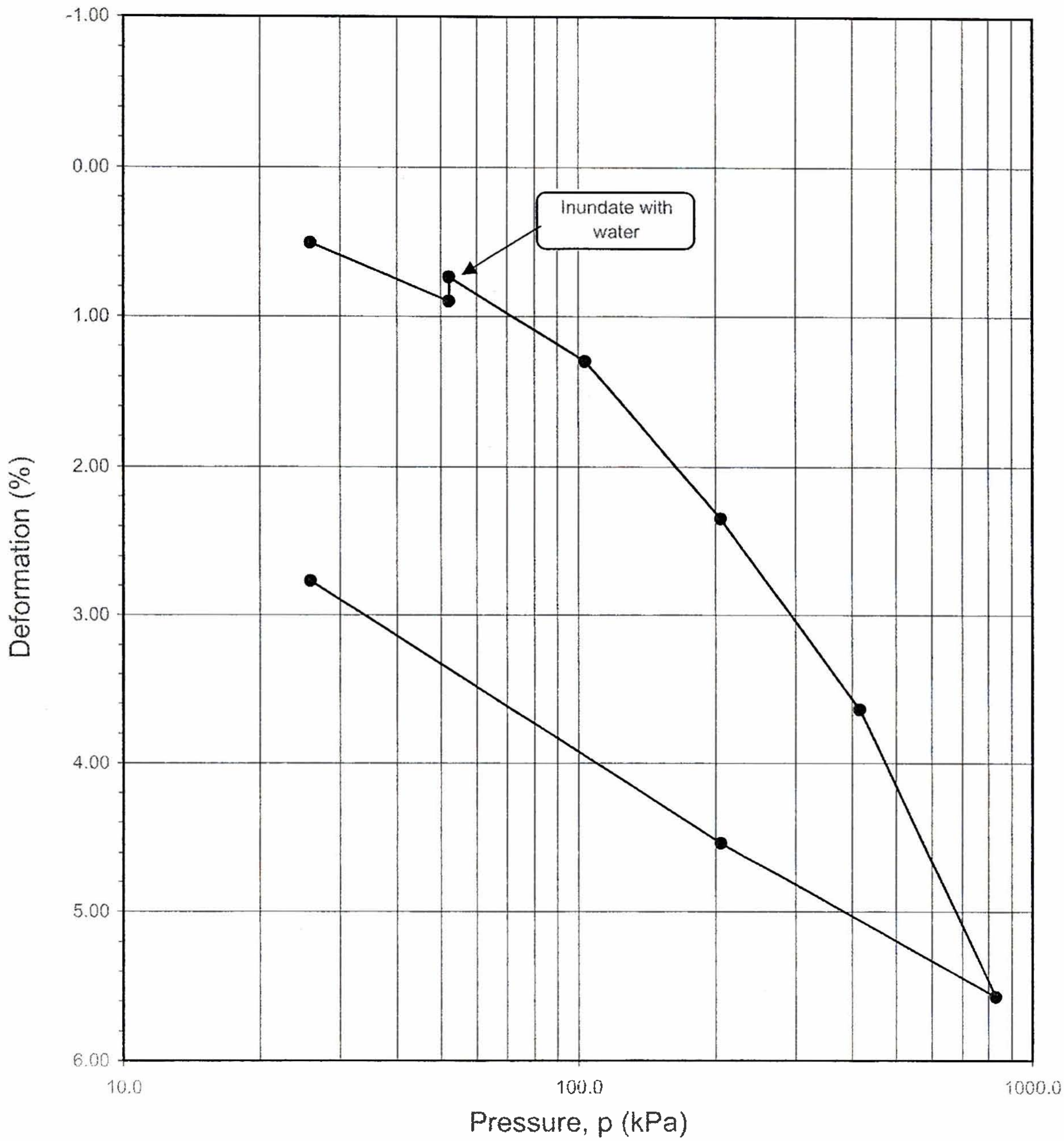
ATTERBERG LIMITS, PARTICLE - SIZE CURVE
ASTM D 4318, D 422

Rev. 8-07

SIEVE TP-5,B1



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-1	**R1**	**1.5-1.8**	**42.6**	**44.2**	**12.40**	**12.75**	**1.177**	**1.117**	**99**	**109**

Sample Description:

ML-CL: PALE GRAY CLAYEY LEAN SILT

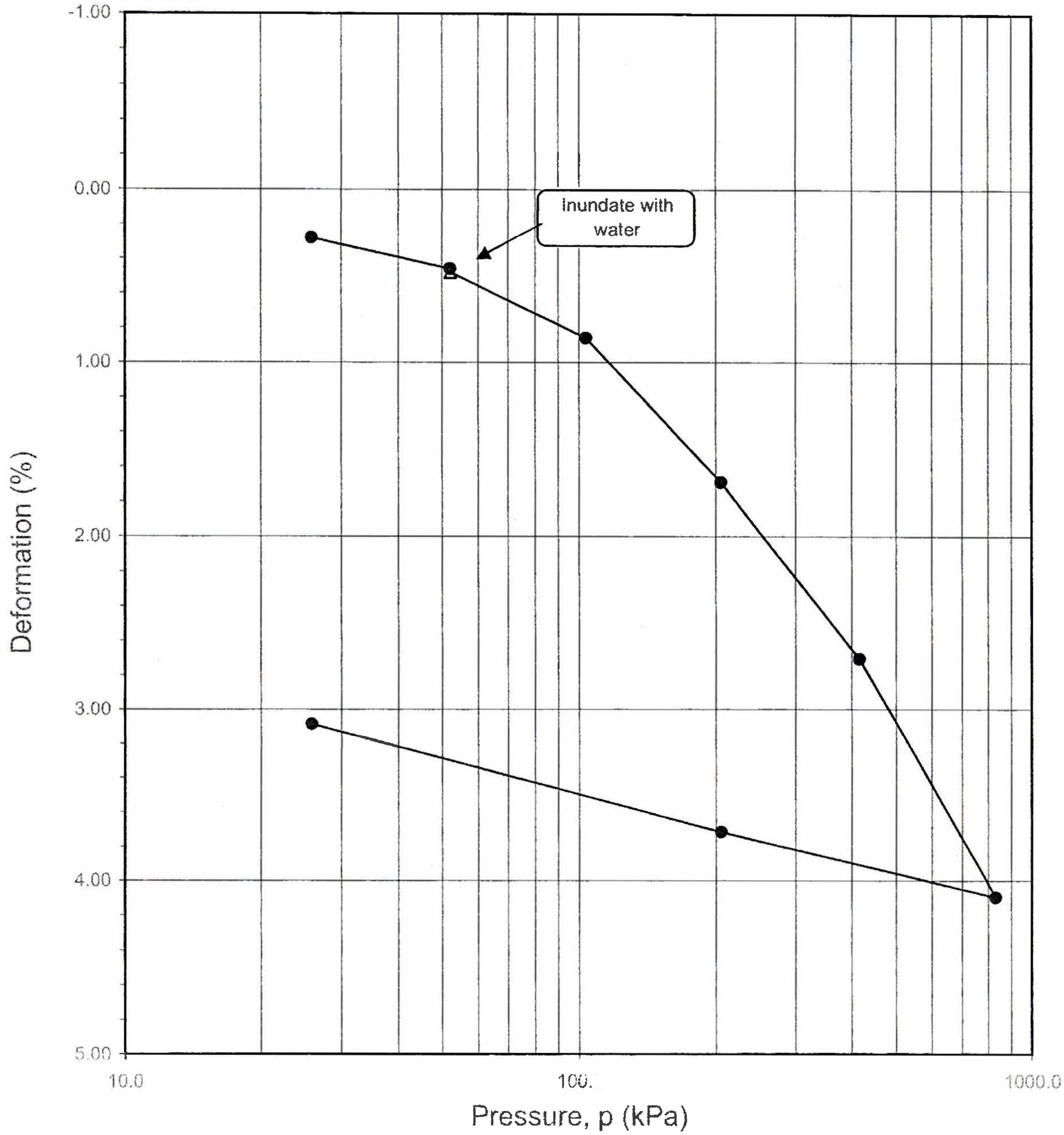
Leighton Consulting, Inc.

Project No.:	600158-905
Project Name:	SR-125

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-2	**R2**	**6.1-6.3**	**18.7**	**18.8**	**17.26**	**17.81**	**0.536**	**0.488**	**94**	**104**

Sample Description:

SM: PALE GRAY SILTY SAND

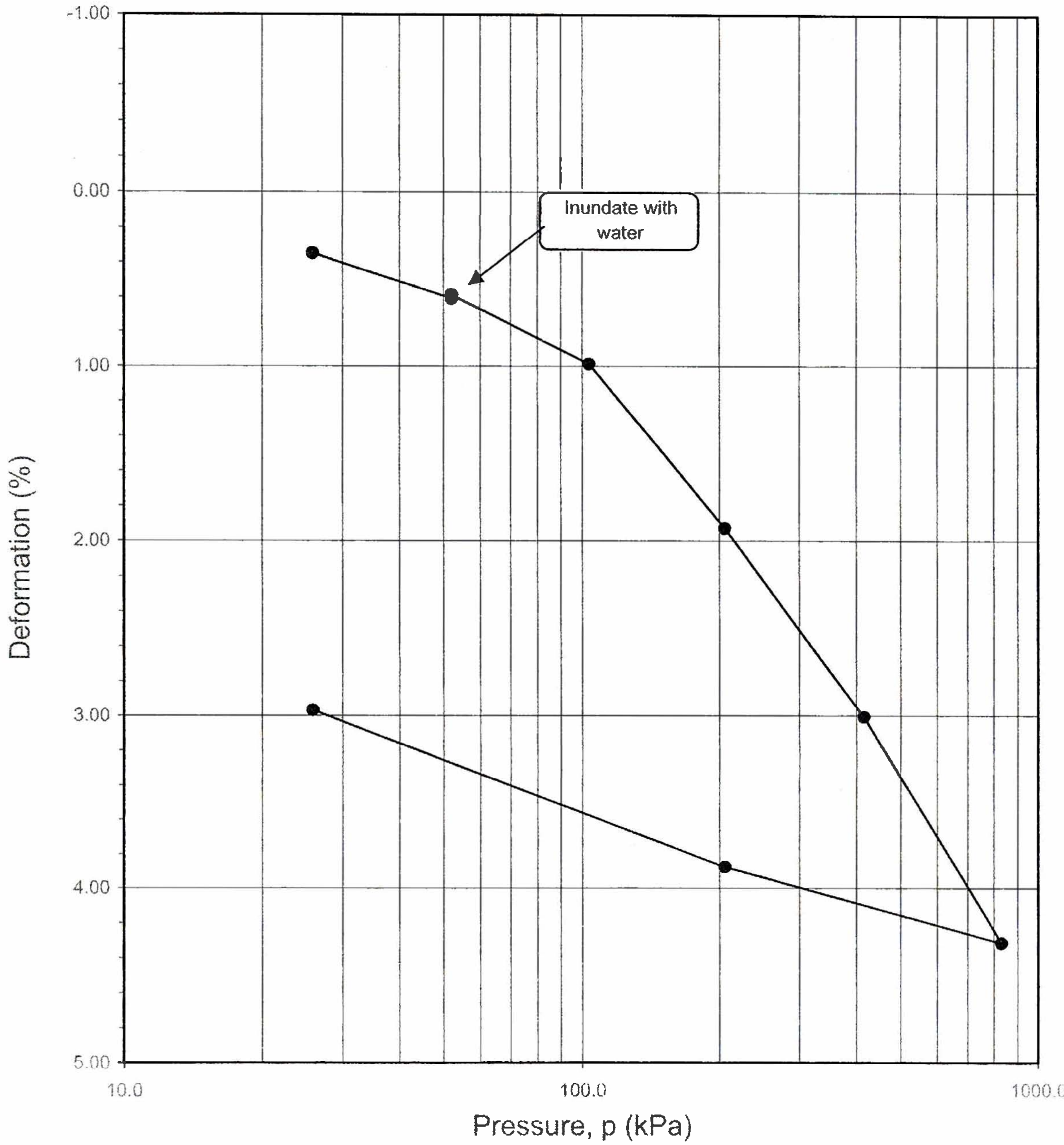
Project No.:	600158-905
Project Name:	SR-125

Leighton Consulting, Inc.

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m³)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-3	**R1**	**3.0-3.4**	**17.8**	**18.9**	**17.12**	**17.64**	**0.548**	**0.502**	**88**	**102**

Sample Description:

SM: PALE GRAY SILTY SAND

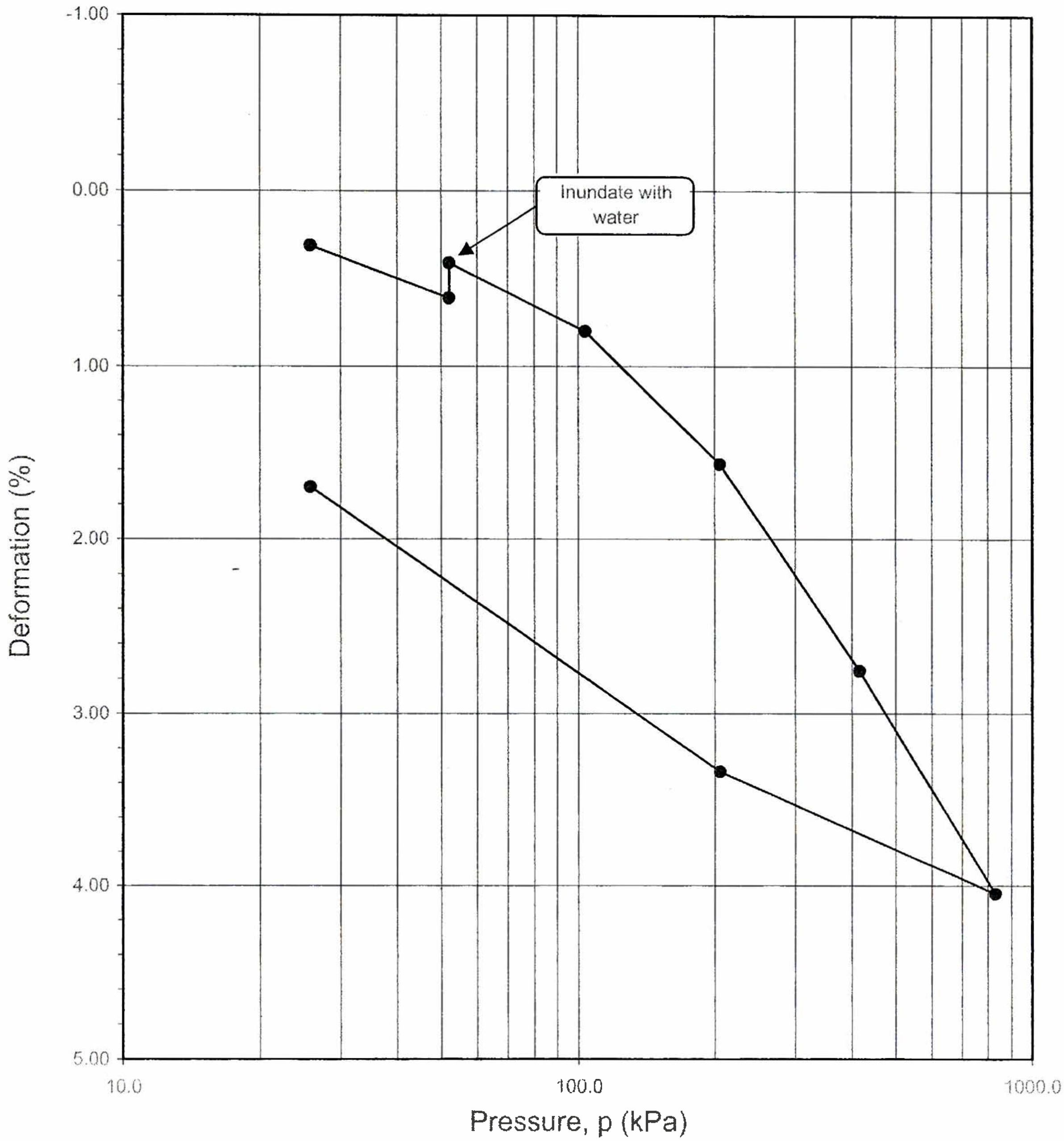
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m³)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-3	**R2**	**6.1-6.4**	**20.2**	**21.6**	**17.05**	**17.35**	**0.583**	**0.556**	**95**	**107**

Sample Description:

SM: PALE GRAY SILTY SAND

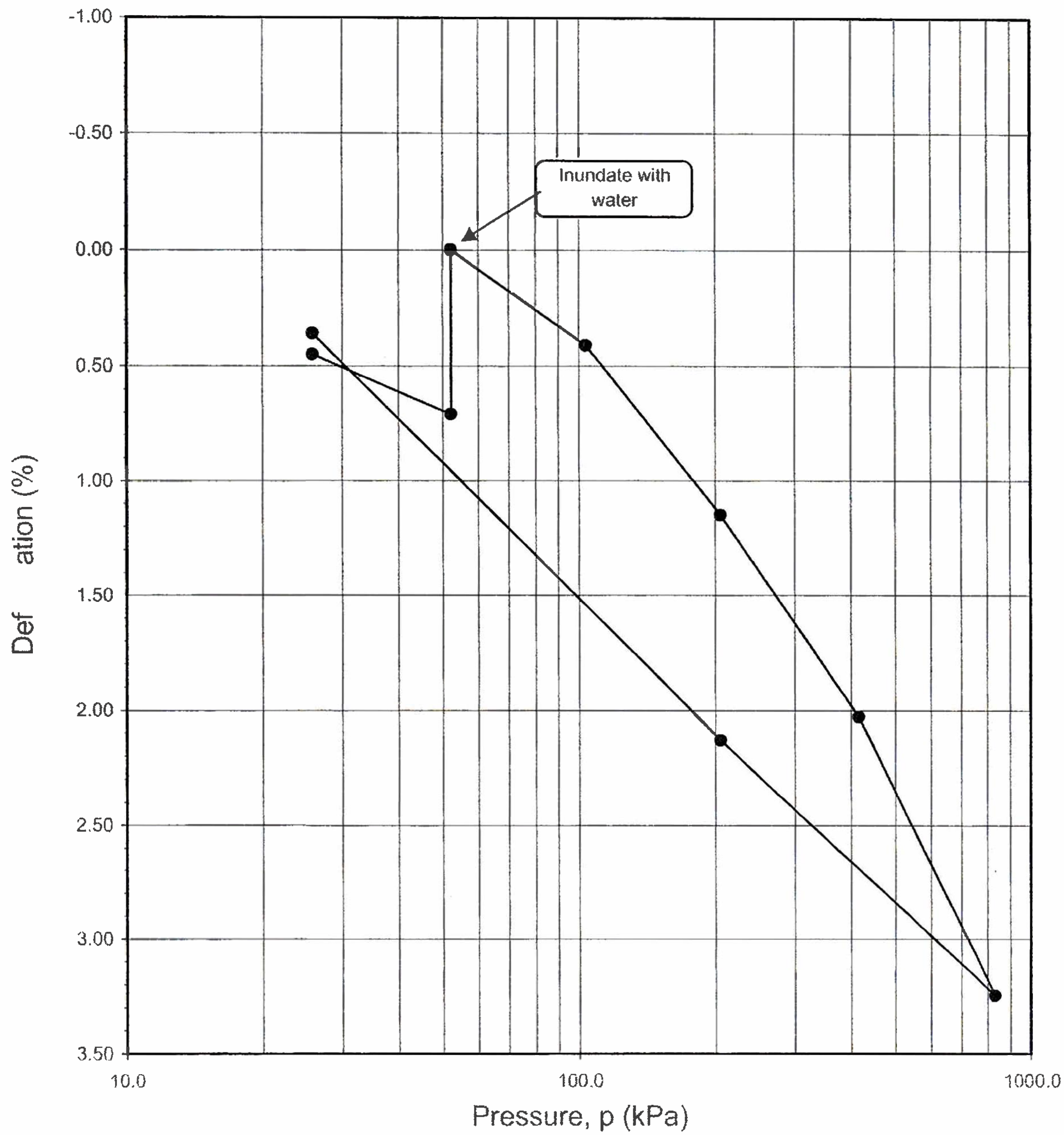
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R3**	**9.1-9.4**	**28.6**	**29.8**	**15.23**	**15.29**	**0.772**	**0.766**	**102**	**107**

Sample Description:

SC: PALE GRAY CLAYEY SAND

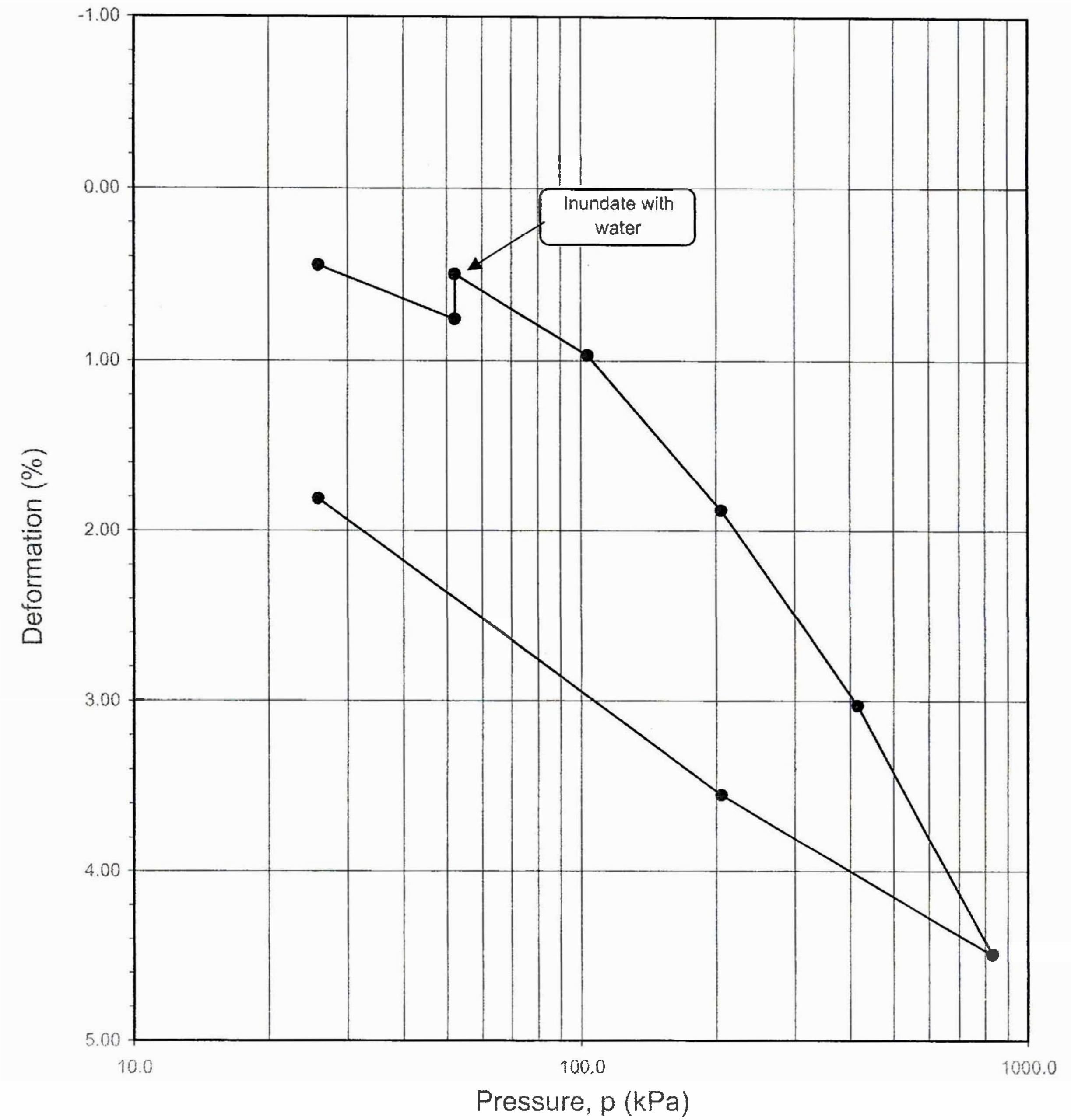
Project No.:	600158-905
Project Name:	SR-125

Leighton

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	R5	16.8-17.1	25.2	28.5	15.40	15.69	0.752	0.721	92	109

Sample Description:

SC: PALE GRAY CLAYEY SAND

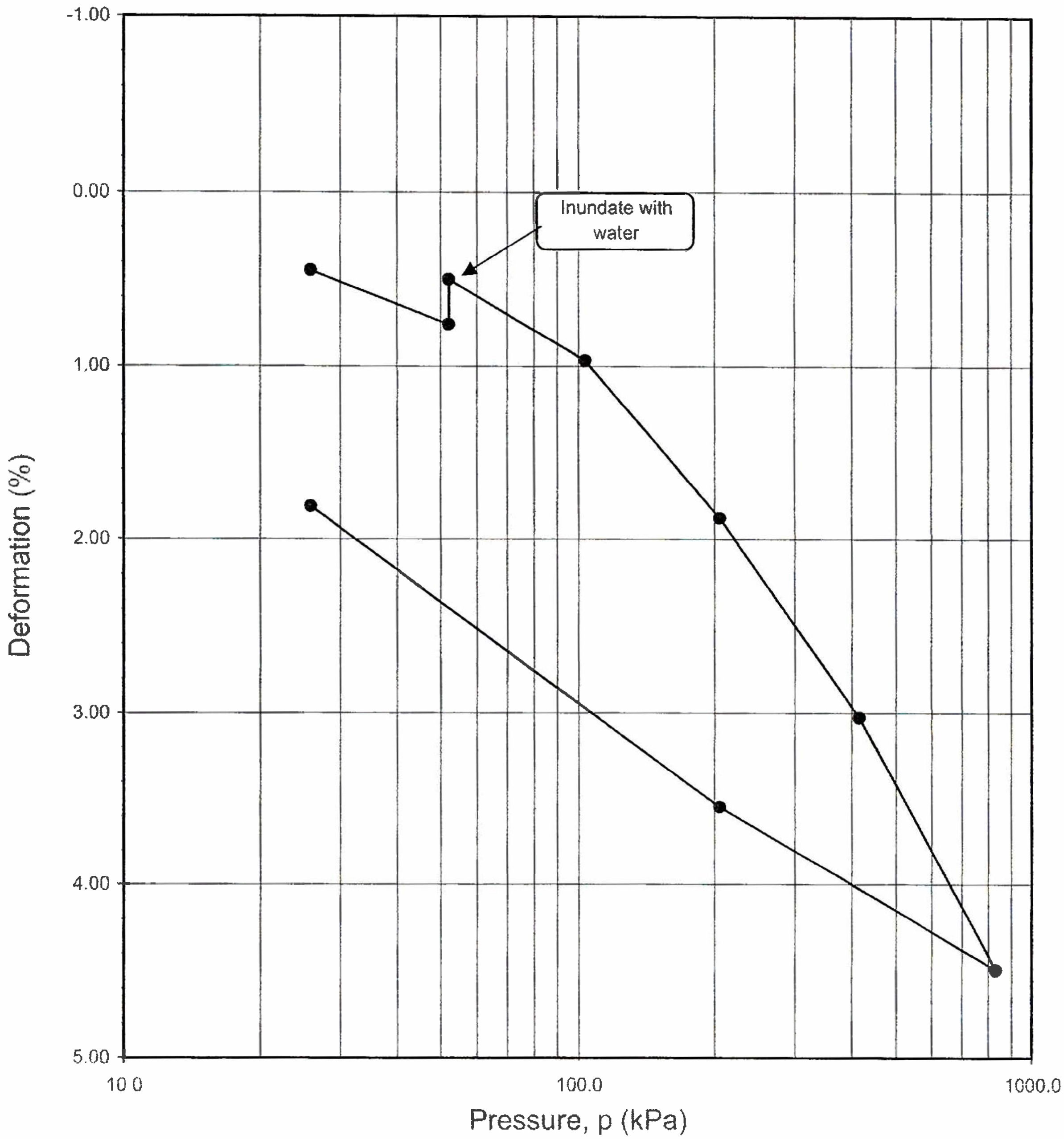
Leighton

Project No.:	600158-905
Project Name:	SR-125

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-4	**R5**	**16.8-17.1**	**25.2**	**28.5**	**15.40**	**15.69**	**0.752**	**0.721**	**92**	**109**

Sample Description:

SC: PALE GRAY CLAYEY SAND

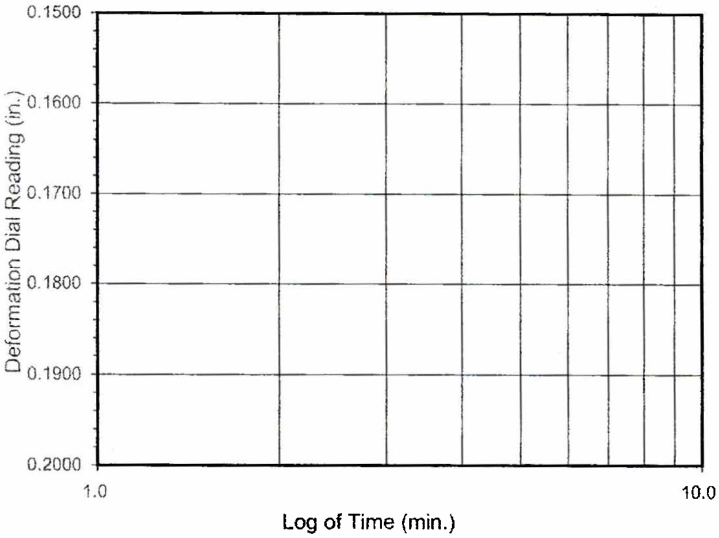
Project No.:	600158-905
Project Name:	SR-125

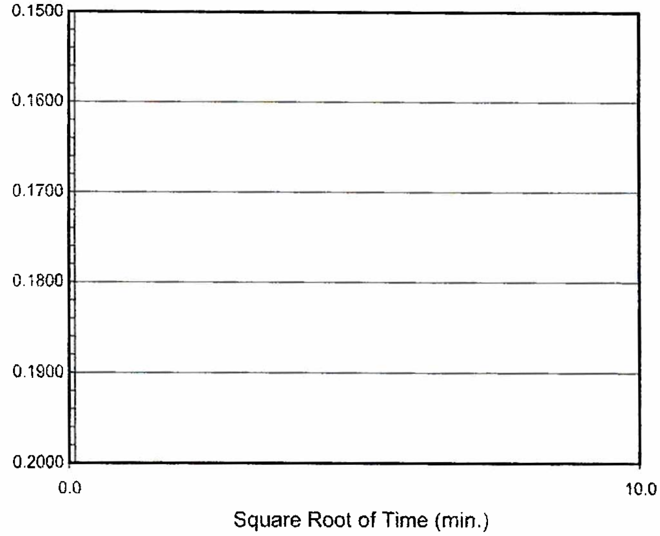
Leighton

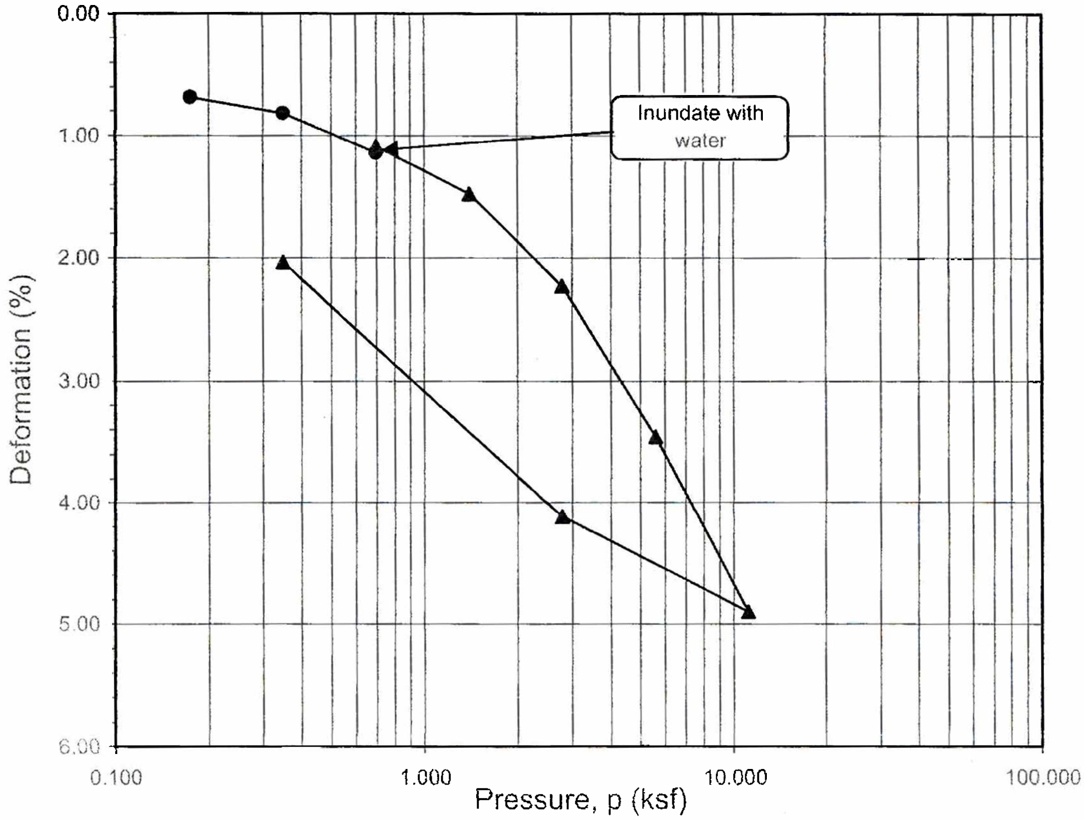
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435

Rev. 02-05







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-7	**R-1**	**1.5**	**29.7**	**31.9**	**1437.0**	**1467.4**	**0.878**	**0.840**	**91**	**100**

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

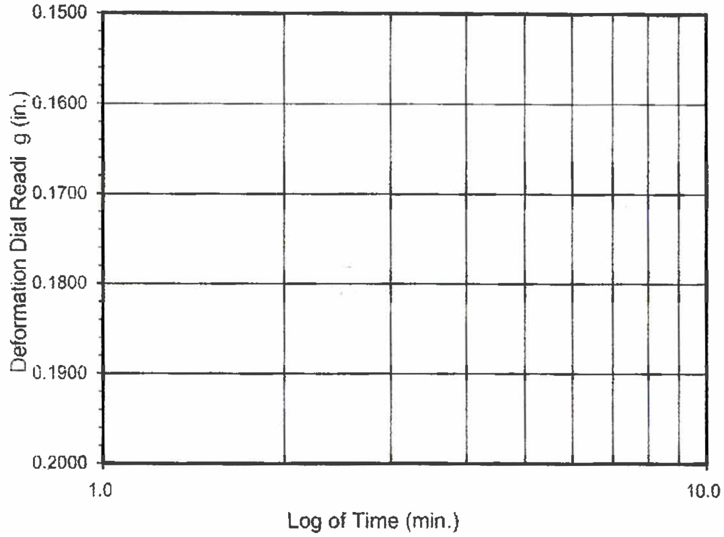
Leighton

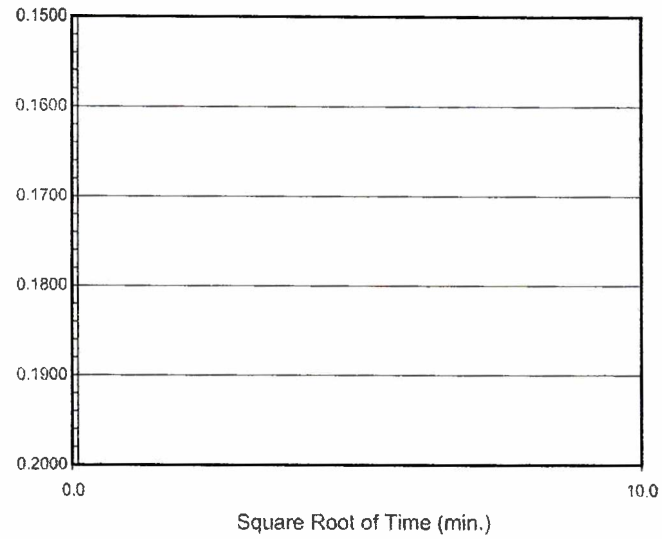
Project No.:	600158-905
Project Name:	SR-125 / 905

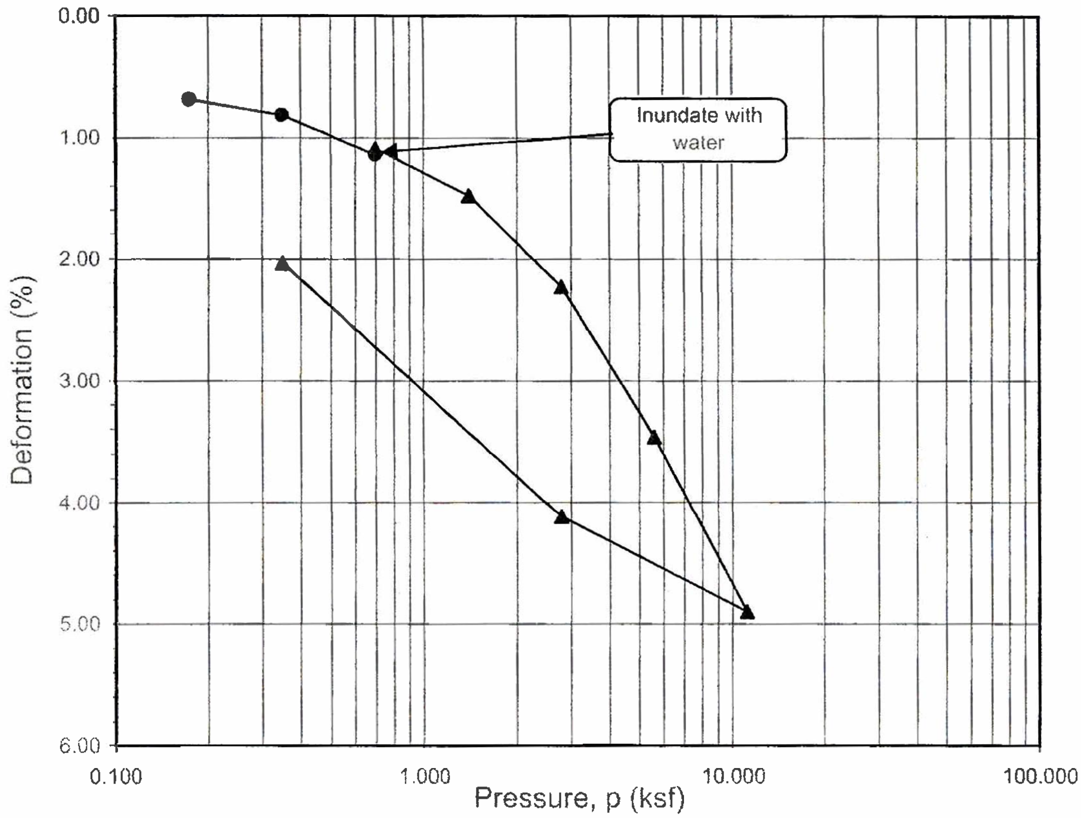
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-7	**R-1**	**1.5**	**29.7**	**31.9**	**1437.0**	**1467.4**	**0.878**	**0.840**	**91**	**100**

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

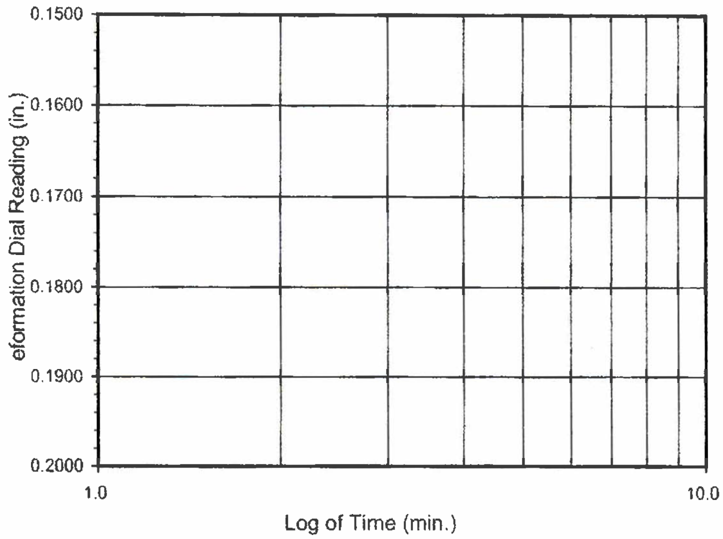
Leighton

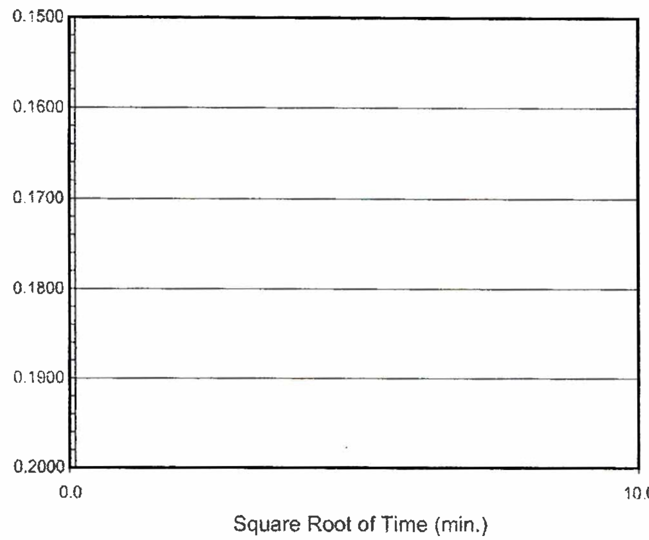
Project No.:	600158-905
Project Name:	SR-125 / 905

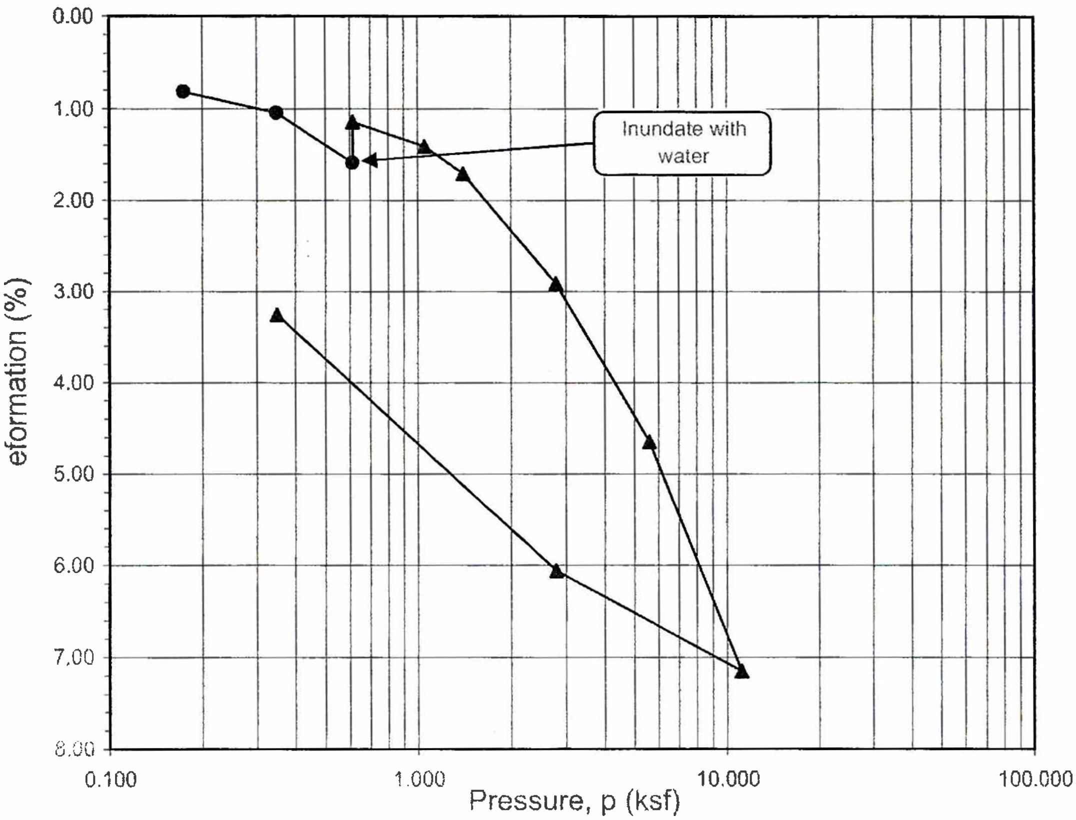
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04







Boring No.	Sample No.:	Depth (m.)	Moisture Content (%)		Dry Density (kg/m3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-10	**R-1**	**1.5**	**19.8**	**21.2**	**1610.0**	**1664.5**	**0.676**	**0.622**	**79**	**92**

Sample Description:

s(CL), LIGHT BROWN SANDY LEAN CLAY.

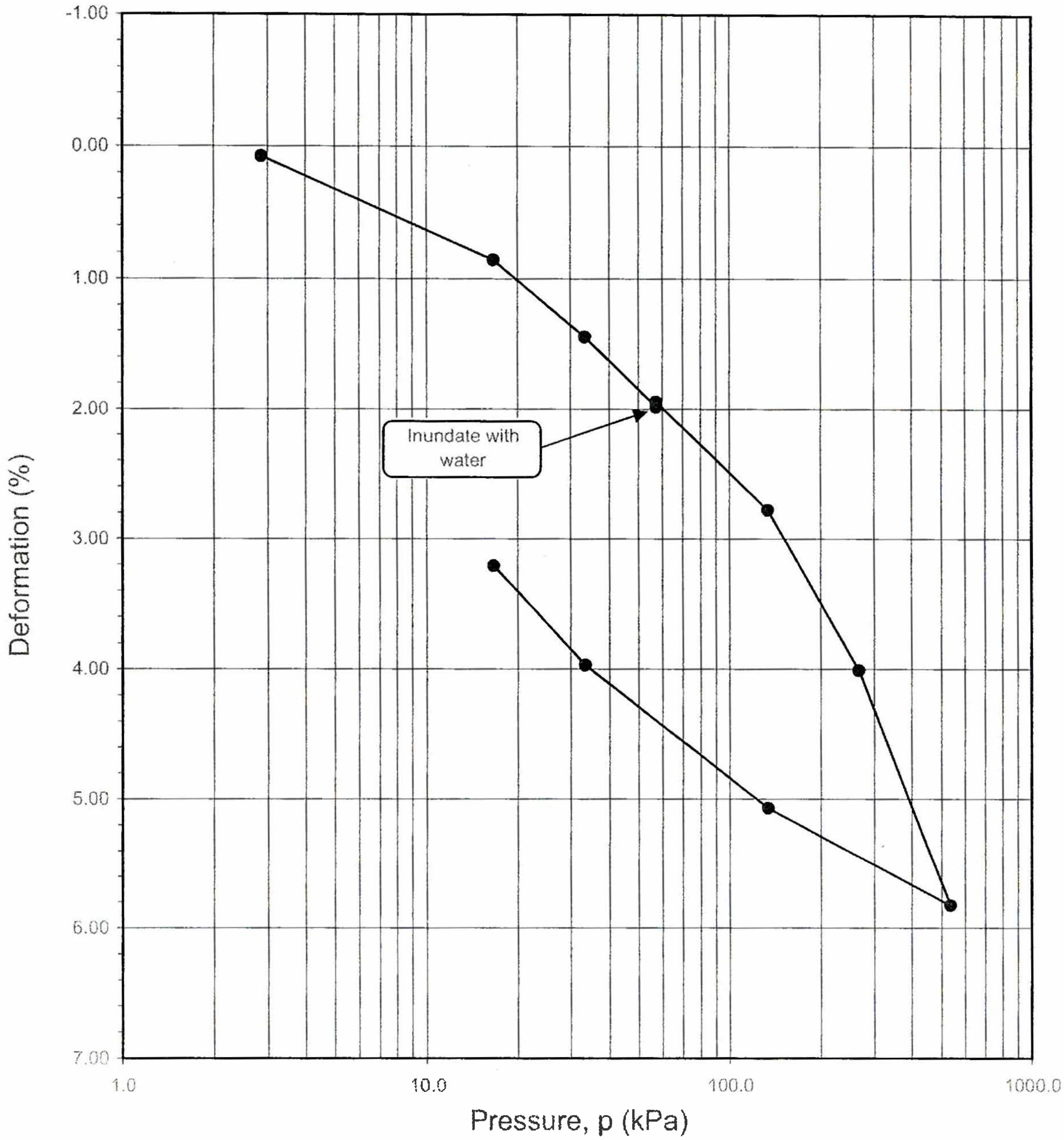
Leighton

Project No.:	600158-905
Project Name:	SR-125 / 905

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-14	**R-1**	**3**	**28.7**	**21.4**	**14.45**	**16.21**	**0.835**	**0.776**	**93**	**91**

Sample Description:

Brown lean clay (CL)

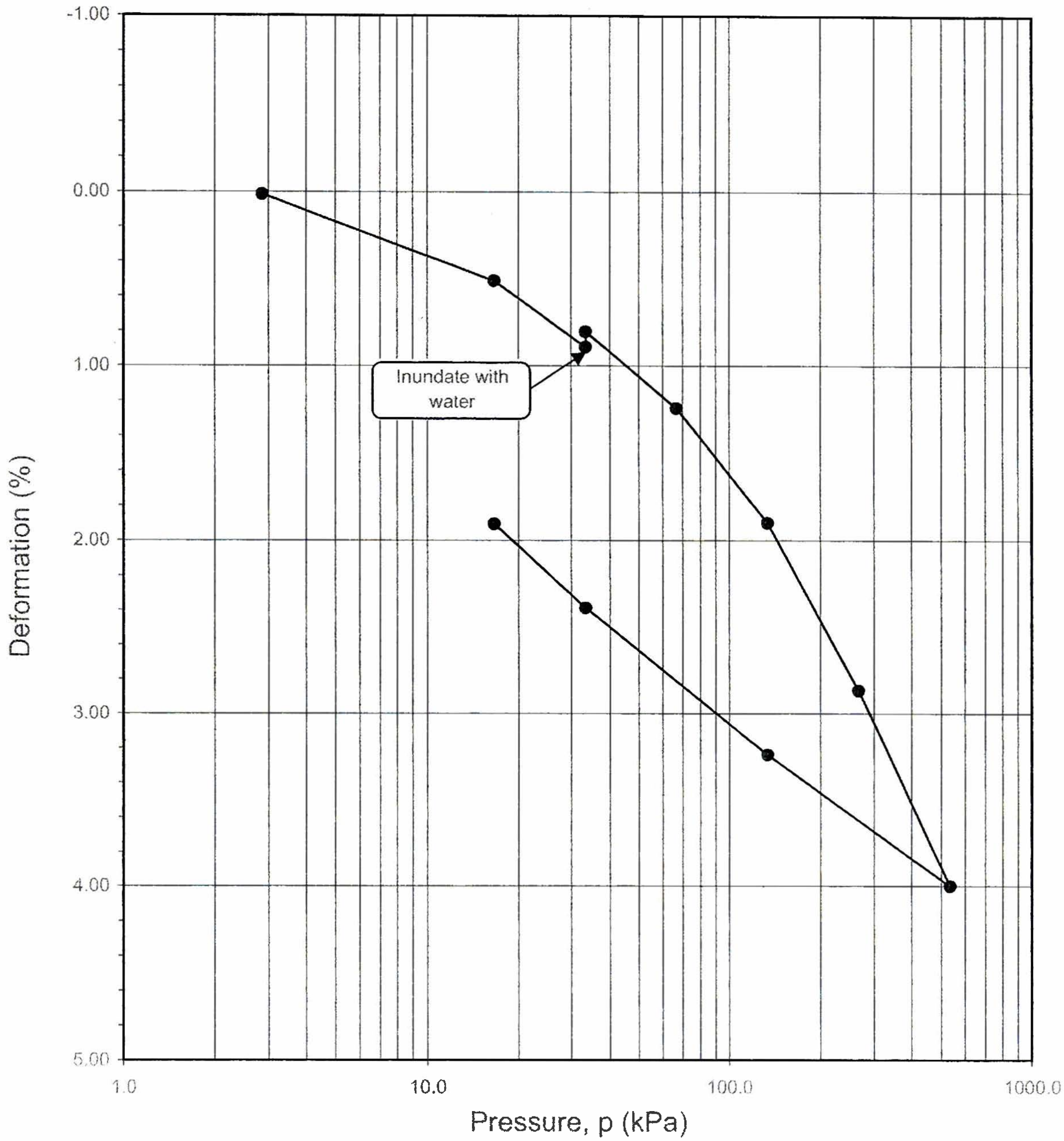
Leighton

Project No.:	600158-905
Project Name:	**SR125 / 905 Interchange**

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-20	**R-1**	**1.5**	**29.5**	**22.5**	**14.32**	**15.32**	**0.851**	**0.815**	**94**	**83**

Sample Description:

Brown lean clay (CL)

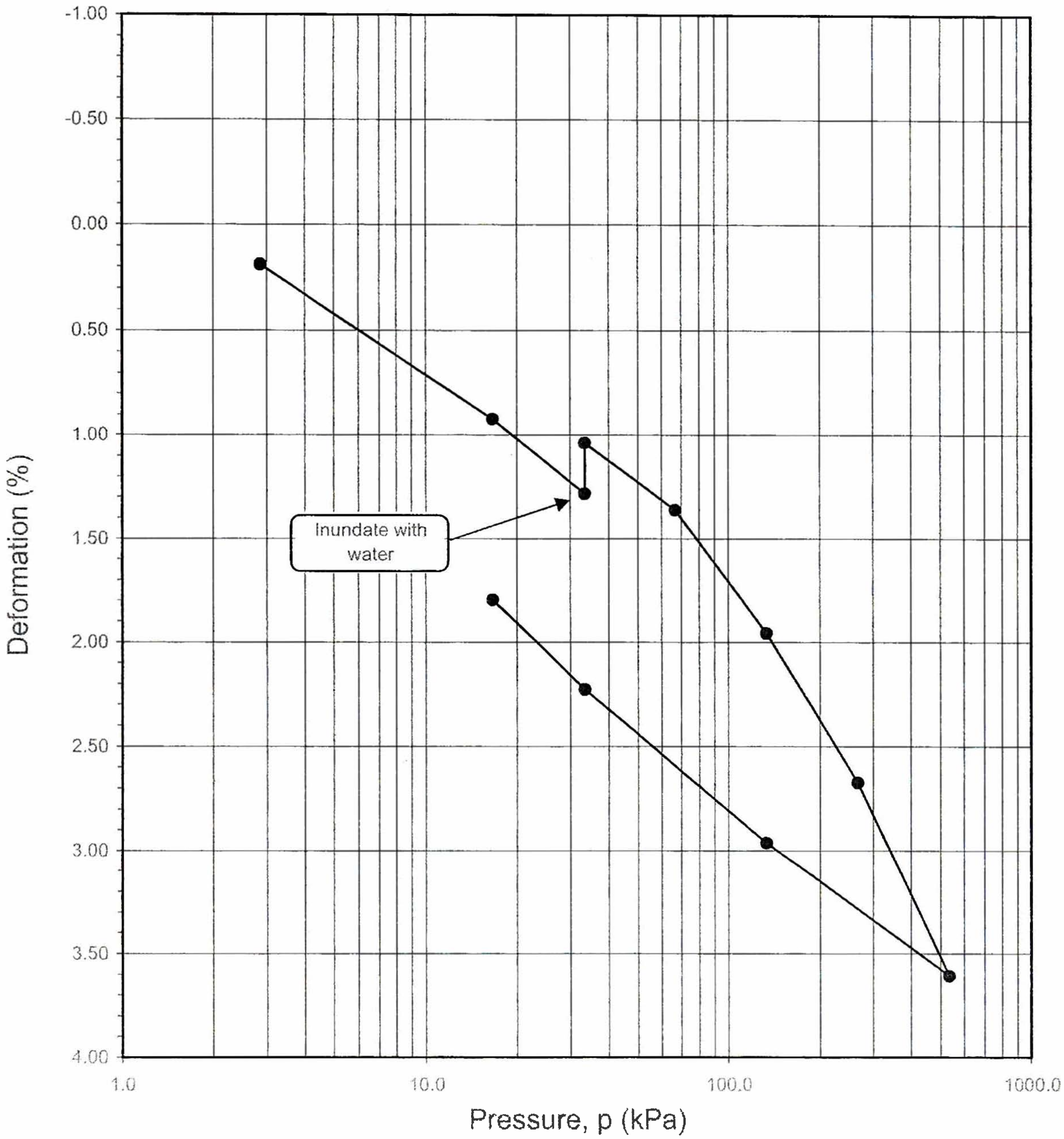
Leighton

Project No.:	600158-905
Project Name:	SR125 / 905 Interchange

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05



Boring No.	Sample No.:	Depth (m)	Moisture Content (%)		Dry Density (kN/m^3)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-20	R-3	**9.1**	**21.0**	**18.3**	**16.18**	**16.89**	**0.638**	**0.608**	**89**	**87**

Sample Description:

Light grayish brown silty sand (SM)

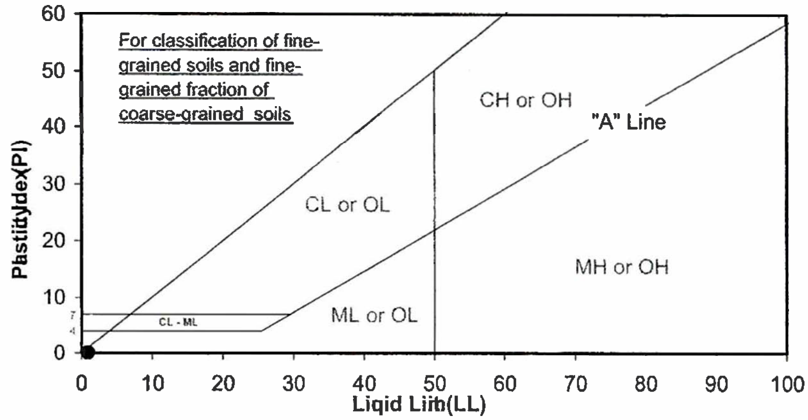
Leighton

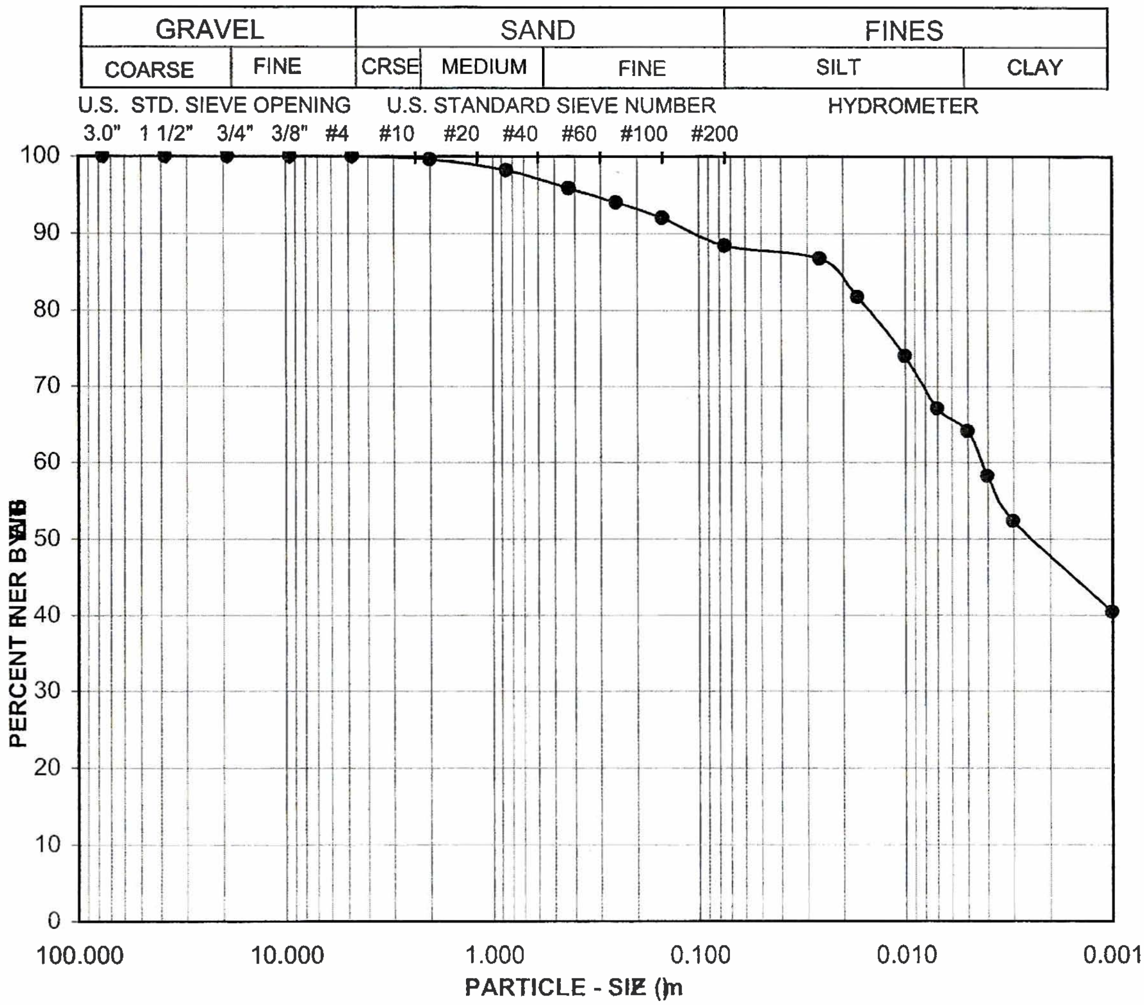
Project No.:	600158-905
Project Name:	SR125 / 905 Interchange

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

CTM 219 ASTM D 2435 ASTM D 5333

Rev. 02-05





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-1	B-1	0.3-1.5	(CL-ML)	0:12:88	**

Sample Description:
(CL-ML), PALE BROWN SILTY LEAN CLAY WITH FEW TO LITTLE SAND.

Leighton

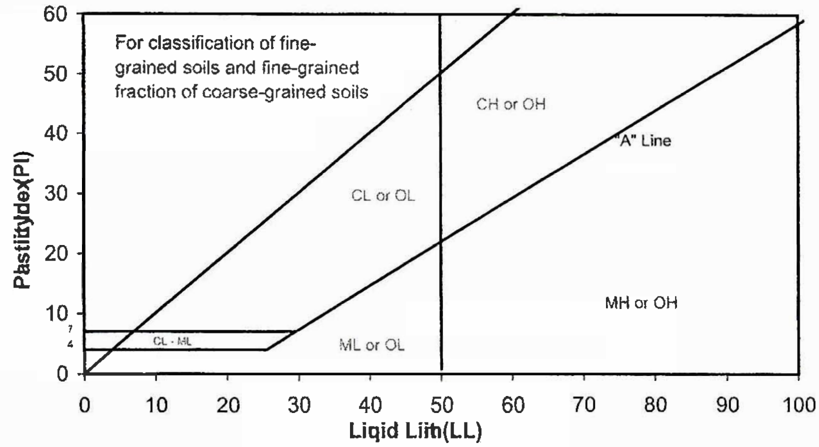
Project No.: 600158-905

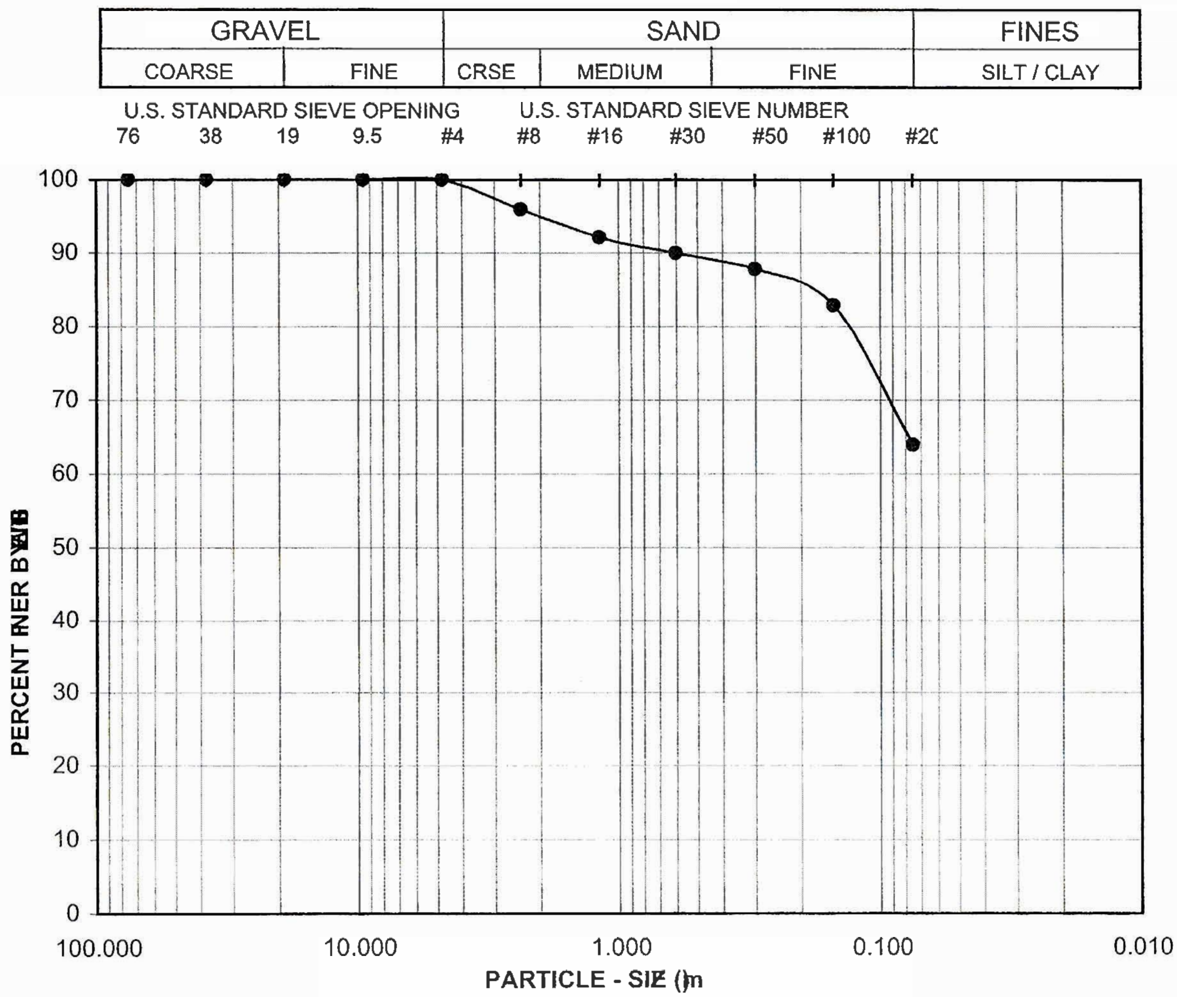
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S1	3.0-3.4	s(ML)	0 : 36 : 64	NP

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

Project No.: 600158-905

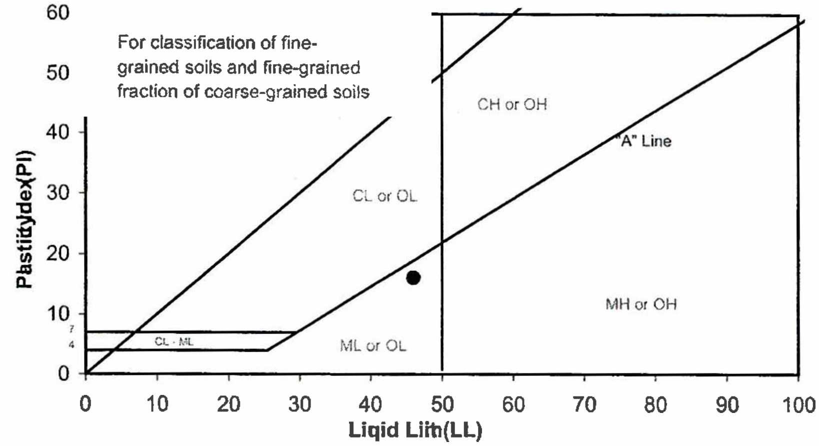
SR-125 / 905

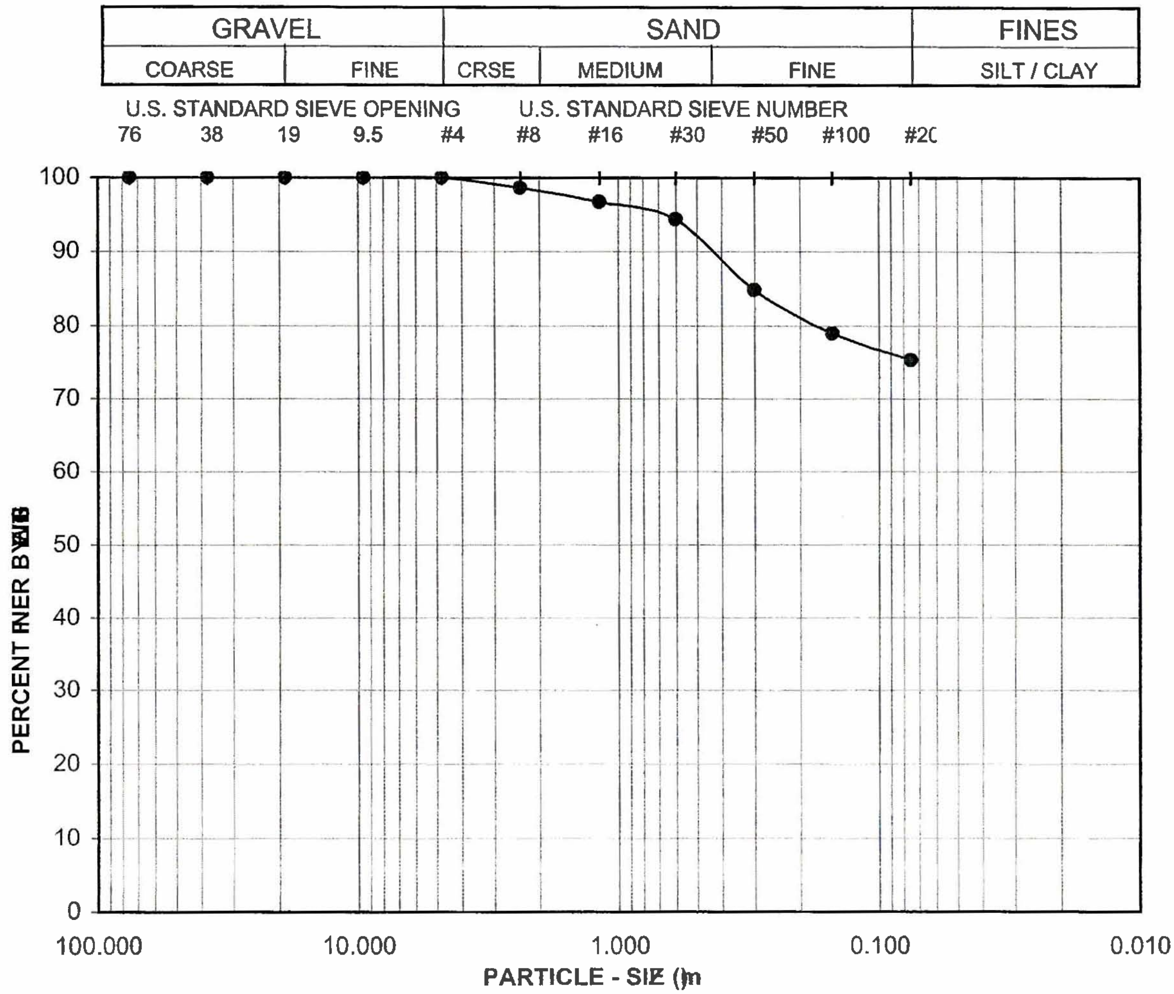
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-1,S1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-1	S3	9.1-9.4	(ML)s	0 : 25 : 75	N/A

Project No.: 600158-905

SR-125 / 905

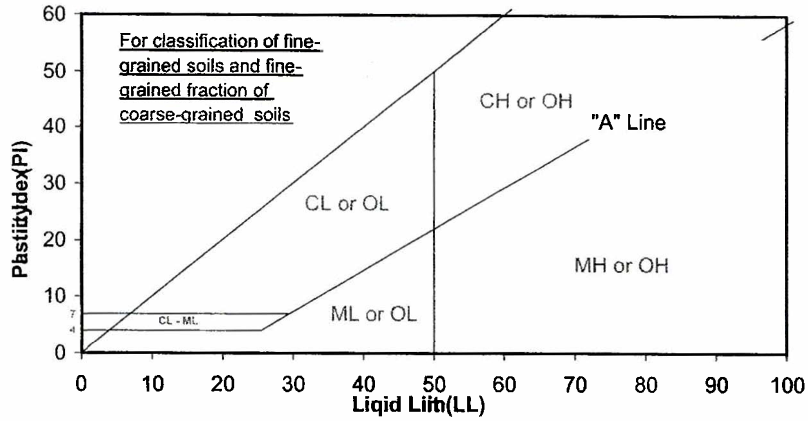
Visual Sample Description:
(ML)s: PALE BROWN LEAN SILT WITH SAND

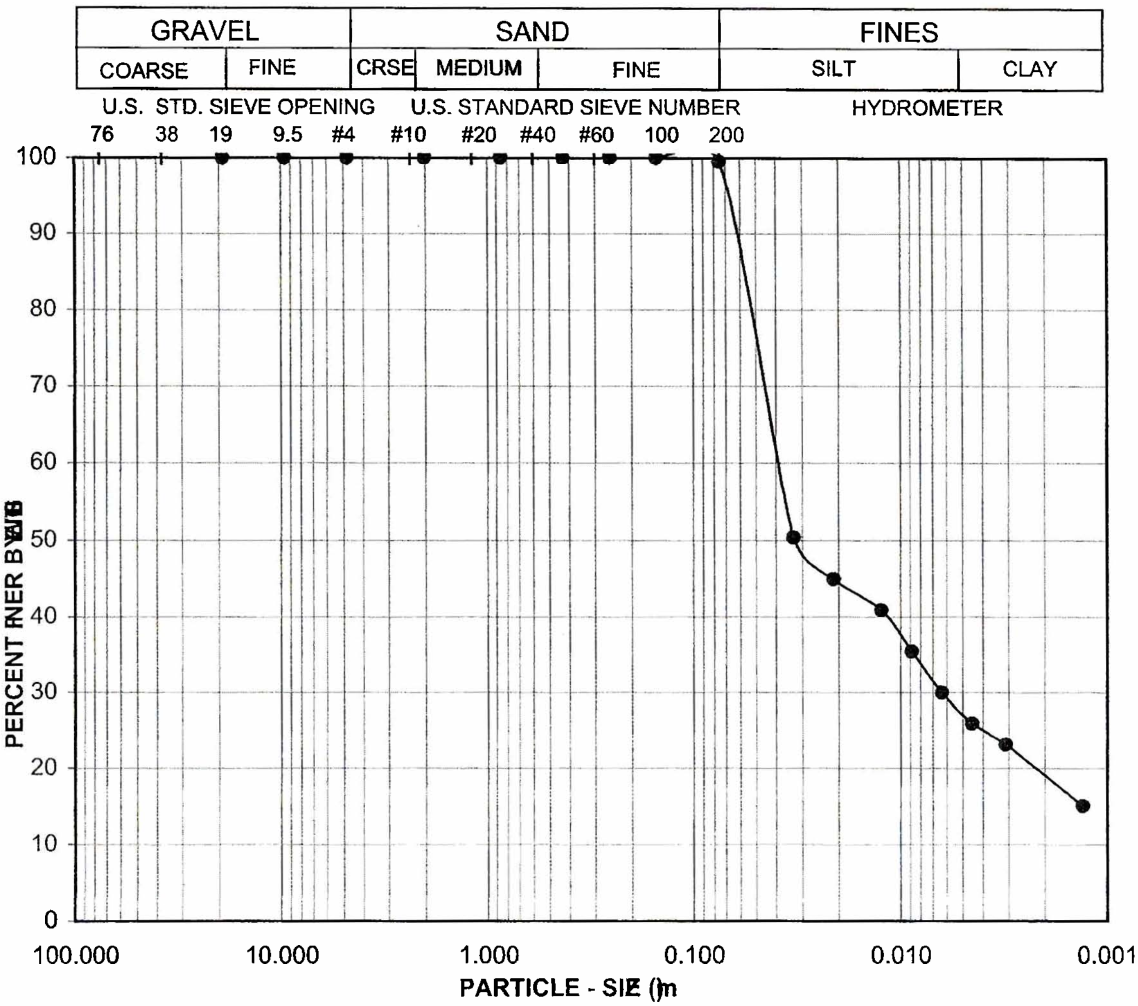
Leighton

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

Rev. 8-07

SIEVE B-1,S3





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S4	10.7-11.1	CH	0:0:100	79:34:45

Sample Description:
CH: PALE BROWN HEAVY CLAY

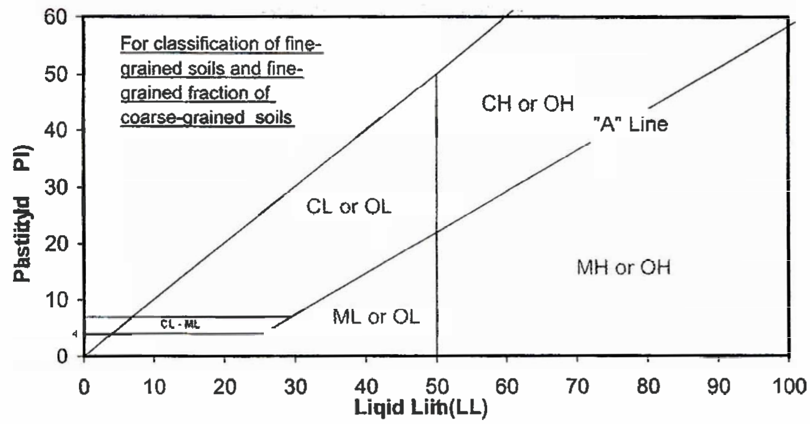
Leighton

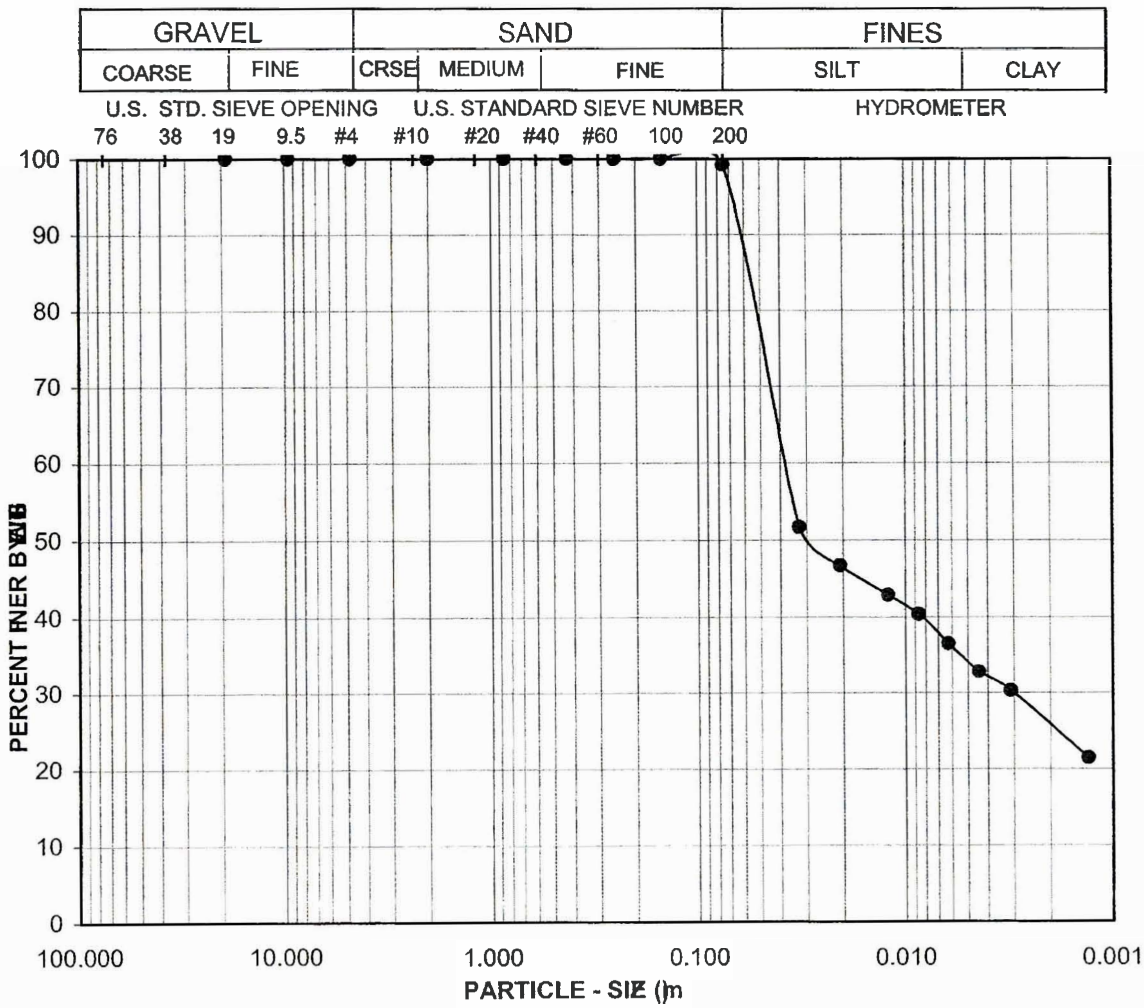
Project No.: 600158-905

SR-125 / 905

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

Rev. 8-07





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-2	S6	16.8-17.2	CL	0:0:100	N/A

Sample Description:
CL: PALE RED-BROWN LEAN CLAY

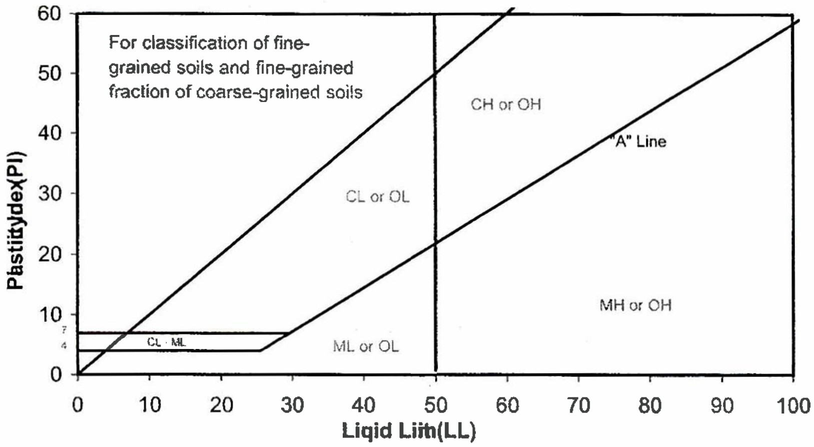
Leighton

Project No.: 600158-905

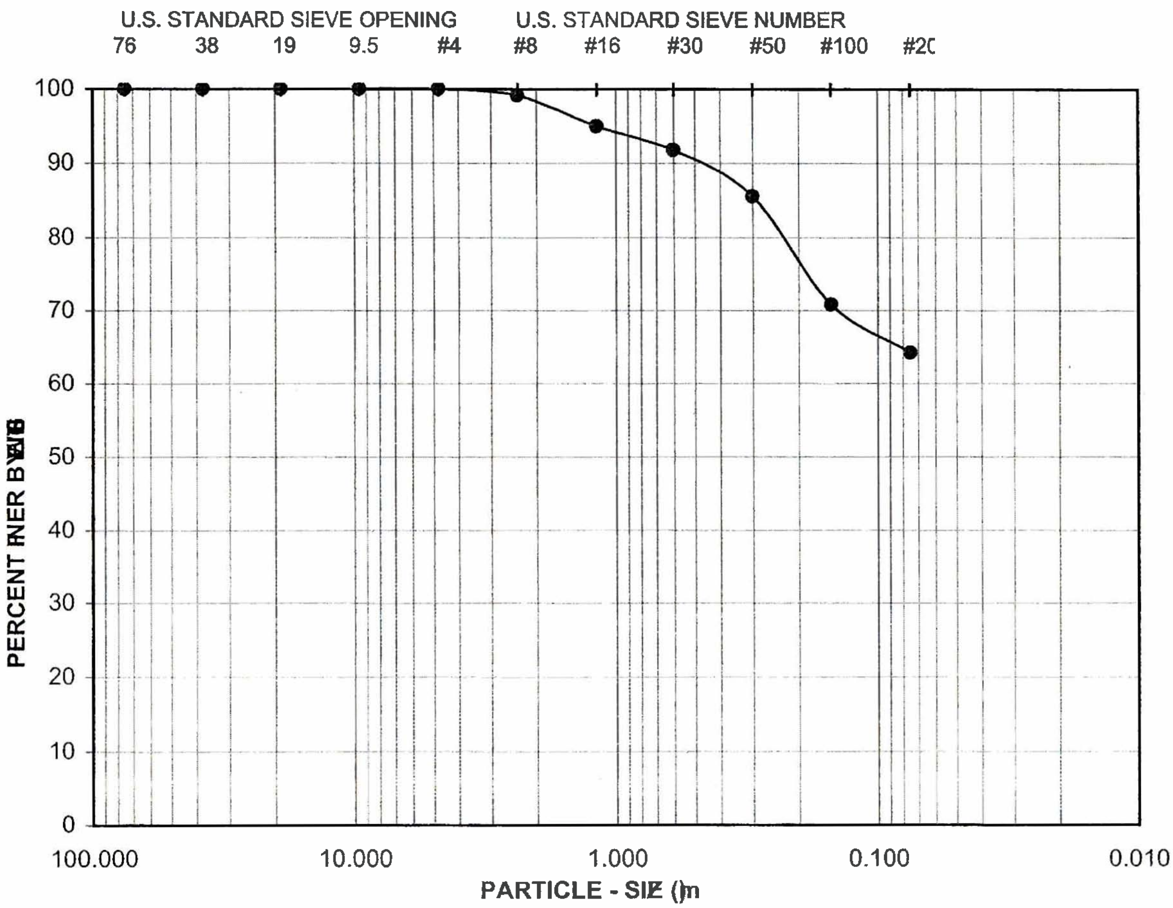
SR-125 / 905

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

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-2	S8	22.9-23.2	s(ML)	0 : 36 : 64	N/A

Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

Leighton

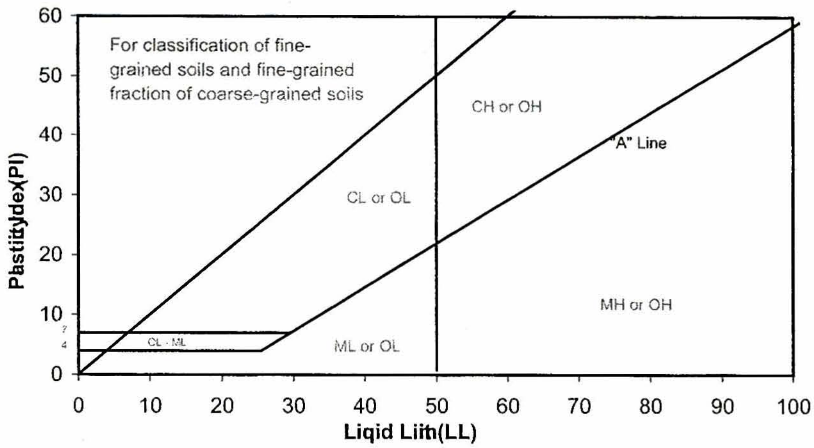
Project No.: 600158-905

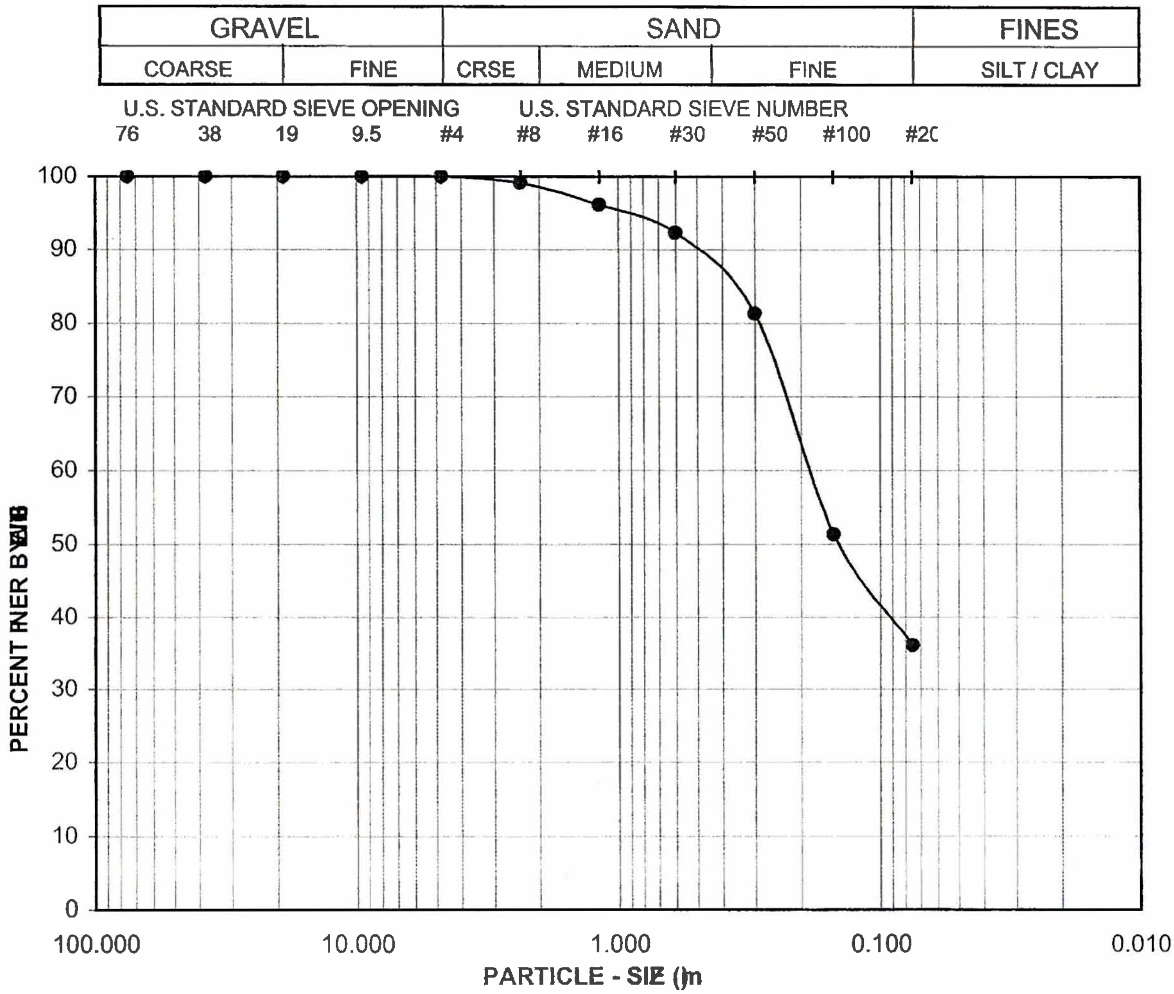
SR-125 / 905

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

Rev. 8-07

SIEVE B-2.S8





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S1	4.6-5.0	SM	0 : 64 : 36	N/A

Visual Sample Description:
SM: PALE BROWN SILTY SAND

Leighton

Project No.: 600158-905

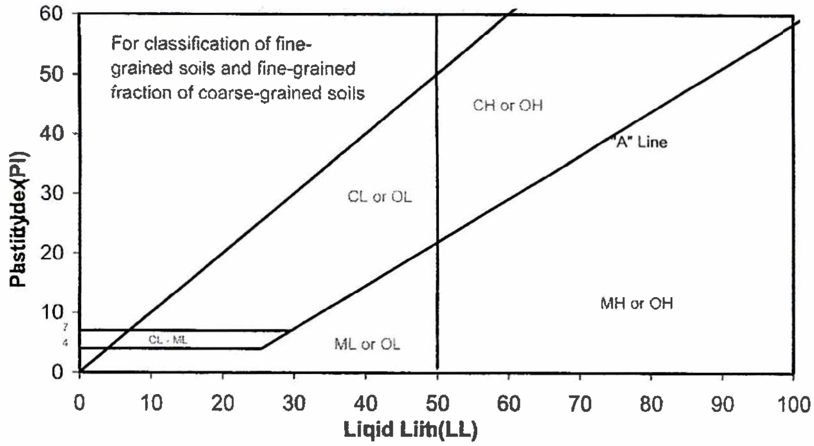
SR-125 / 905

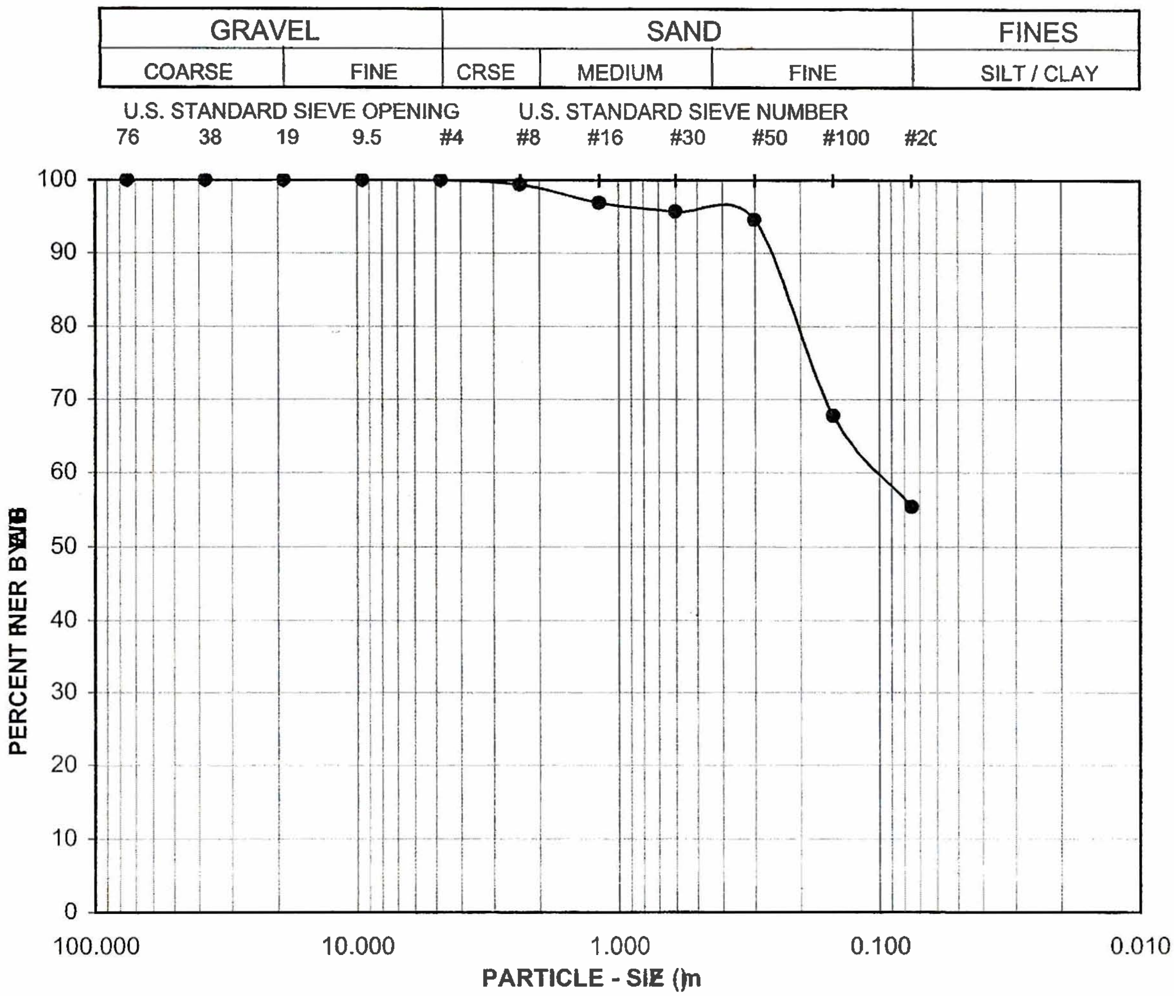
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 8-07

SIEVE B-3,S1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-3	S3	10.7-11.1	s(ML)	0 : 45 : 55	N/A

Project No.: 600158-905

SR-125 / 905

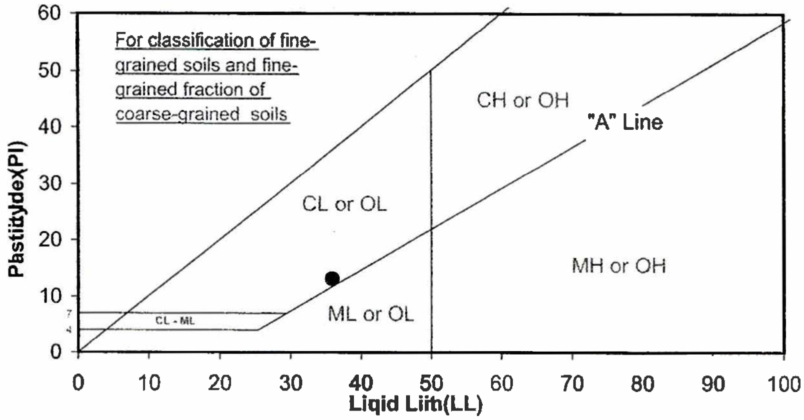
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

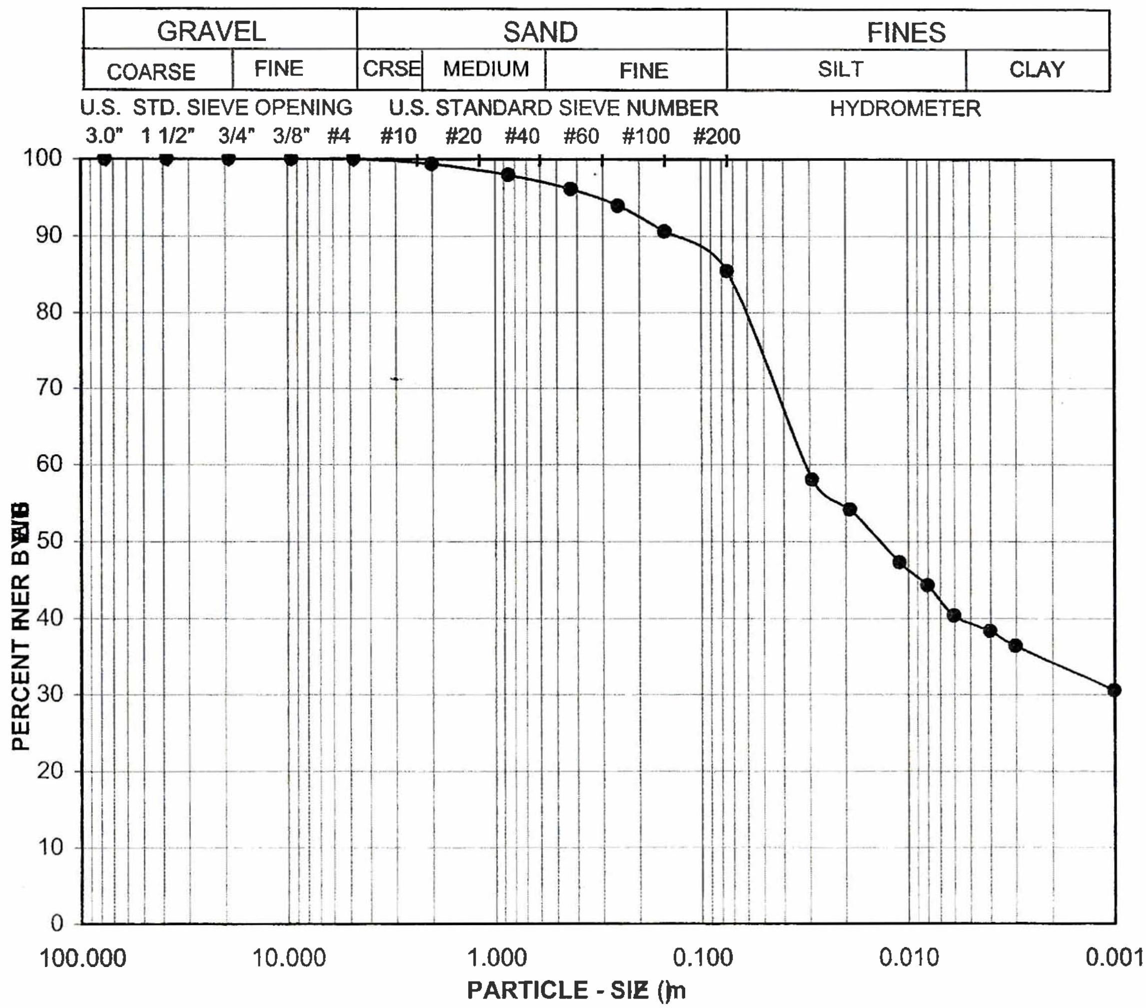
Leighton

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

Rev. 8-07

SIEVE B-3,S3





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	B-1	0.3-1.5	(ML-CL)s	0:15:85	36:23:13

Sample Description:
(ML-CL)s, DARK OLIVE BROWN CLAYEY SILT WITH SAND.

Leighton

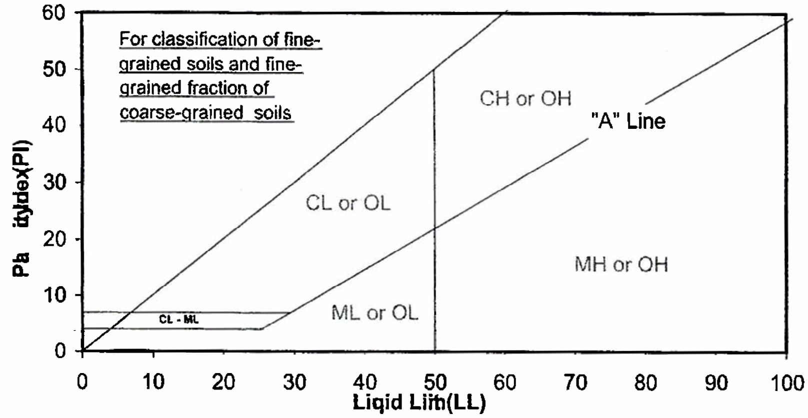
Project No.: 600158-905

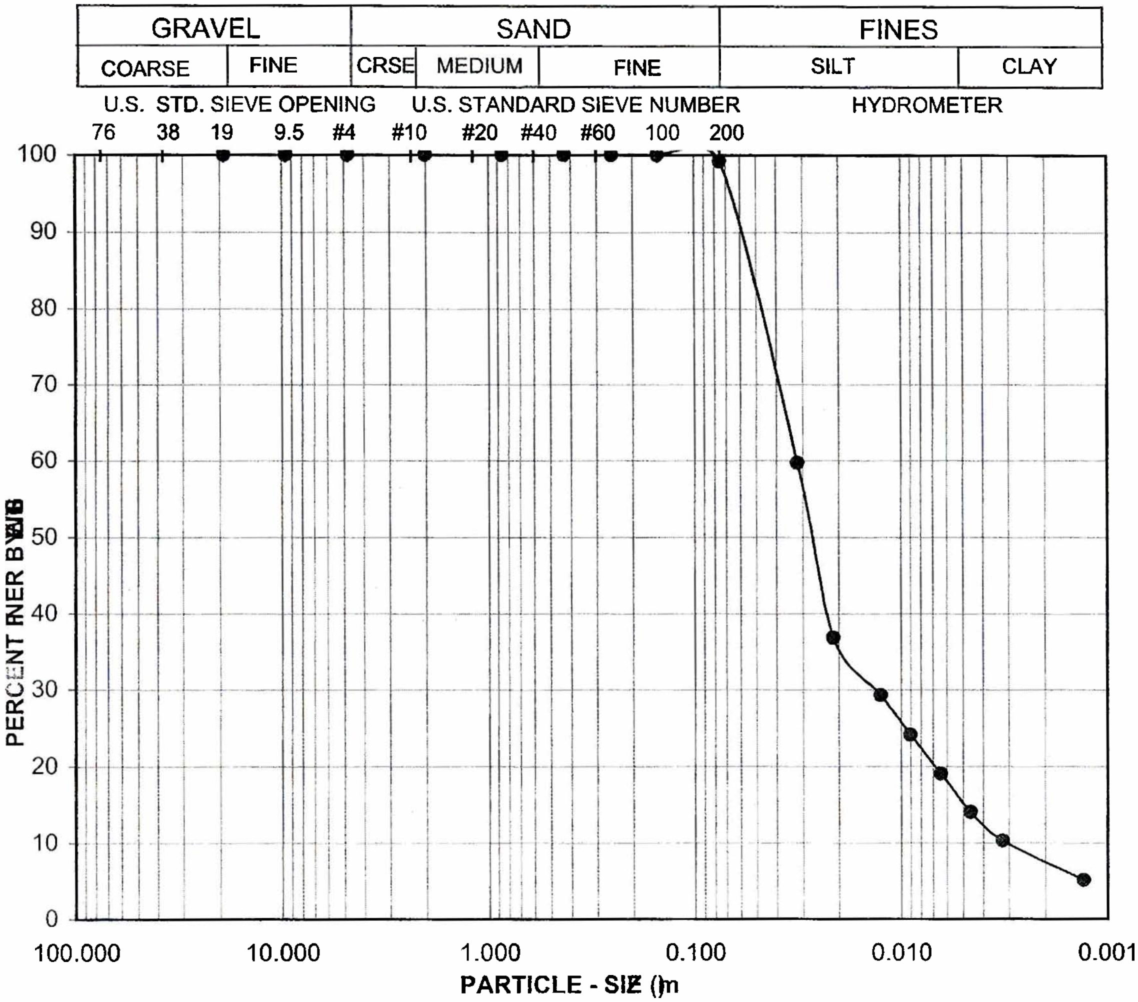
SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04





Location	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-4	S1	3.0-3.4	ML-CL	0:0:100	N/A

Sample Description:
ML-CL: PALE BROWN CLAYEY LEAN SILT

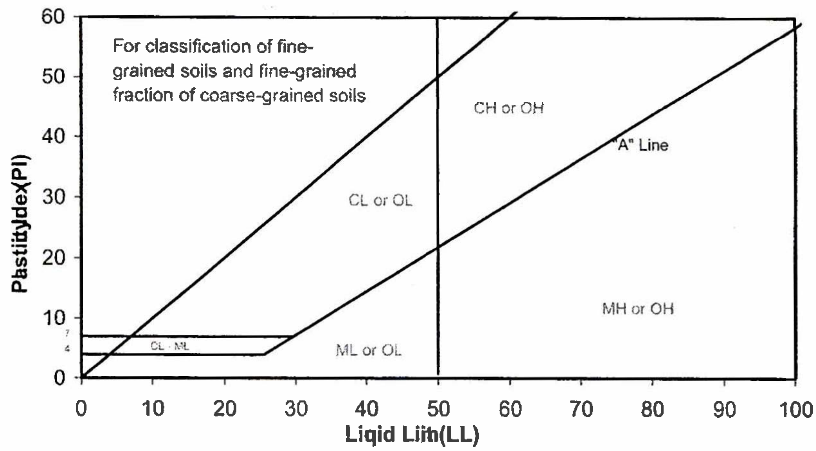
Leighton

Project No.: 600158-905

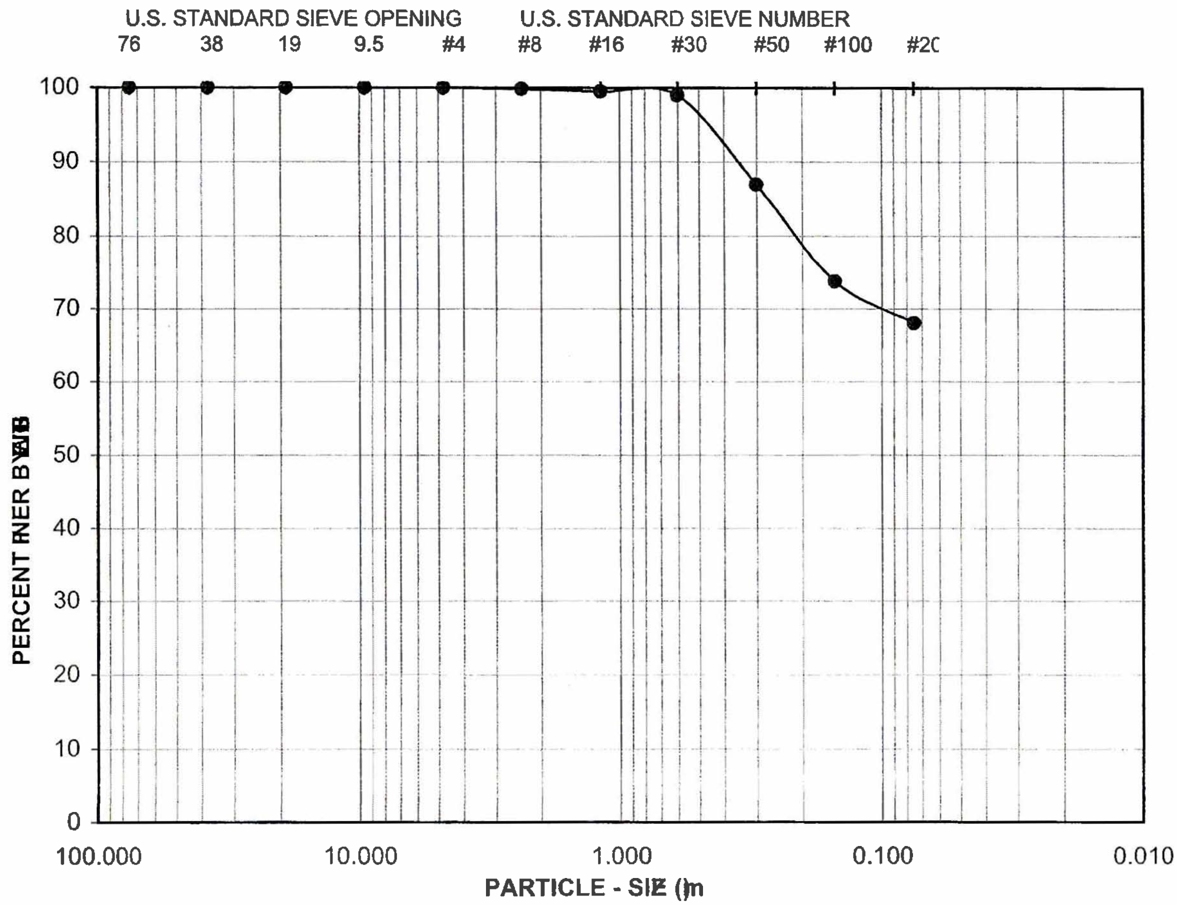
SR-125 / 905

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

Rev. 8-07



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
B-4	S3	7.6-7.9	s(ML)	0 : 32 : 68	N/A

Project No.: 600158-905

SR-125 / 905

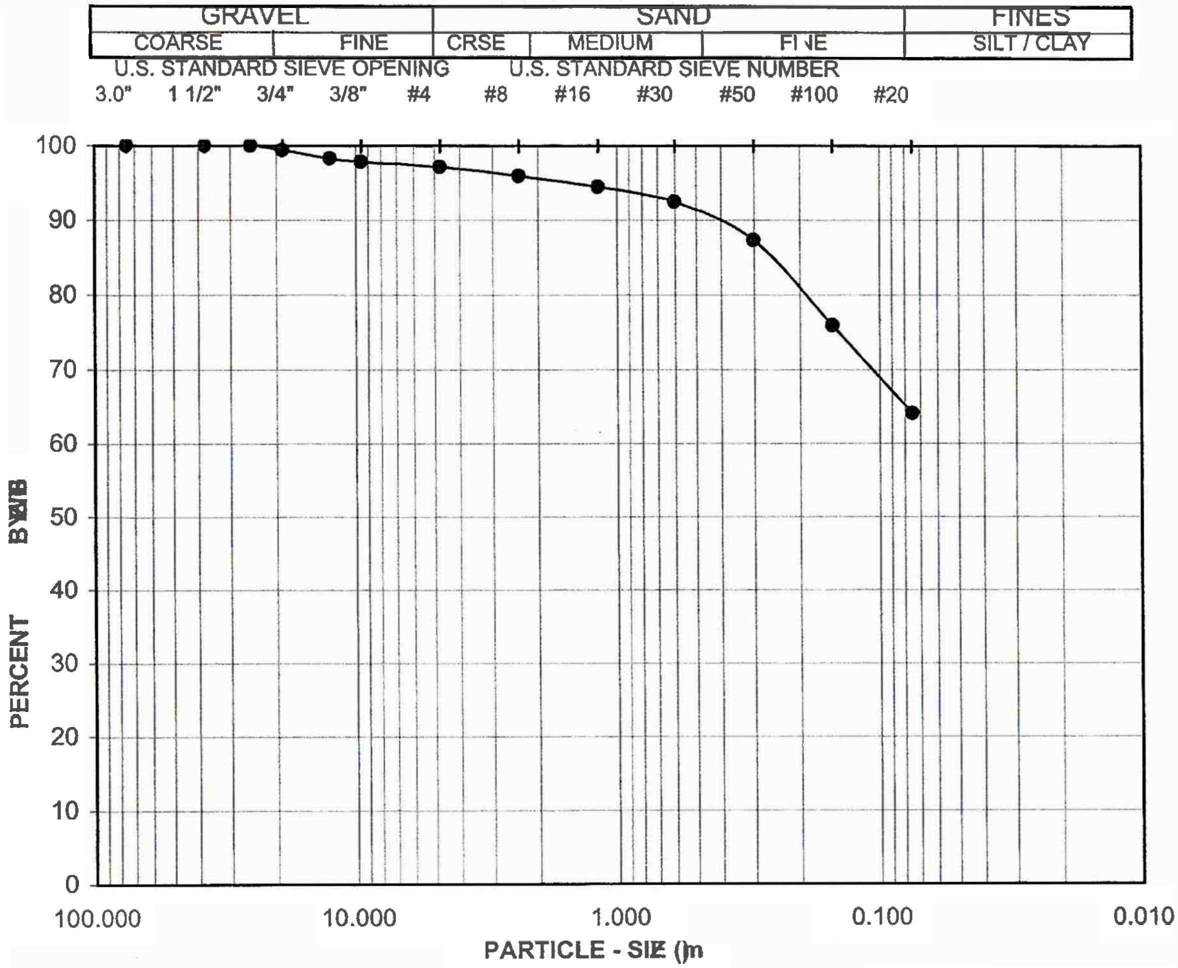
Visual Sample Description:
s(ML): PALE BROWN SANDY LEAN SILT

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

Leighton

Rev. 8-07

SIEVE B-4,S3



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI
B-5	B-1	5-10.0	s(CL)	3 : 33 : 64

Visual Sample Description:

s(CL), DARK BROWN SANDY LEAN CLAY WITH TRACE GRAVEL.

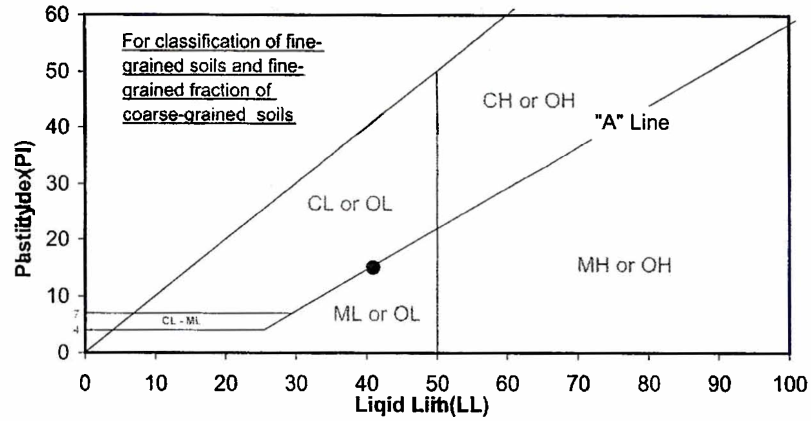
Leighton

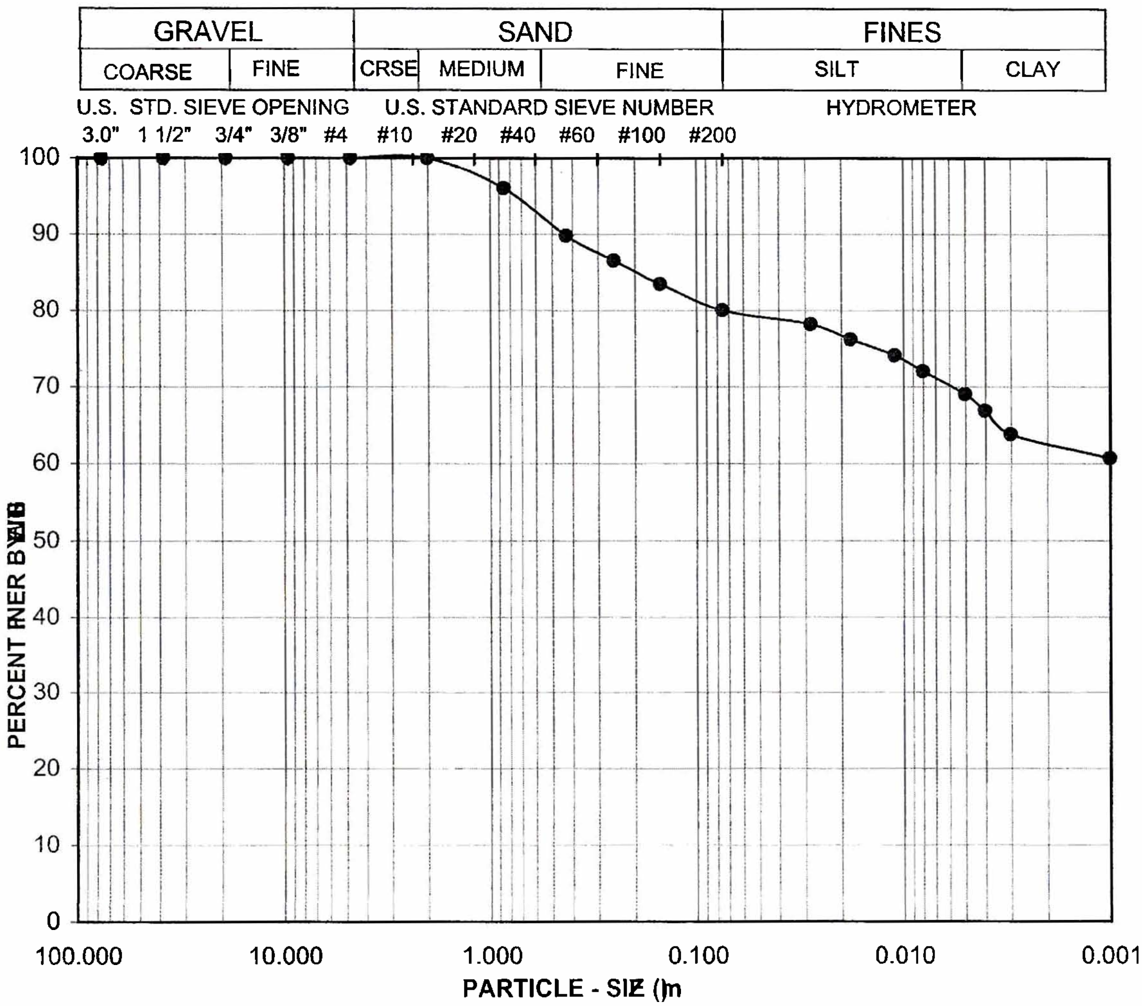
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06





Boring No.	Sample No.	Depth (m)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-7	R-1	1.5	(CL)s	0:20:80	41:26:15

Sample Description:

(CL)s, LIGHT BROWN LEAN CLAY WITH SAND.

Leighton

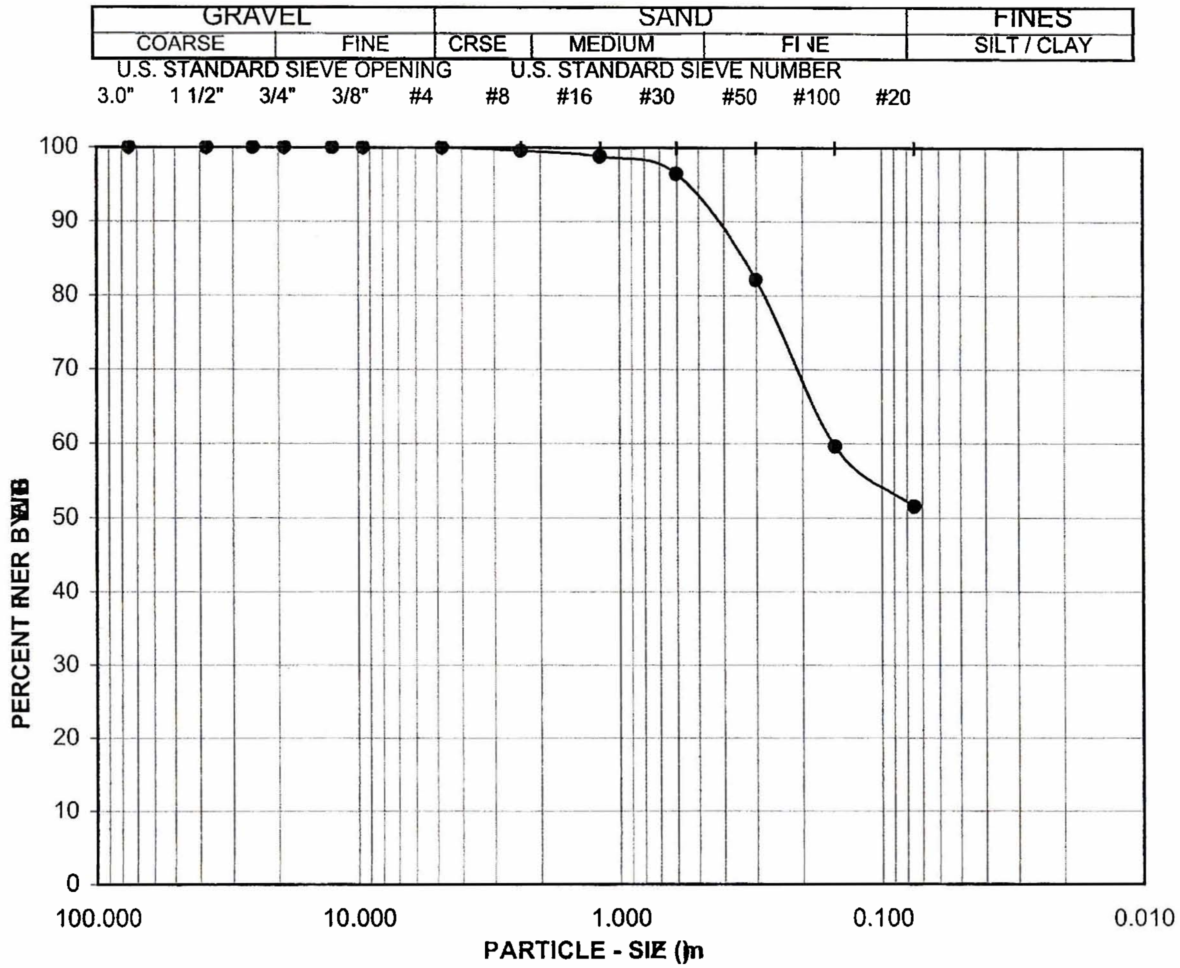
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-10	R-1	1.5	s(CL)	0 : 48 : 52

Visual Sample Description:
s(CL), LIGHT BROWN SANDY LEAN CLAY.

Leighton

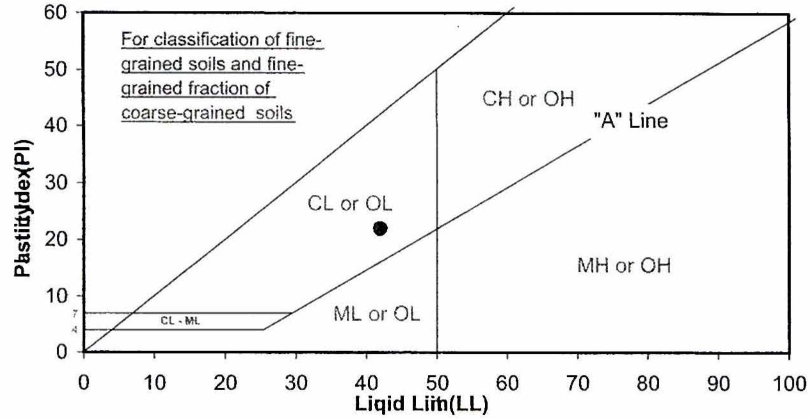
Project No.: 600158-905

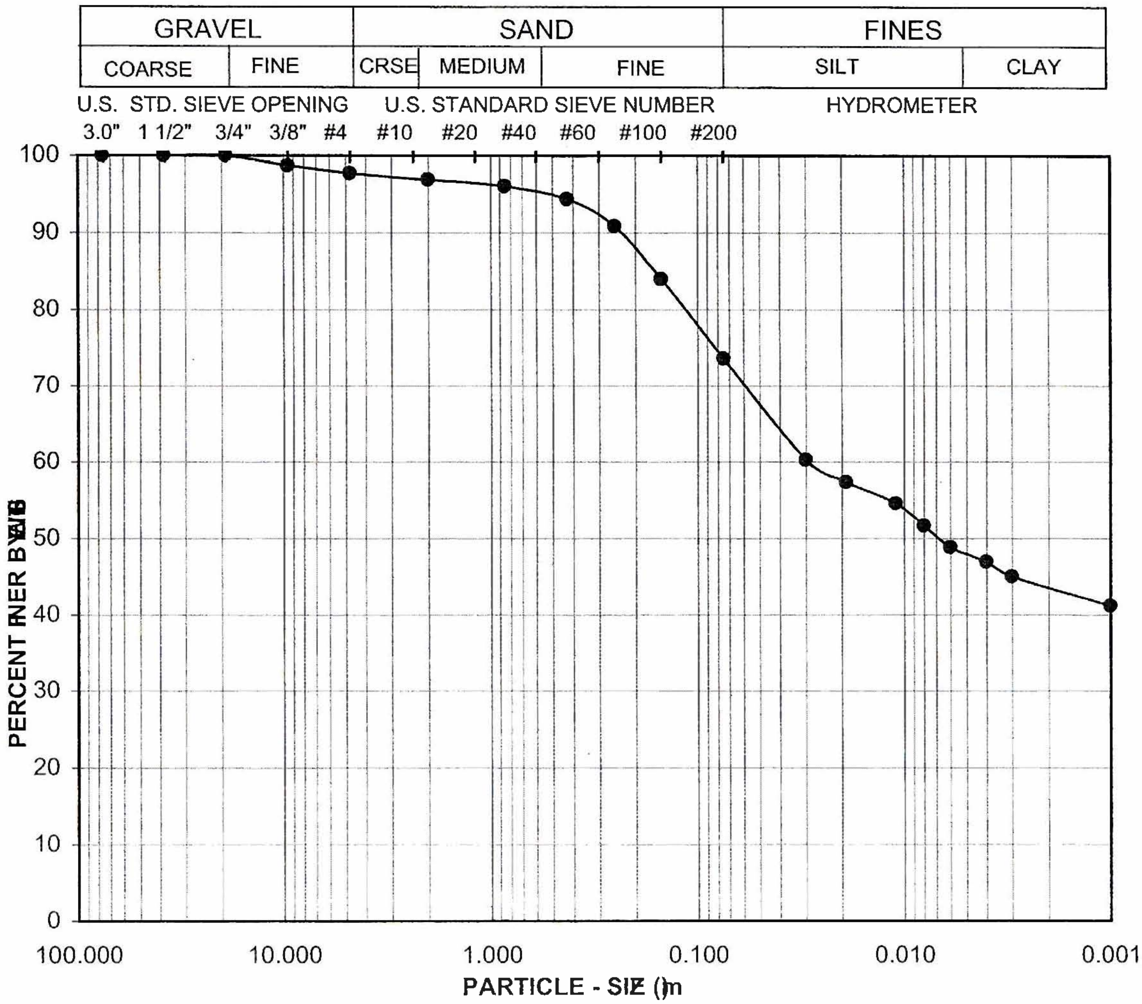
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-10,R-1





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	B-1	0-1.2	(CL)s	2:24:74	42:20:22

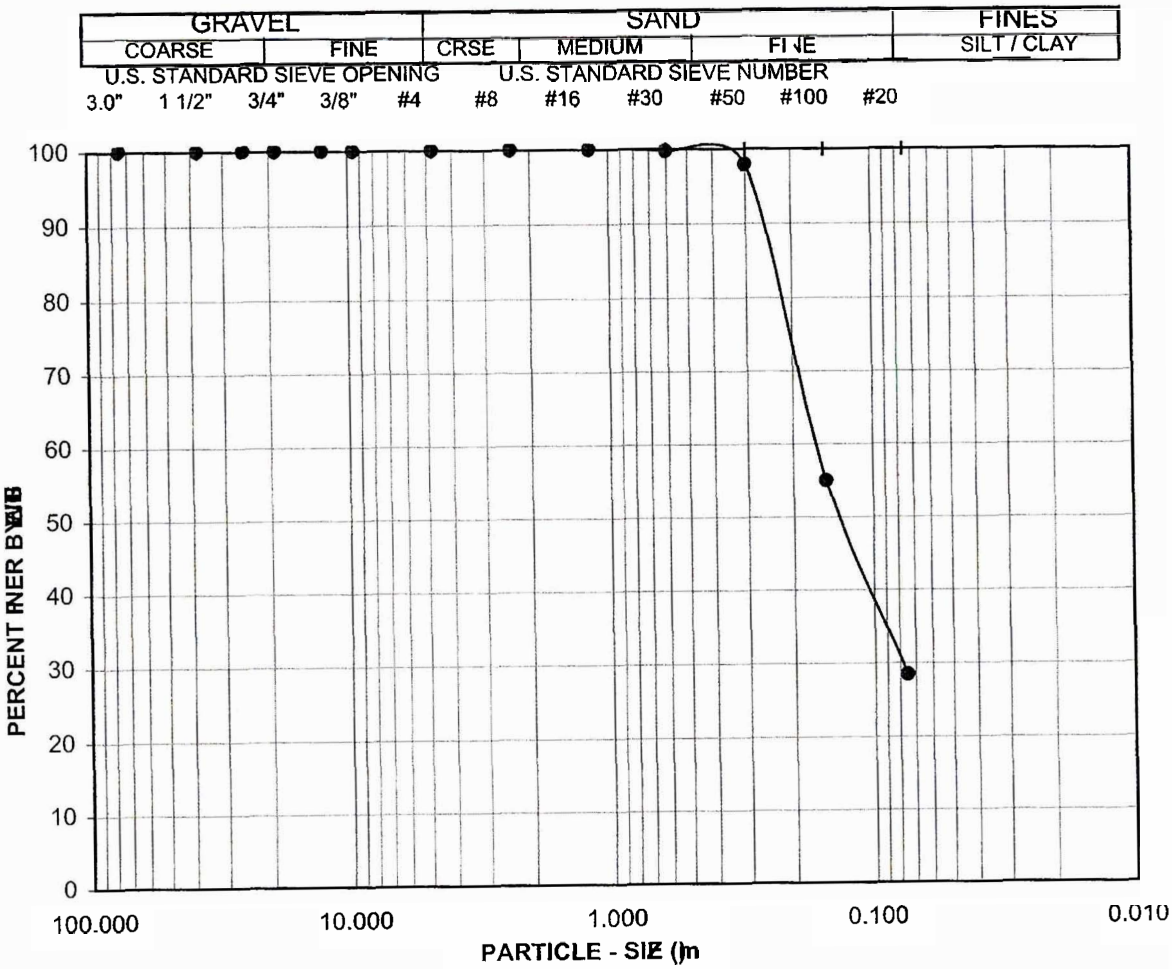
Sample Description:
(CL)s, LIGHT BROWN LEAN CLAY WITH SAND AND TRACE GRAVEL.

Leighton

Project No.: 600158-905
SR-125 / 905

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

Rev. 08-04



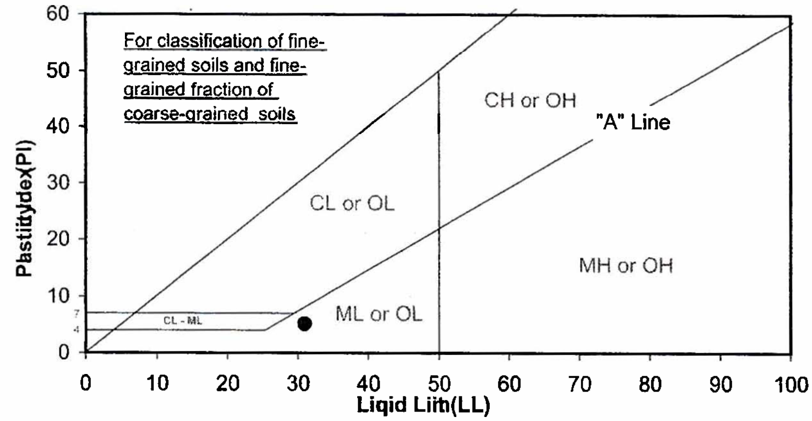
Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-15	S-1	3.0	SM	0 : 72 : 28

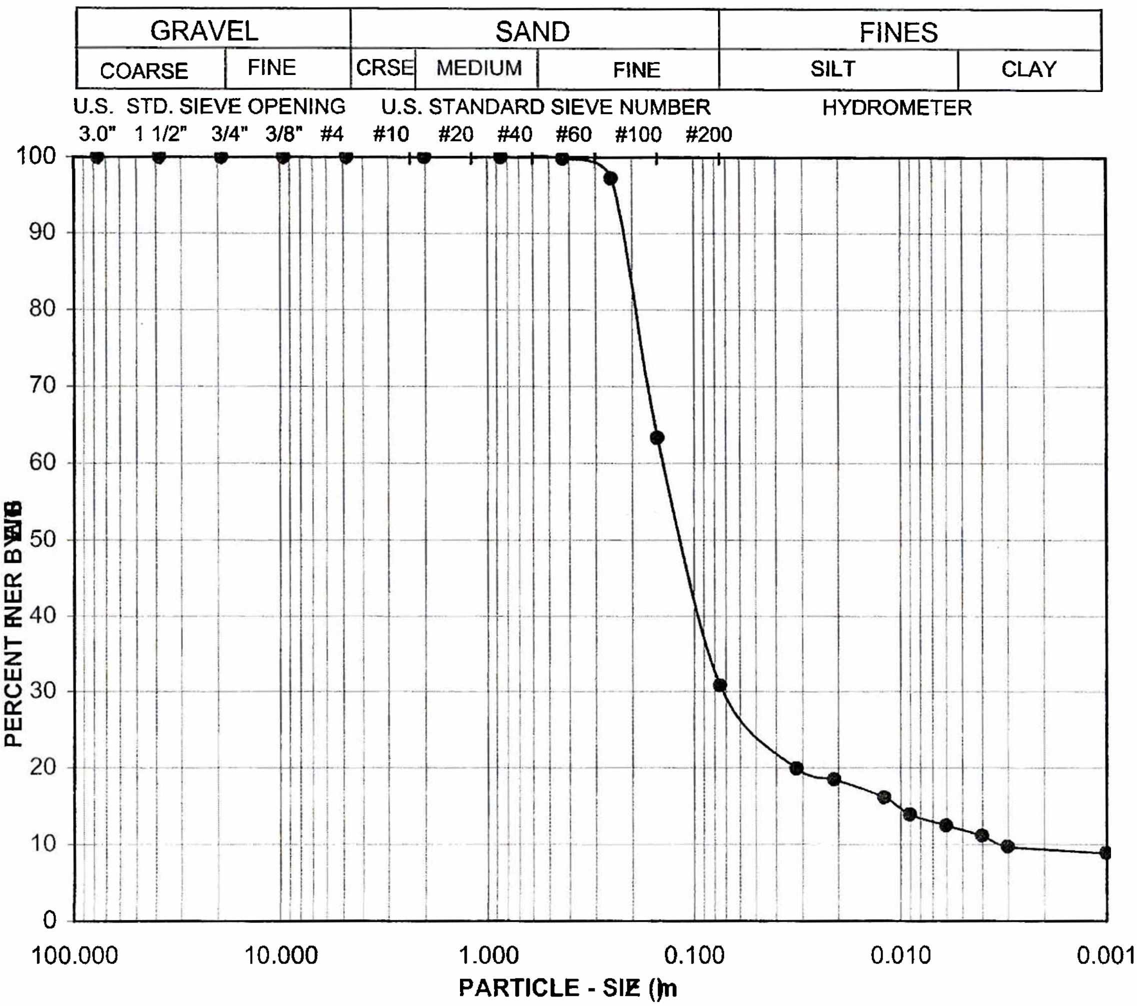
Project No.:	600158-905 SR-125 / 905
	CALTRANS 202

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

Leighton

Rev. 12-06





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-16	S-1	1.5	SM	0:69:31	31:26:5

Sample Description:
SM, BROWN SILTY SAND.

Leighton

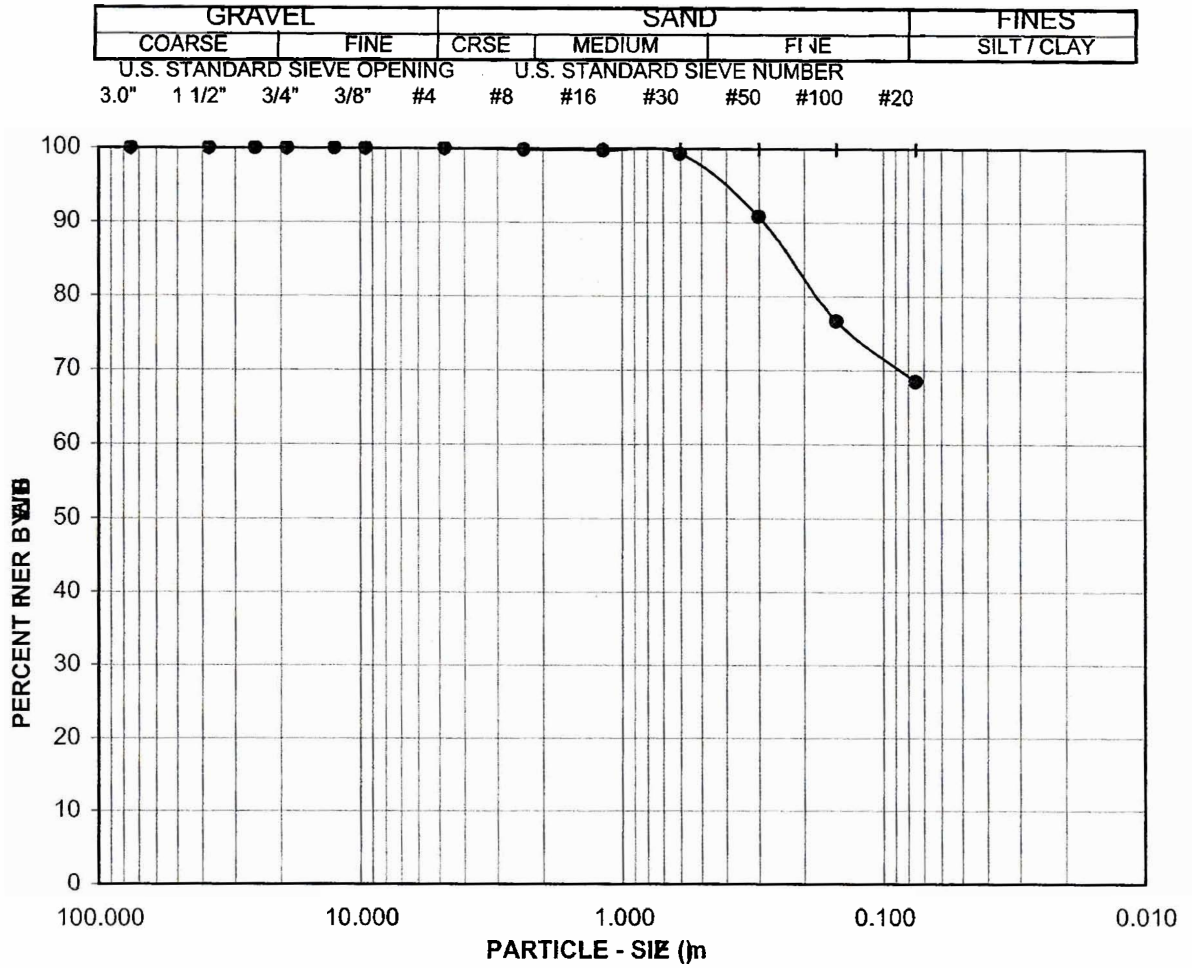
Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-18	B-1	0-1.0	s(CL)	0 : 32 : 68

Visual Sample Description:
s(CL), DARK OLIVE BROWN SANDY LEAN CLAY.

Leighton

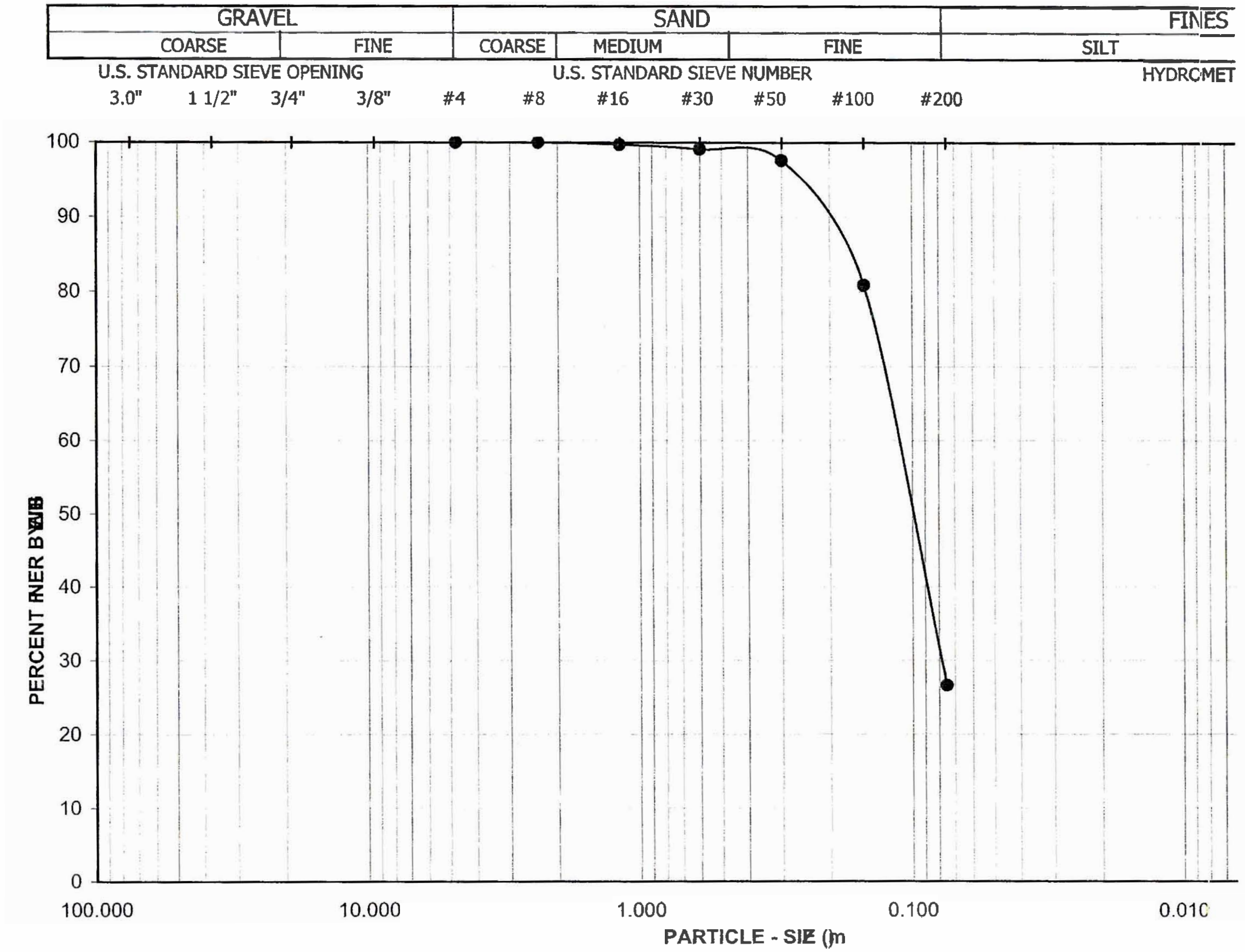
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve,B-18,B-1



Project Name: SR 125 / 905 Interchange

Project No.: 600158-905

Exploration No.: B-19

Sample No.:

Depth (m): 1.5

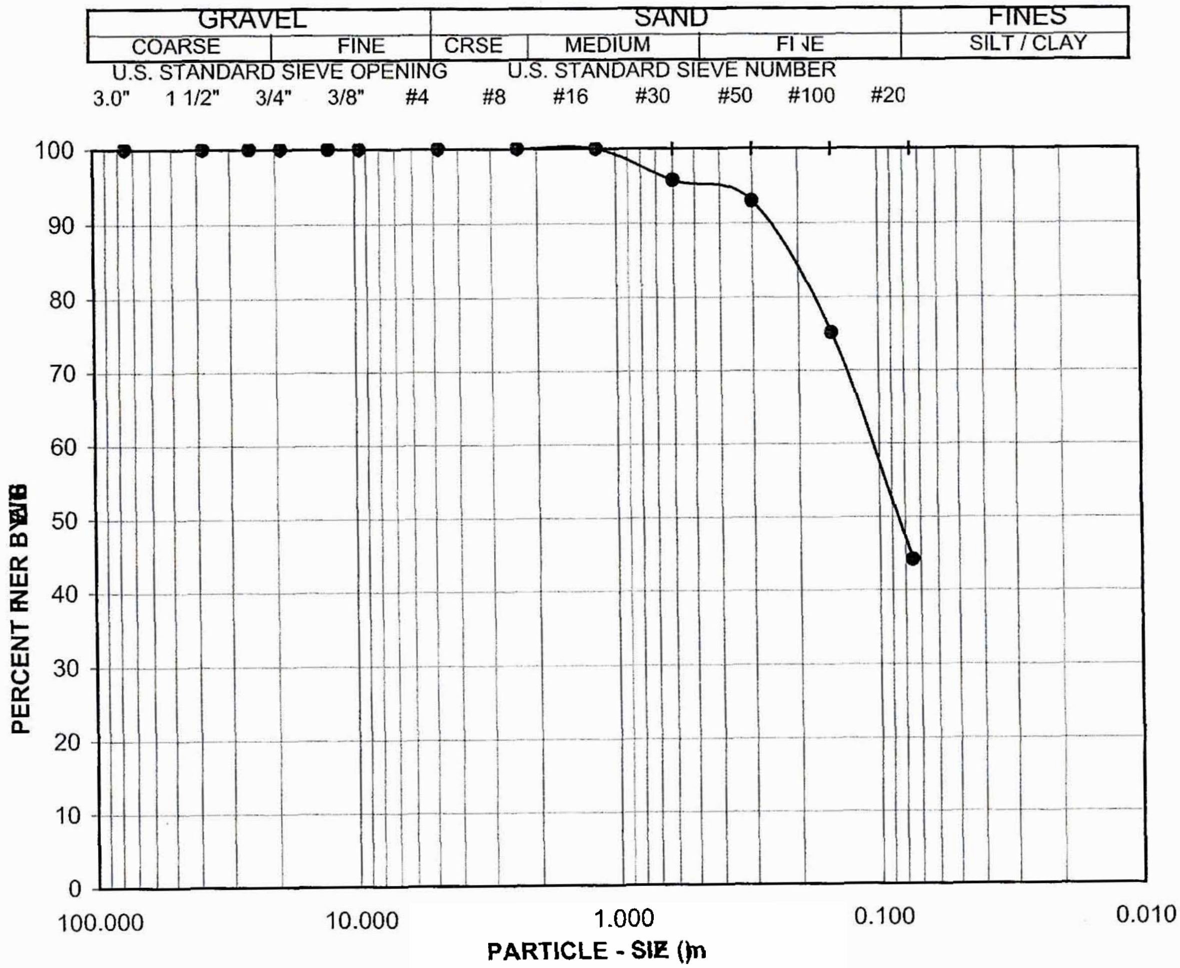
Soil Type :

Soil Identification: Very pale brown silty sand (SM)

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

GR:SA:FI : (%) 0 : 73 : 27



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-1	3.0	SM	0 : 56 : 44

Project No.: 600158-905

SR-125 / 905

Visual Sample Description:

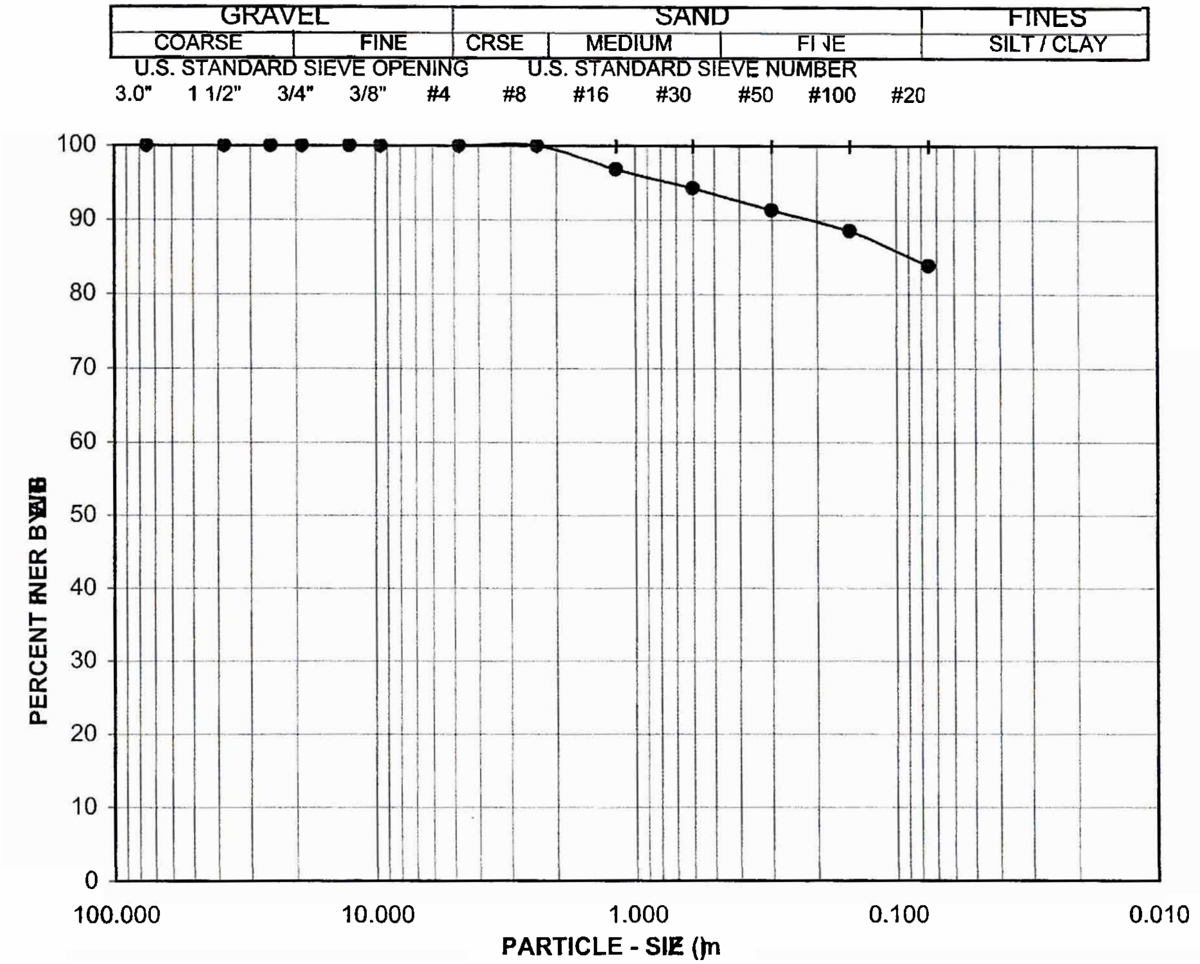
SM, LIGHT BROWN SILTY SAND.

Leighton

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-2	6.1	(ML)s	0 : 16 : 84

Project No.: 600158-905

SR-125 / 905

Visual Sample Description:

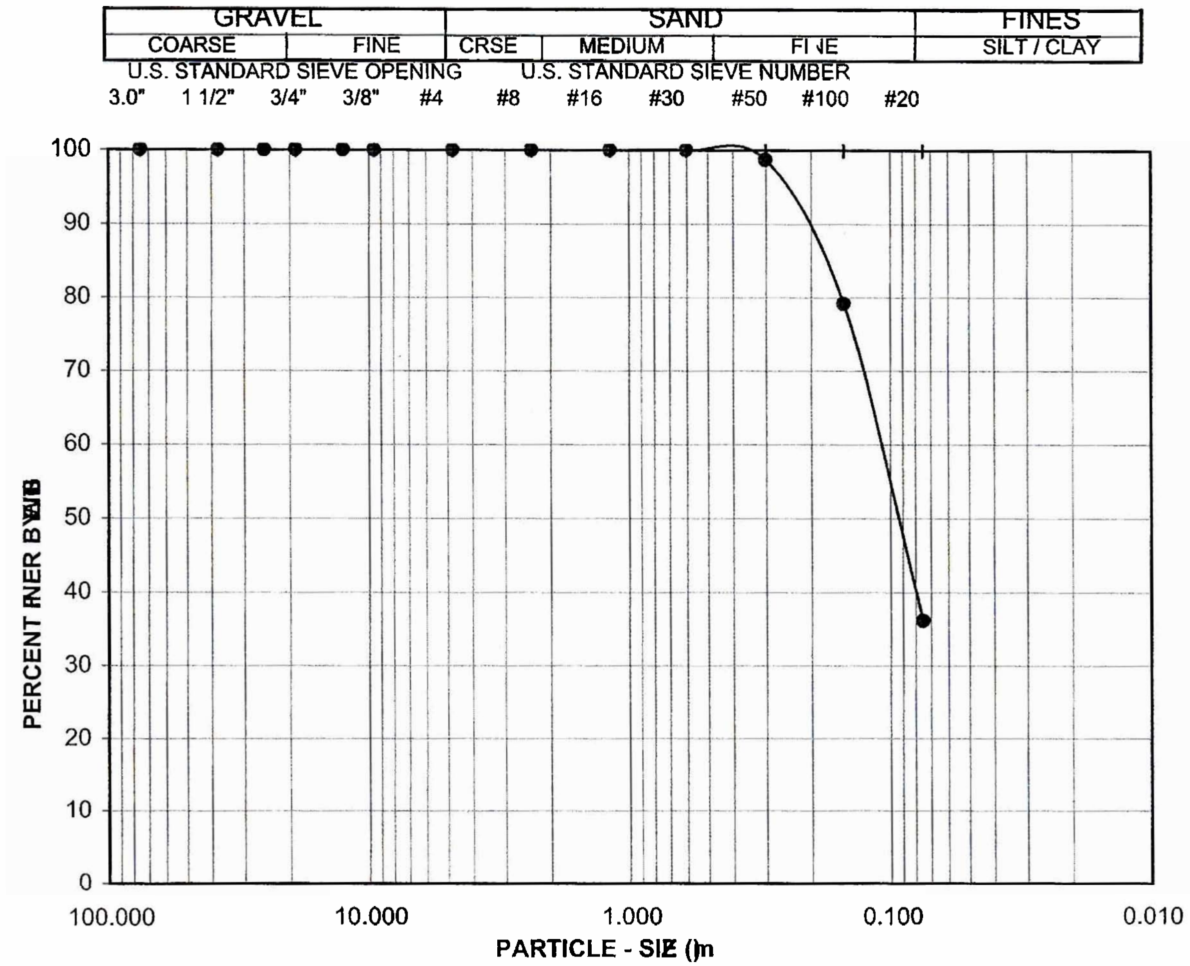
(ML)s, LIGHT BROWN SILT WITH SAND.

Leighton

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-2



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-19	S-4	10.7	SM	0 : 64 : 36

Visual Sample Description:
SM, LIGHT BROWN SILTY SAND.

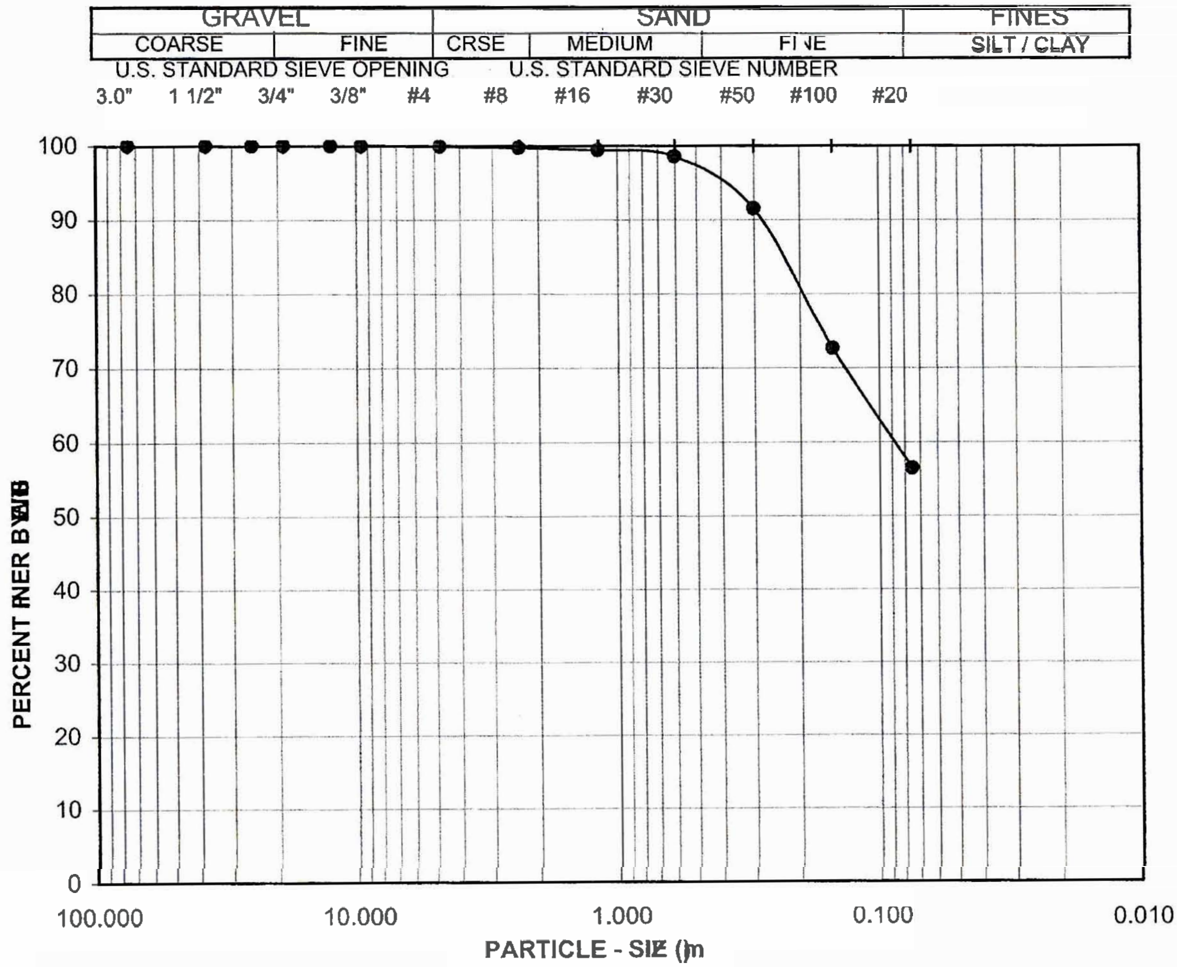
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split; B-19 S-4



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
B-21	B-1	1.8-3.0	s(CL)	0 : 44 : 56

Visual Sample Description:
s(CL), LIGHT OLIVE BROWN SANDY LEAN CLAY.

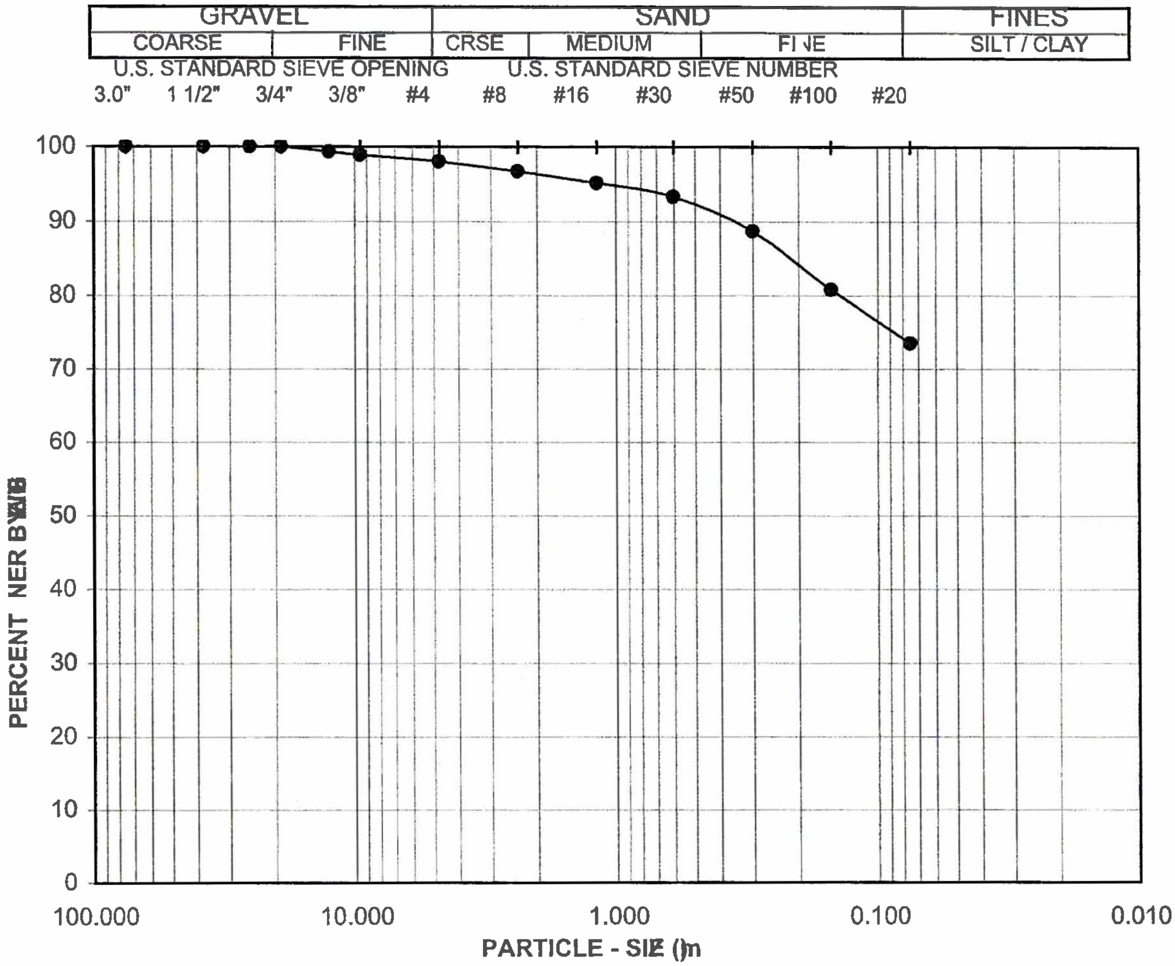
Leighton

Project No.: 600158-905
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,B-21,B-1



Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI
TP-1	B-1	0.6-1.0	(CH)s	2 : 24 : 74

Visual Sample Description:

(CH)s, GRAYISH BROWN FAT CLAY WITH SAND AND TRACE GRAVEL.

Leighton

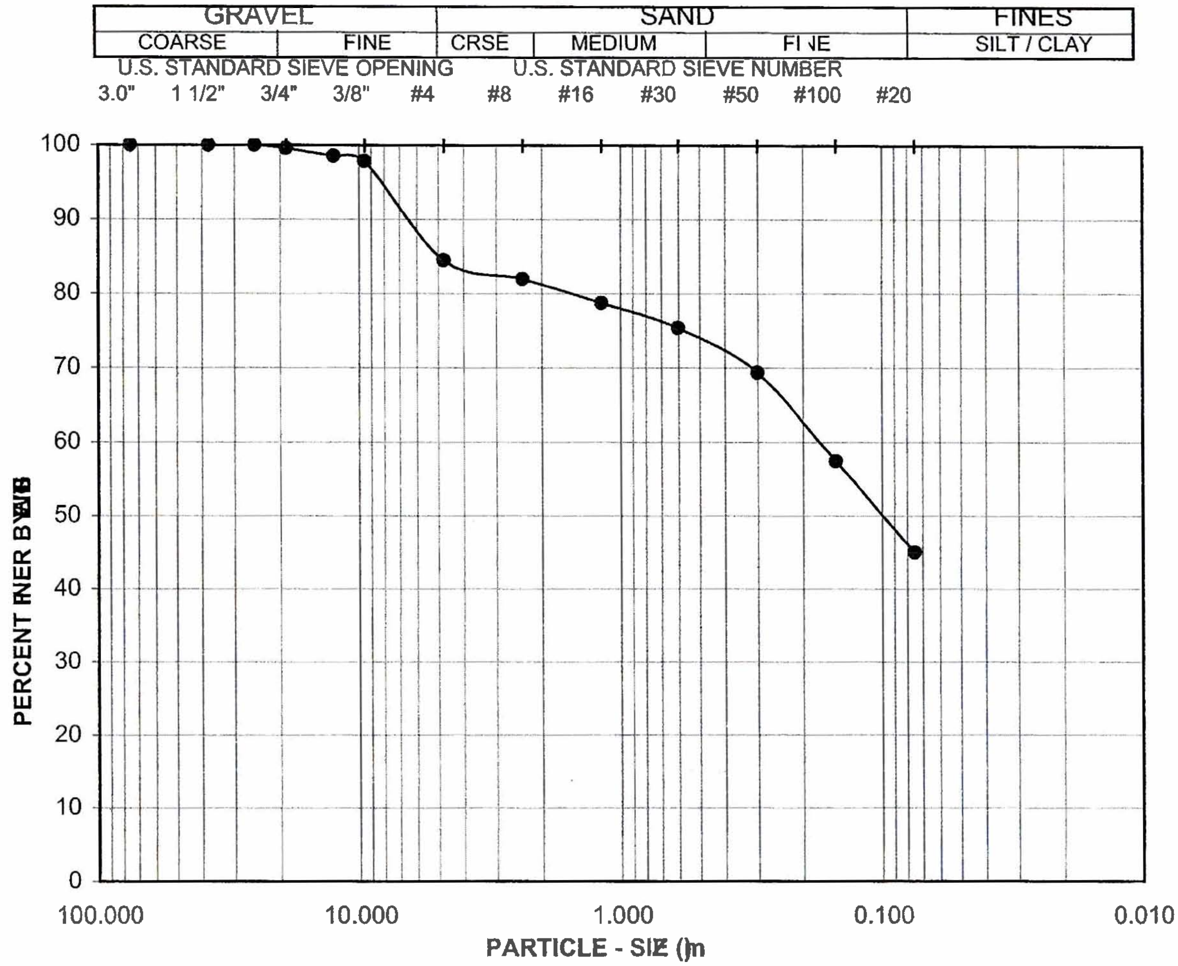
Project No.: 600158-905

SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split,TP-1,B-1



Boring No.:	Sample No.:	Depth (m.):	Soil Type	GR:SA:FI
TP-3	B-1	0.8-1.0	SC	16 : 39 : 45

Visual Sample Description:

SC, LIGHT BROWN CLAYEY SAND WITH GRAVEL.

Leighton

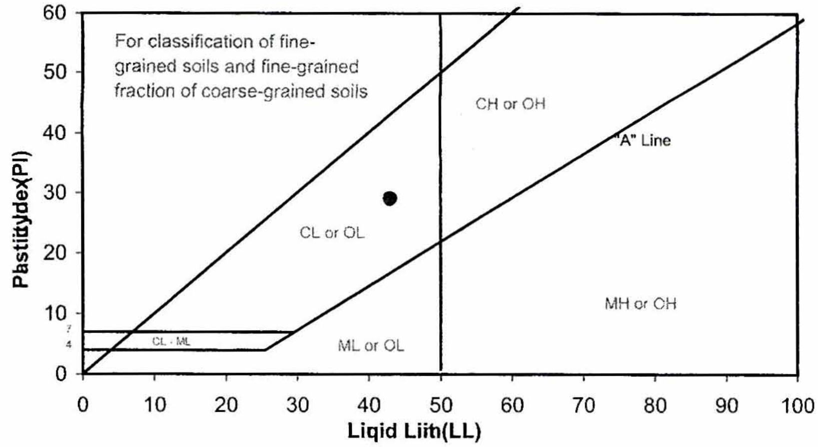
Project No.: 600158-905

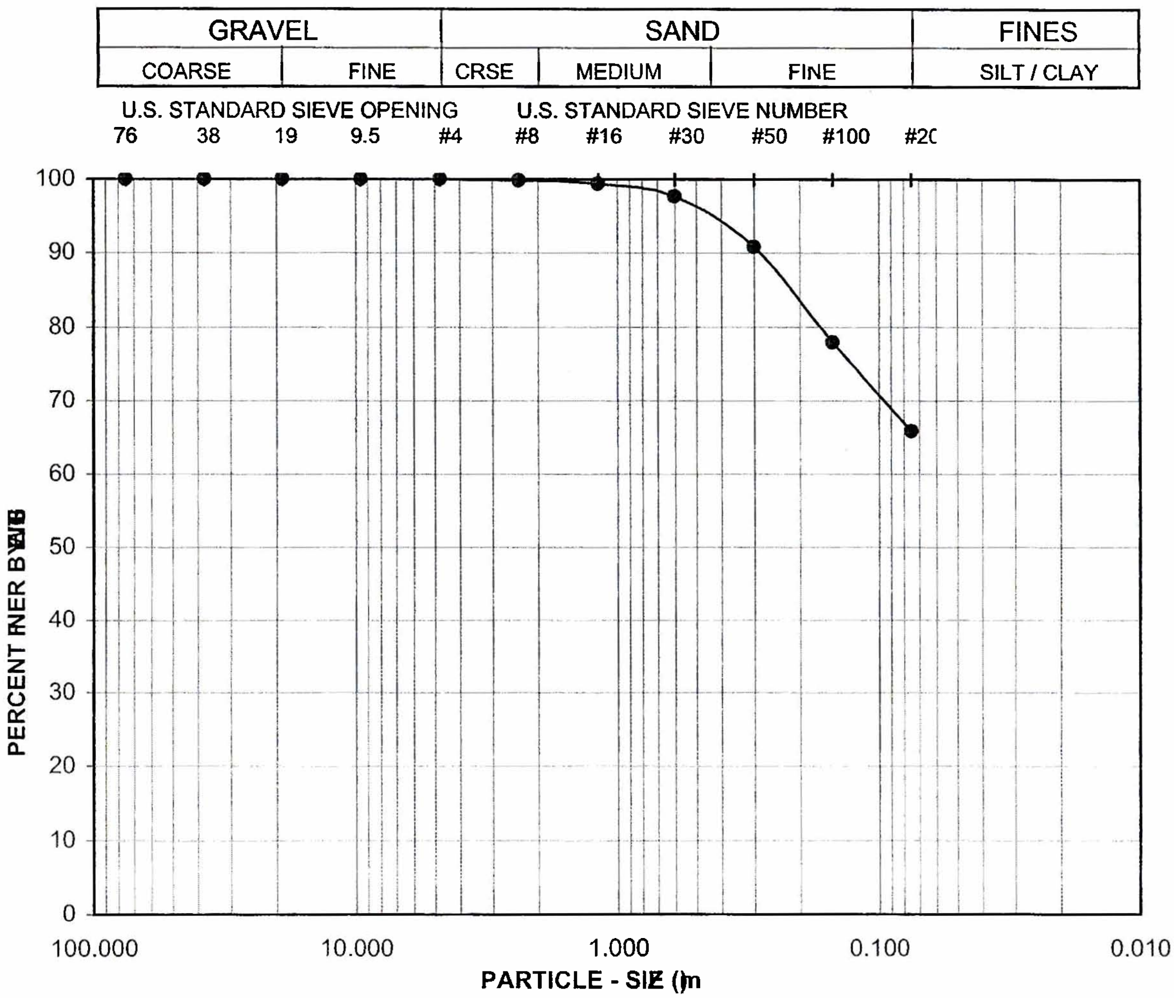
SR-125 / 905

CALTRANS 202

Rev. 12-06

CT 202- Sieve Split, TP-3,B-1





Boring No.:	Sample No.:	Depth (m):	Soil Type	GR:SA:FI	LL,PL,PI
TP-5	B1	0.0-0.5	s(CL)	0 : 34 : 66	29

Project No.:	600158-905
SR-125 / 905	
ATTERBERG LIMITS, PARTICLE - SIZE CURVE ASTM D 4318, D 422	

Visual Sample Description:
s(CL): BROWN SANDY LEAN CLAY

Leighton

Rev. 8-07

SIEVE TP-5,B1

Appendix D

Previous Studies

1. State Route 125 Toll Road Stations 27+00 to 168+30, San Diego County, California, Phase 1 Preliminary Geotechnical Design Report and Phase 1 Preliminary Bridge Foundation Reports, prepared by Ninyo and Moore and dated September 17, 1999.

2. Geotechnical Design Report State Route 125 South Toll Road Segment 1A/K.P. 2.7 To 8.2 San Diego, California, May 2005, prepared by Ninyo and Moore and dated May 16, 2005.

3. Foundation Recommendations and Log of Test Borings, Airway Road Undercrossing (Br. #57-1148 L/R), prepared by Caltrans, Memorandum dated March 17, 2004.

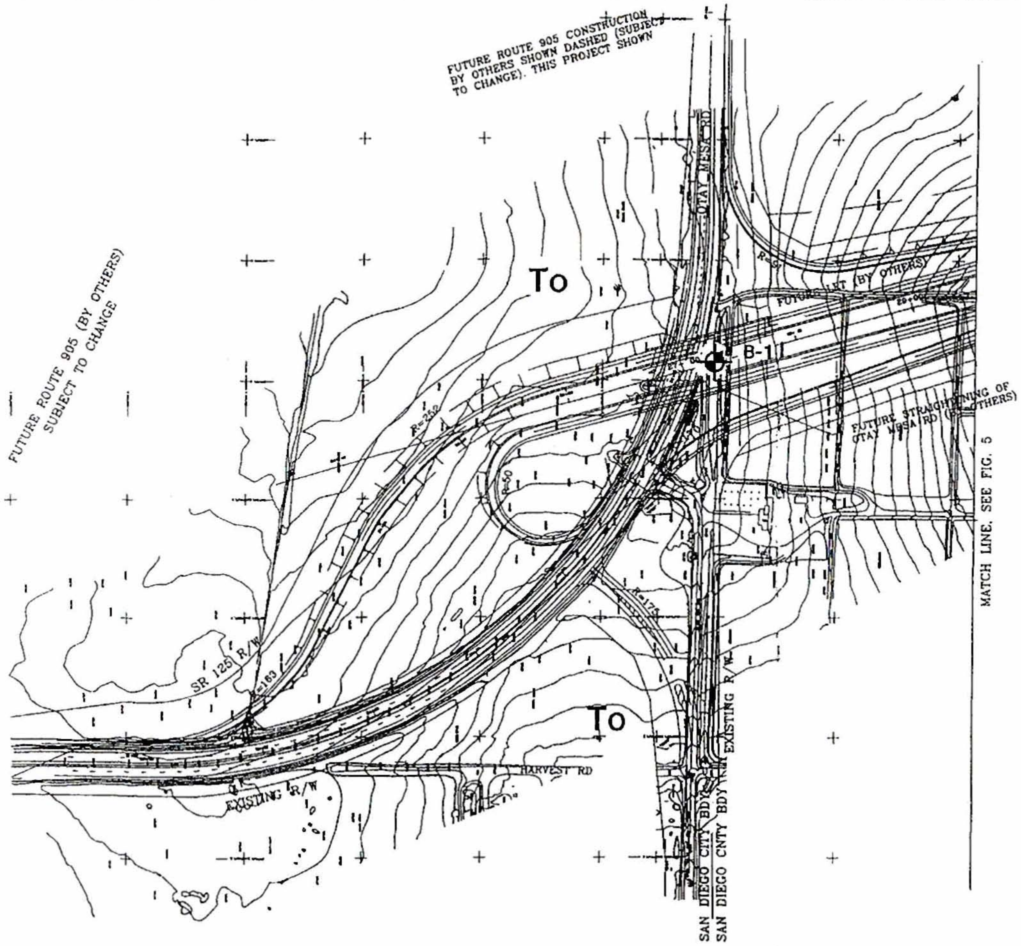
4. Geotechnical Design Report, 11-SD-905, KP 9.2/18.0, 11-091821, prepared by Caltrans, dated September 14, 2005.

Appendix D.1

State Route 125 Toll Road Stations 27+00 to 168+30, San Diego County, California, Phase 1 Preliminary Geotechnical Design Report and Phase 1 Preliminary Bridge Foundation Reports, prepared by Ninyo and Moore and dated September 17, 1999.

LEGEND

Qal	Alluvium
Qls(?)	Possible Landslide Deposits
Qt_1	Terrace Deposits One
Qt_2	Terrace Deposits Two
To	Otay Formation
Tsw	Sweetwater Formation
Tmv	Mission Valley Formation
KJ_{gs}	Granitic and Metavolcanic Rock
— —	Approximate location of geologic contact, queried where uncertain
TP-18	Approximate location of exploratory test pit
B-14	Approximate location of exploratory boring
SL-10	Approximate location of seismic refraction traverse



Scale 1:4 000

Ninyo & Moore

PRELIMINARY GEOTECHNICAL MAP

STATE ROUTE 125 TOLL ROAD
STA 27+00 TO 128+30
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
103936-01	9/99

BORING LOG 1 of 4

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 # DROP: 30"	B - 1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
	1	CAL	6 13 14	16"	Sandy Lean Clay (CL) hard, dry to moist, gray-brown w/ root hairs — Topsoil	
					Colluvium. Lean Clay (CL) stiff, moist, dk gray-brown w/many clasts of pale brown sandy silt to silty fine sand (ML/SM)	
5	2	SPT	2 4 8	8"		
	3	BULK			Fine Sandy Clay (CL) stiff, moist, lt. gray w/some clasts of fine sandy silt to silty fine sand (ML/SM)	
					Older Alluvium or Terrace Deposits?	>4.5
	4	CAL	7 20 31	18"	Interlayered Lean to Fat Clay (CL-CH) hard, moist, gray-brown and Fine Sandy Silt to Silty Fine Sand (SM-ML) hard/dense, moist, gray-brown (interlayers typically 1/4-1" thick)	
15	5	SPT	9 20 22			
	6	BULK			Lean to Fat Clay (CL/CH) Stiff, moist, olive-gray	
20					Otay Formation	

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road OTAY MESA Rd U.C.	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
20	7	CAL	19 37 40/1"	13"	Otay Fm (cont'd.) Silty V. Fine Sand (SM) v. dense, moist, lt. gray-brown w/few interlayers of Fine Sandy Lean Clay (CL) hard, moist, olive gray	
25	8	SPT	12 23 31	18"		
					Silty Fine Sand (SM) v. dense, moist, gray-brown	
	9	CAL	26 50/5"	11"		
					Sandy Lean to Fat Clay (CL/CH) hard, moist, gray-brown w/ trace fine sand	
35	10	SPT	11 18 18	18"		>4.5
					Fat Clay (CH) hard, moist, gray-white bentonite	
40						

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road O.M.R.U.C.	FIGURE NO.:

BORING LOG

LOGGED BY: C.S.	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B - 1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION	Pocket Pen (tsf)
40	11	CAL	50/5"	5"	Silty Fine Sand (SM) — Otay Fm. (Cont'd) v. dense, gray-brown, moist light to mod. cementation ▽ A.T.D.	
45					becomes wet, not cemented	
	12	SPT	13 29 50/3"	9"	Clayey Fine Sand (SC) v. dense, moist, gray-brown	
					Silty F. Sand (SM) v. dense, moist, gray-brown w/ flakes of mica light to mod. cementation	
	13	CAL	27 50/5"	11"		
					Clayey F. Sand (SC) v. dense, moist, gray-brown	
55	14	SPT	28 50/5"	11"	Sandy Lean Clay (CL) hard, moist, mottled gray-brown	>4.5
60						

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR125 Toll Road OMRUC	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

BORING LOG

BY: CS	DATE DRILLED: 8-18-99	BORING ELEVATION:	BORING NO.:
DRILL RIG: CME 750	BORING DIAMETER: 8" HSA	HAMMER WT.: 140# DROP: 30"	B-1

Depth	Sample #	Type	Blow Count	Recovery	DESCRIPTION
60	15	CAL	32 50/5"	11"	Silty to locally Clayey V. Fine Sand (SM, SC) v. dense, moist, lt. gray-brown
65	16	SPT	27 27 50/4"	16"	
					Boring terminated @ 66'4" Groundwater @ 42' A.T.D. Backfilled with cuttings.

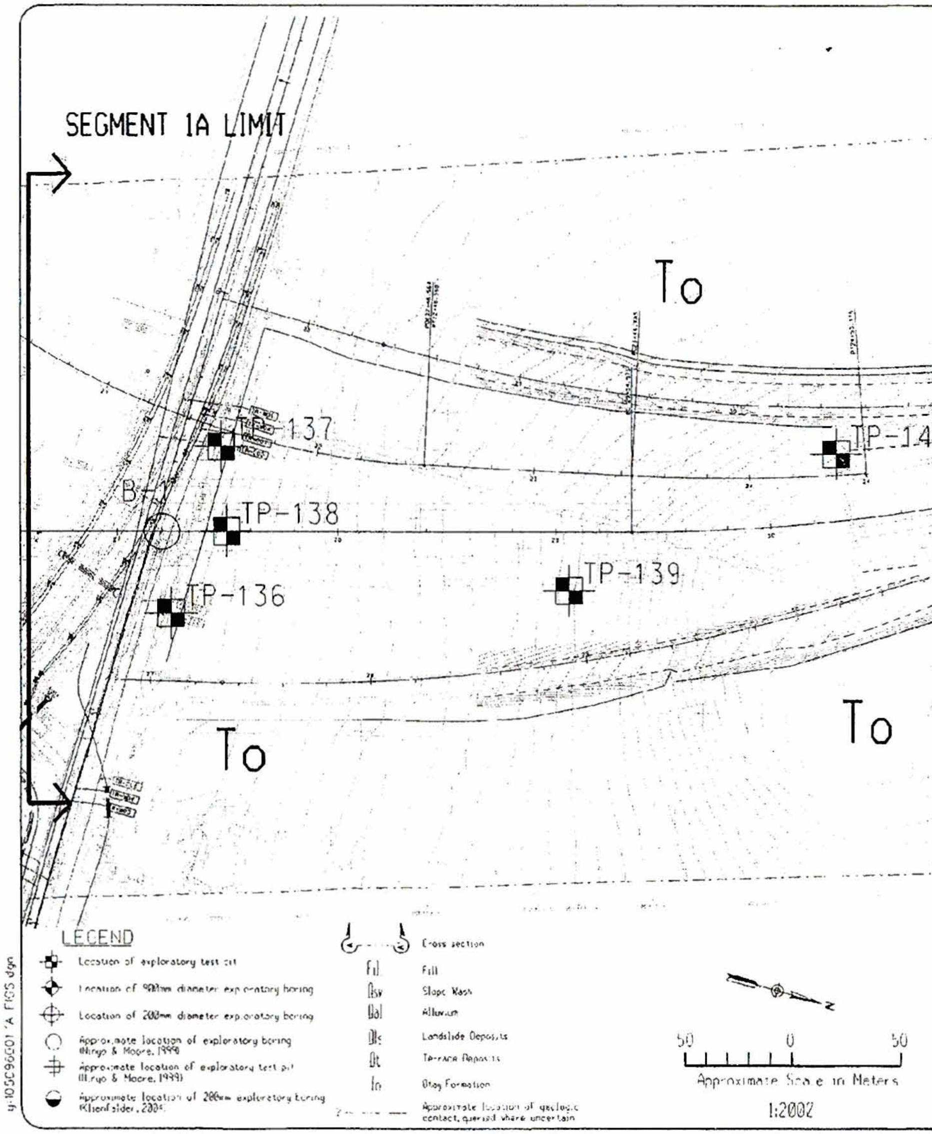
Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: I-197	SR 125 Toll Road OMRUC	FIGURE NO.:

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

Appendix D.2

Geotechnical Design Report State Route 125 South Toll Road Segment 1A/K.P. 2.7 To 8.2 San Diego, California, May 2005, prepared by Ninyo and Moore and dated May 16, 2005.



Ninyo & Moore

LOCATION OF EXPLORATIONS AND GEOLOGIC MAP

SR 125 SOUTH
SEGMENT 1A
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO.	DATE	FIGURE
105096001	5/05	14.2-1

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

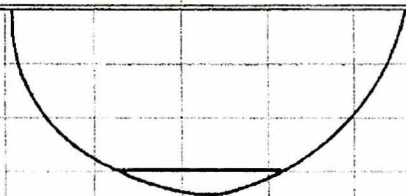
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-136

GROUND ELEVATION 160 m± (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m³)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SC	TOPSOIL: Dark brown, moist, loose, clayey fine to medium SAND with scattered gravel and cobbles.
							OTAY FORMATION: Light grayish brown, moist, weakly cemented, clayey fine-grained SANDSTONE.
							Total Depth = 1.4 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

SCALE: 10 mm =0.50 m

FIGURE 14.5-10

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

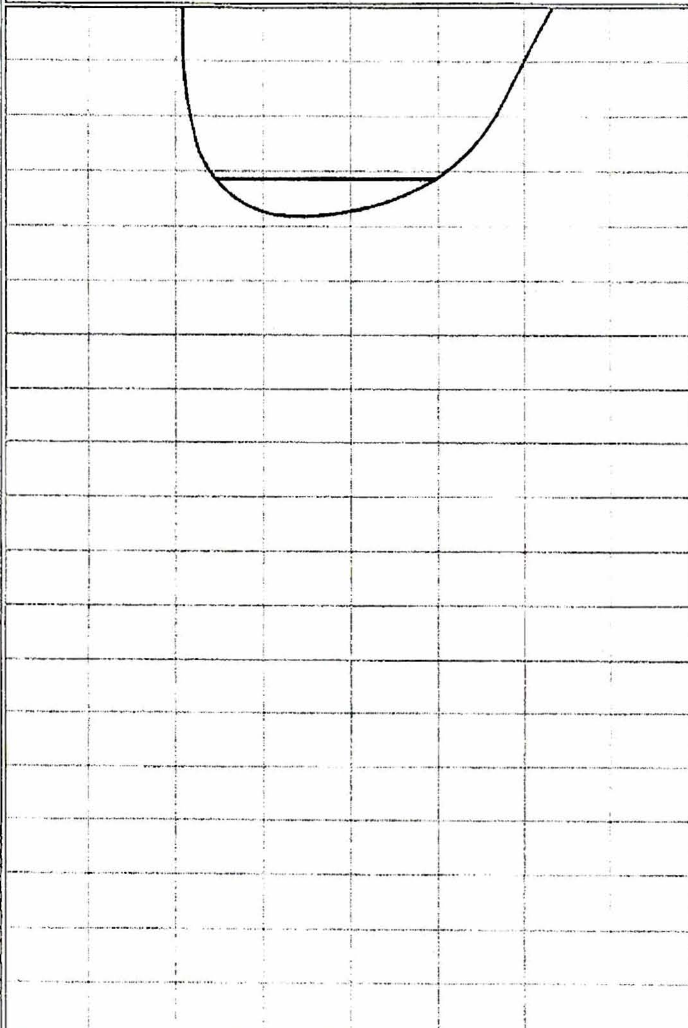
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-137

GROUND ELEVATION 160.5 m (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m 3)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0	■					SC	TOPSOIL: Dark brown, moist, loose, clayey fine SAND.
							OTAY FORMATION: Light grayish brown, moist, weakly cemented, clayey fine-grained SANDSTONE.
							Total Depth = 1.5 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

SCALE: 10 mm =0.50 m

FIGURE 14.5-11

Ninyo & Moore

TEST PIT LOG

SR 125 SOUTH
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE
105096001	5/05

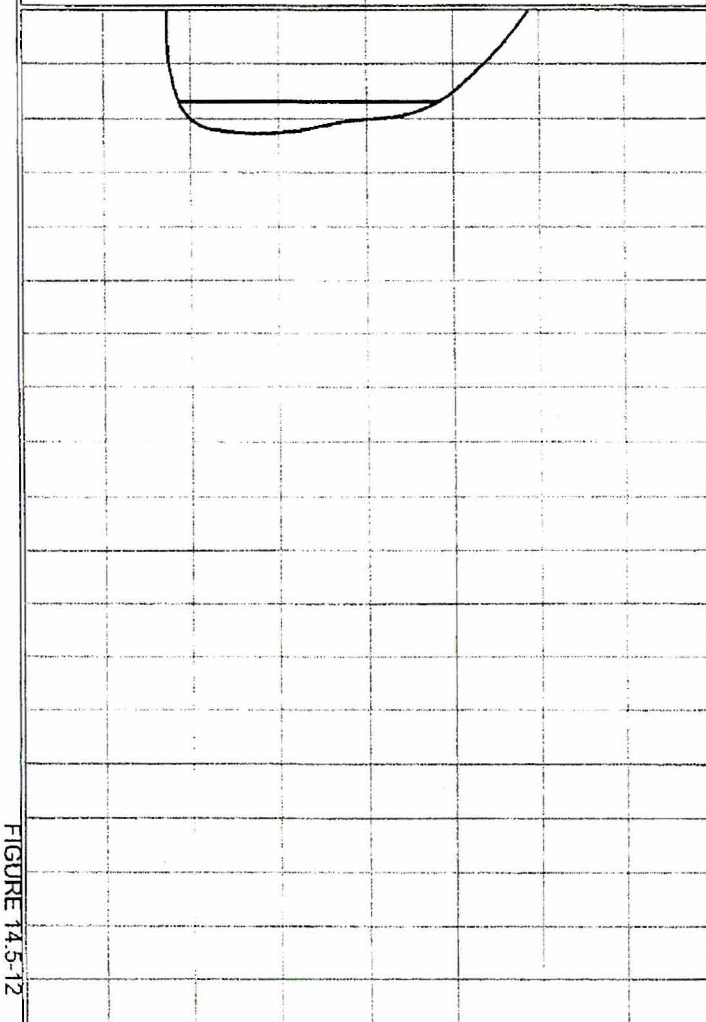
DATE EXCAVATED 05/12/04 TEST PIT NO. TP-138

GROUND ELEVATION 161.6 m (MSL)

METHOD OF EXCAVATION Cat 416 C Backhoe

LOCATION

LOGGED BY FOM



SCALE: 10 mm =0.50 m

DEPTH (METERS)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY UNIT WEIGHT (kN/m 3	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SC	TOPSOIL: Dark brown, moist, loose, clayey fine SAND.
							OTAY FORMATION: Light brown, moist, weakly cemented, clayey diatomaceous SILTSTONE.
							Total Depth = 0.9 m. Groundwater not encountered. Backfilled on 05/12/04.
2							
4							
6							

FIGURE 14.5-12

Appendix D.3

Foundation Recommendations and Log of Test Borings, Airway Road Undercrossing (Br. #57-1148 L/R), prepared by Caltrans, Memorandum dated March 17, 2004.

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. MAJID MADANI
Structures Design
Office of Bridge Design-South
Bridge Design Branch 14
MS #9-4/11G

Attention: Mr. Ron Bromenschenkel

Date: March 17, 2004

File: 11-SD-905-KP 17.60
11-091821
Airway Road UC
Br. #57-1148 L/R
Airway Road Ramp
Br. #57-1148S

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN – SOUTH II
DESIGN BRANCH B, MS #5

Subject: Foundation Recommendations

This report presents the foundation recommendations for the proposed Airway Road Undercrossing (UC) (Br. #57-1148 L/R) and the adjacent Airway Road Ramp (Br. #57-1148S). The following foundation recommendations are based on subsurface information gathered during the recent foundation investigation (October 2003) performed by Caltrans. The foundation investigation performed in October 2003 consisted of drilling four mud rotary exploratory borings. All the boring locations and data are shown on the Log of Test Boring sheets. With regards to the current foundation recommendations, all elevations referenced within this report and shown on the recent Log of Test Boring sheets are based on the NAVD 1988 vertical datum.

Project Description

The proposed Airway Road UC and Airway Road Ramp site is located at the intersection of Otay Mesa Rd. (State Highway 905) and Airway Road in the southern portion of the City of San Diego, just north of the Mexican border. The project is part of the proposed Route 905 Freeway which is being built to connect the Otay Mesa international border crossing with the north/south trending Route 805 Freeway to the west. The Airway Road UC is proposed to be two (left and right) single span, cast-in-place, pre-stressed, box girder structures, on seat abutments, with a single continuous abutment footing extending beneath both Abutments 1 and 2 left and right bridge abutments. The adjacent Airway Road Ramp is proposed to be a single span, cast-in-place, prestressed, box girder structure, on seat abutments.

Site Geology

The bridge site is located on Otay Mesa, which is an east-west trending relic wave cut marine terrace, separating the Otay River drainage to the north, and the Tijuana River drainage to the south. Otay Mesa has generally flat to slightly rolling topography, except where it is cut by

Spring Canyon, near the center of the mesa. The foundation investigation performed in October 2003 consisted of four mud rotary borings: borings B-1-03, B-2-03, B-3-03, and B-4-03. Borings B-1-03, B-3-03 and B-4-03 were drilled with a Mobile Drill B-47 drill rig. Boring B-2-03 was drilled with a CS 2000 drill rig.

The 2003 foundation investigation, at the proposed bridge locations, revealed horizontal lying sedimentary facies below the bridge sites, generally consisting of soft to hard, intensely to moderately weathered, weakly to well cemented sandstones, siltstones and clayestones, which are considered to be part of the Otay Formation.

In boring B-2-03, drilled at the Abutment 1 left location, from the ground surface to approximately 28.9 m deep (elev. 135.4 m), an intensely to moderately weathered, soft to hard, weakly to well cemented sandstone was encountered. This is considered to be part of the Otay Formation. From approximately 28.9 m deep (elev. 135.4 m) to the maximum depth of boring B-2-03, at 36.5 m deep (elev. 127.8 m) a moderately weathered, moderately hard to hard, moderately well cemented to well cemented siltstone was encountered (Otay Formation).

In boring B-4-03, drilled at the Abutment 1 right location, from the ground surface to approximately 0.1 m deep (elev. 162.8 m), a sandstone, decomposed to a loose, well graded sand was encountered. From approximately 0.1 m deep (elev. 162.8 m) to approximately 22.1 m deep (elev. 140.8 m) an intensely to moderately weathered, moderately soft to hard, weakly to well cemented sandstone was encountered. This is considered to be part of the Otay Formation. From approximately 22.1 m deep (elev. 140.8 m) to approximately 23.3 m deep (elev. 139.6 m) a moderately weathered, moderately hard to hard, well cemented claystone was encountered (Otay Formation). From approximately 23.3 m deep (elev. 139.6 m) to approximately 32.3 m deep (elev. 130.6 m) a moderately weathered, moderately hard to hard, well cemented sandstone with thin interbedded siltstone and claystone layers was encountered (Otay Formation). From approximately 32.3 m deep (elev. 130.6 m) to approximately 32.6 m deep (elev. 130.3 m) a moderately weathered, moderately hard to hard, moderately well cemented claystone was encountered (Otay Formation). From approximately 32.6 m deep (elev. 130.3 m) to the maximum depth of boring B-4-03, at 33.7 m deep (elev. 129.2 m) a moderately weathered, moderately hard to hard, well cemented sandstone was encountered (Otay Formation).

In boring B-3-03, drilled at the Abutment 2 left location, from the ground surface to approximately 35.1 m deep (elev. 132.2 m), a moderately weathered, moderately soft to hard, moderately well cemented to well cemented sandstone was encountered. This is considered to be part of the Otay Formation. From approximately 35.1 m deep (elev. 132.2 m) to approximately 36.4 m deep (elev. 130.9 m) a moderately weathered, moderately hard to hard, well cemented siltstone was encountered (Otay Formation). From approximately 36.4 m deep (elev. 130.9 m) to the maximum depth of boring B-3-03, at 39.6 m deep (elev. 127.7 m) a moderately weathered, hard, well cemented sandstone was encountered (Otay Formation).

In boring B-1-03, drilled at the Abutment 2 right location, from the ground surface to approximately 0.9 m deep (elev. 163.8 m), a poorly graded sand with silt and clay was encountered. From 0.9 m deep (elev. 163.8 m) to approximately 18.4 m deep (elev. 146.3 m) an intensely to moderately weathered, moderately soft to hard, weakly to well cemented sandstone was encountered. This is considered to be part of the Otay Formation. From approximately 18.4 m deep (elev. 146.3 m) to the maximum depth of boring B-1-03, at 36.7 m deep (elev. 128.0 m) interbedded layers of moderately hard to hard, moderately well cemented to well cemented siltstones, sandstones, and claystones were encountered (Otay Formation).

For more specific soils and rock data, from the 2003 foundation investigation, refer to the Log of Test Borings.

Ground Water

A piezometer was placed in boring B-1-03, after completion of drilling. Ground water was encountered at elev. 158.2 m, when measured on January 13, 2004. Borings B-2-03 through B-4-03 were immediately backfilled after completion of drilling operations, therefore no attempt was made to measure ground water in those borings. Ground water levels indicated in this report reflect the measured ground water level in the borehole on the specified dates. Ground water elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.

Scour Potential

Scour is not considered to be an issue at this bridge site.

Corrosion

Corrosion test results for some soil samples collected from borings B-1-03 and B-2-03 are shown below in Table 1. Based on current Caltrans standards, the site is not considered corrosive.

Table 1 – Corrosion Test Summary

Location	SIC Number	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
Boring B-1-03 (Elev. 161.1 m)	C638638 A	1300	9.03	N/A	N/A
Boring B-1-03 (Elev. 152.1 m)	C638638 B	550	8.86	200	95
Boring B-1-03 (Elev. 145.8 m)	C638638 C	650	9.52	207	24
Boring B-1-03 (Elev. 139.7 m)	C638638 D	660	8.52	80	55
Boring B-2-03 (Elev. 161.9 m)	C638639 A	350	9.12	121	1365
Boring B-2-03 (Elev. 153.3 m)	C638639 B	640	8.66	278	34
Boring B-2-03 (Elev. 149.7 m)	C638639 C	620	8.96	278	24
Boring B-2-03 (Elev. 144.8 m)	C638639 D	510	9.22	311	38
Boring B-2-03 (Elev. 138.7 m)	C638639 E	930	9.23	95	97

Note: Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less.

Fault and Seismic Data

The structure site may potentially be subject to strong ground motions from nearby earthquake sources during the design life of the new structure. The Office of Geotechnical Design-South II has provided Final Seismic Design Recommendations for the site in the memorandum dated January 8, 2004. The controlling fault for the site is the Newport-Inglewood-Rose Canyon/E Fault (NIE) with a maximum credible earthquake Mw=7.0 located approximately 11.8 kilometers from the site. The corresponding Peak Bedrock Acceleration is estimated to be 0.4g.

Liquefaction Potential

Final Seismic Design Recommendations, dated January 8, 2004, state that the potential for liquefaction at this site is considered negligible.

Foundation Recommendations

The following recommendations are for the proposed Airway Road UC (Br. #57-1148 L/R), the associated center retaining walls, between the left and right bridges, and the adjacent Airway Road Ramp (Br. #57-1148S), as shown on the General Plans dated February 27, 2004, and February 17, 2004, respectively. Recommendations for the proposed Abutments 1 and 2, left and right side retaining walls, for each of the three structures, will be provided in an addendum when design information is available.

Spread footings are recommended to be used at all support locations of the Airway Road bridges (Br. #57-1148L/R and S), and the center retaining walls, between the left and right bridges. The proposed bottom of footing elevations, for Abutments 1 and 2 of all the proposed structures, will locate the footings on native formational material (Otay Formation). The recommendations for Gross Allowable Soil Bearing Pressures are listed in Tables 2 and 3, below.

Table 2
Abutments 1 and 2 Spread Footing Data (Br. #57-1148 L/R)

Support Location	Minimum Footing Width	Bottom of Footing Elevation	Recommended Soil Bearing Pressures	
			ASD [1]	LFD [2]
			Gross Allowable Soil Bearing Pressure (q_{all})	Ultimate Soil Bearing Pressure (q_{ult}^{*})
Abutment 1 Left Bridge	**4.90 m** (16.1 ft.)	**160.35 m** (526.1 ft.)	**287 kPa (6.0 ksf)**	**N/A**
Abutment 1 Center Retaining Wall	**4.90 m** (16.1 ft.)	**160.00 m** (524.9 ft.)	**287 kPa (6.0 ksf)**	**N/A**
Abutment 1 Right Bridge	**4.20 m** (13.8 ft.)	**160.00 m** (524.9 ft.)	**287 kPa (6.0 ksf)**	**N/A**

Table 2 (Continued)
Abutments 1 and 2 Spread Footing Data (Br. #57-1148 L/R)

Support Location	Minimum Footing Width	Bottom of Footing Elevation	Recommended Soil Bearing Pressures	
			ASD [1]	LFD [2]
			Gross Allowable Soil Bearing Pressure (q_{all})	Ultimate Soil Bearing Pressure (q_{ult}^*)
Abutment 2 Left Bridge, Left Side	**4.90 m** (16.1 ft.)	**160.75 m** (527.4 ft.)	**287 kPa** **(6.0 ksf)**	N/A
Abutment 2 Left Bridge, Right Side	**4.90 m** (16.1 ft.)	**160.45 m** (526.4 ft.)	**287 kPa** **(6.0 ksf)**	N/A
Abutment 2 Center Retaining Wall	**4.90 m** (16.1 ft.)	**160.45 m** (526.4 ft.)	**287 kPa** **(6.0 ksf)**	N/A
Abutment 2 Right Bridge, Left Side	**4.20 m** (13.8 ft.)	**160.45 m** (526.4 ft.)	**287 kPa** **(6.0 ksf)**	N/A
Abutment 2 Right Bridge, Right Side	**4.20 m** (13.8 ft.)	**160.15 m** (525.4 ft.)	**287 kPa** **(6.0 ksf)**	N/A

Notes: 1) Allowable Stress Design (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure (q_{all}).
2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}*). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}*).

Table 3
Abutments 1 and 2 Spread Footing Data (Br. #57-1148S)

Support Location	Minimum Footing Width	Bottom of Footing Elevation	Recommended Soil Bearing Pressures	
			ASD [1]	LFD [2]
			Gross Allowable Soil Bearing Pressure (q_{all})	Ultimate Soil Bearing Pressure (q_{ult}^*)
Abutment 1	**5.49 m** (18.0 ft.)	**159.00 m** (521.7 ft.)	**287 kPa** **(6.0 ksf)**	N/A
Abutment 2	**5.49 m** (18.0 ft.)	**159.00 m** (521.7 ft.)	**287 kPa** **(6.0 ksf)**	N/A

Notes: 1) Allowable Stress Design (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure (q_{all}).
2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}*). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}*).

The recommended Gross Allowable Soil Bearing Pressures provided in Table 2 and 3, above, are based upon the following design criteria:

1) All abutment and the center retaining wall footings have the minimum footing widths as listed in Tables 2 and 3.

2) All abutment and the center retaining wall footings are to be constructed at or below the recommended elevations as listed in Tables 2 and 3.

If any of the above minimum footing widths are reduced, or bottom of footing elevations raised, the Office of Geotechnical Design-South II, Branch B, is to be contacted for reevaluation.

General Notes:

1. All support locations are to be plotted in plan view on the Log of Test Borings as stated in "Memo to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations:

1. At all abutment support locations, concrete for the structure and the center retaining wall support footings shall be placed neat against the undisturbed formational material at the bottom of the footing excavations. Should the bottom of the footing excavations be disturbed, then the bottom of the footing excavations shall be extended down at 0.15-meter intervals until undisturbed formational material is observed and approved by the Engineer. The subexcavated material is to be replaced with lean concrete. The disturbed native material is not to be recompacted.

2. All abutment and center retaining wall support excavations are to be inspected and approved by a representative of the Office of Geotechnical Design-South II, Branch B, prior to placing any steel or concrete for the support footings in the excavations. The required inspection is to verify that the concrete for the support footings is being placed on top of the formational material. Once the abutment and center retaining wall footing excavations have been completed to the specified elevations, the contractor is to allow the Office of Geotechnical Design–South II, Branch B, five (5) working days to perform the inspection. The structures representative is to provide the Office of Geotechnical Design–South II, Branch B, a one-week notification prior to beginning the five-day contractor waiting period.

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided by the Office of Bridge Design-South. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South II, Design Branch B should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Erich Neupert, (916) 227-4565 (CALNET 498-4565), or Mark DeSalvatore, (916) 227-5391 (CALNET 498-5391), at the Office of Geotechnical Design-South II, Branch B.

Prepared by:

Erich Neupert
Engineering Geologist
Office of Geotechnical Design-South II
Design Branch B

Supervised by: Date: 3/17/04

Mark DeSalvatore, R.C.E., 039499
Senior Materials & Research Engineer
Office of Geotechnical Design-South II
Design Branch B

cc: R.E. Pending File
John Stayton - Specs & Estimates (4)
Dave Pajouhesh – PCE
Randy Sanchez – District 11 (Project Manager)
Chuck Davis – District 11 (Design Manager)
Abbas Abghari – OGDS-II
Project File-North
Project File-South

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
11	SD	905	1386		

REGISTERED CIVIL ENGINEER 3-2-04

PLANS APPROVAL DATE

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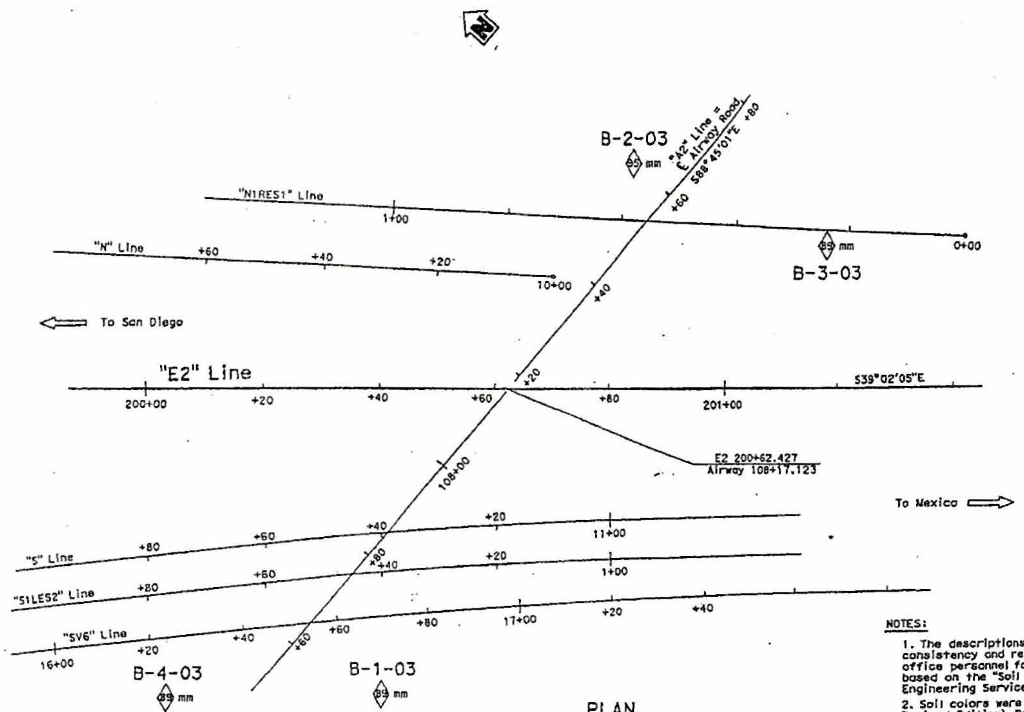
REGISTERED PROFESSIONAL ENGINEER Mark DeSalvatore No. C39499 Exp. 12-31-05 CIVIL STATE OF CALIFORNIA

Caltrans Metric

DRAFT



PLAN
1:400

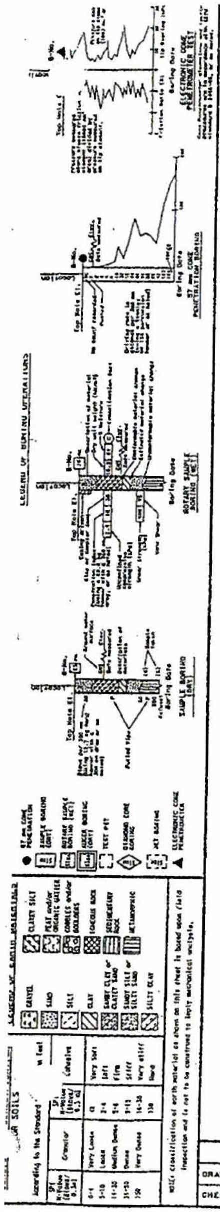
BENCH MARK

BM 905-K18.3 Elev.164.25 m

Brass disk set in concrete on the northwest corner of Airway Road and existing Route 905. NAVD 88 datum.

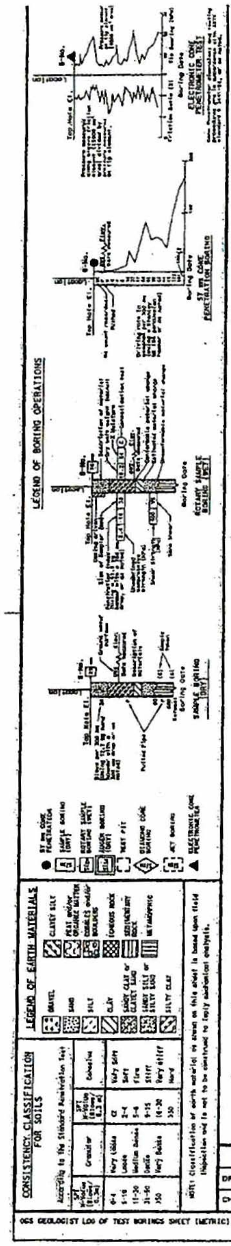
NOTES:

1. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structure Foundations, August 1996.
2. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using Geological Society of America rock color charts (1995, 8th Printing).
3. Ground water was measured in Boring B-1-03. Please refer to that boring for ground water measurement. No attempt was made to measure ground water in borings B-2-03 through B-4-03. Those borings were backfilled immediately after completion of drilling.
4. The ground water level indicated on the Log of Test Boring (LOTB) sheets reflects the measured ground water level in the borehole on the specified date. Ground water surface elevations are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction.
5. Test borings B-1-03, B-3-03 and B-4-03 utilized a safety hammer, and boring B-2-03 utilized a Dietrich auto hammer to advance the sampler using a 63.5 kg hammer with a 760 mm drop. Penetration index values shown are the actual blow counts recorded in the field. Soil descriptions shown on the LOTB sheets are based on these index values.
6. E = Blow count for 0.3 m penetration extrapolated from blow count for less than 0.3 m (due to change in material or hard driving).
7. RQD with an asterisk designation (i.e. RQD=53%*) indicates that the rock within the drilled interval is soft and that the soundness criteria has not been met (as described by Deere and Deere, 1989). Rock not meeting the soundness criteria is defined as moderately soft, soft, or very soft.



ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO. 57-1148L/R KILOMETER POST 17.6	AIRWAY ROAD UNDERCROSSING LOG OF TEST BORINGS 1 OF 4
DRAWN BY W. Tang 12/03						
CHECKED BY E. Neupert		E. Neupert, F. Syed		CU 11224		SHEET 22 OF 25

FOR PLAN VIEW, SEE 'LO OF TEST BORINGS" 1 OF 4



B-4-03 (52.7 m Rt Sta 200+0.41 "E2" Line) — 89 mm — elev 162.93 — 10-15-03

164 m

SANDSTONE, decomposed to a well graded SAND, estimated loose, light brownish gray, dry, fine to medium grained. (RESIDUAL OTAY FORMATION)
SANDSTONE, light brownish gray to white, intensely weathered, moderately soft to moderately hard, weak to moderate calcium carbonate cementation, fine to medium grained. (OTAY FORMATION)

161 m

Soft to moderately soft at elev 160.8 m.
Becomes moderately soft to moderately hard at elev 159.27 m, slightly fractured.
With approx 10-20% SILT at elev 158.17 m, predominantly fine grained.

158 m

Moderately soft to moderately hard, moderately well cemented, fine to medium grained with calcium carbonate cementation.
Becomes moderately weathered, moderately hard to hard, non-fractured, fine to medium grained, light brownish gray to light olive gray, moderately well cemented, 10-20% SILT content.

155 m

Moderately hard, moderately well cemented.
Moderately soft to moderately hard, moderately fractured.
Becomes moderately hard, moderately well cemented at elev 153.18 m.

152 m

Moderately fractured at elev 152.41 m.
With numerous thin calcite lenses and vein, non-fractured.
Becomes predominantly fine grained at elev 150.43 m.
At elev 150.13 m, becomes moderately hard to hard, moderately well cemented to well cemented, scattered calcite lenses, fine grained at elev 149.21 m, then becomes fine to medium grained, non-fractured.

149 m

Becomes moderately hard, well cemented.
Slightly fractured at 45° angle, fine to medium grained, moderately hard, well cemented.

146 m

Slightly fractured.

143 m

CLAYSTONE, light olive gray with grayish red mottling along fracture planes, moderately weathered, moderately hard to hard, well cemented, moderately fractured. (OTAY FORMATION)

140 m

SANDSTONE, light brownish gray, moderately weathered, moderately hard to hard, well cemented, slightly fractured, predominantly fine grained with approx 10-20% SILT content. (OTAY FORMATION)

137 m

134 m

Predominantly fine grained SANDSTONE with scattered thin interbedded SILTSTONE and CLAYSTONE layers, moderately weathered, moderately hard to hard, moderately well cemented, moderately fractured along horizontal planes between elev 131.99 m to 134.77 m.

131 m

CLAYSTONE, light olive gray, moderately weathered, moderately hard to hard, moderately cemented, moderately fractured. (OTAY FORMATION)
SANDSTONE, light brownish gray, moderately weathered, moderately hard to hard, moderately well cemented, predominantly fine grained with approx 10-20% SILT content, moderately to slightly fractured. (OTAY FORMATION)

128 m

B-1-03 (52 m Rt Sta 200+41 "E2" Line) — 89 mm — elev 164.73 — 10-8-03

164 m

Poorly graded SAND with SILT and CLAY, medium dense, dark brown, dry, fine to medium grained. (Fill)
SANDSTONE, light brown to moderately brown, intensely weathered, moderately soft to soft, fine grained with approx 20% SILT content, scattered calcium carbonate veins. (OTAY FORMATION)
Pale yellowish brown, intensely weathered, moderately soft to soft, fine to medium grained, extensive calcium carbonate veins and lenses, weak to moderately cementation.

161 m

Predominantly moderately hard, moderately well cemented, highly fractured, becomes light brownish gray color.
Moderately hard, moderately well cemented from elev 159.55 m to 159.4 m.
Predominantly moderately soft, poorly indurated, with approx 10% CLAY content and approx 20% SILT content.

158 m

GWS EL. 158.2 m 8-15-04
With approx 30% CLAY content from elev 158.05 m to 157.87 m.
At elev 157.26 m, becomes moderately weathered, moderately hard, moderately well cemented.
Predominantly moderately hard, moderately well cemented, becomes light olive gray color, slightly fractured.
Predominantly moderately soft, 10-20% SILT content, poorly indurated.

155 m

Predominantly moderately hard, moderately well cemented, moderately weathered, fine to medium grained.
Moderately hard, moderately well cemented, slightly fractured.
Becomes hard, well cemented at elev 152.84 m, numerous calcium carbonate veins and lenses.

152 m

Predominantly hard, moderately weathered, well cemented, with scattered moderately hard, moderately well cemented zones, slightly fractured.
Hard, moderately weathered, well cemented, slightly fractured.

149 m

Becomes predominantly moderately hard at elev 148.88 m, moderately well cemented.
Becomes hard, well cemented, color variable light gray to light brownish gray, at elev 146.66 m, thin CLAY-filled fractured at 45 ° angle, with SLICKENSIDES.

146 m

SILTSTONE, light olive gray, moderately weathered, moderately hard, moderately well cemented, slightly to moderately fractured, scattered calcium carbonate lenses, approx 10-20% fine SAND content. (OTAY FORMATION)
CLAYSTONE, light olive gray with brownish gray mottling, moderately weathered, moderately hard, moderately well cemented, moderately fractured, with approx 20% SILT content. (OTAY FORMATION)

143 m

SILTSTONE, light olive gray, moderately weathered, moderately hard, moderately well cemented, moderately fractured. (OTAY FORMATION)
SANDSTONE, olive gray, moderately weathered, moderately hard, moderately well cemented, approx 20% SILT content, predominantly fine to medium grained.
SILTSTONE, olive gray, moderately weathered, moderately hard, moderately well cemented, with approx 10-20% CLAY CONTENT.

140 m

CLAYSTONE, olive gray, moderately weathered, moderately hard to hard, moderately well cemented to well cemented, with scattered dark gray mottling and scattered calcium carbonate lenses. (OTAY FORMATION)
SILTSTONE, olive gray, moderately weathered, moderately hard to hard, moderately well cemented to well cemented, slightly fractured. (OTAY FORMATION)
Becomes hard at elev 139.74 m, well cemented.

137 m

SANDSTONE, medium light gray, moderately weathered, hard, well cemented, fine to medium grained, slightly fractured.
SILTSTONE, medium light gray, moderately weathered, hard, well cemented, with approx 20% fine SAND content, slightly fractured. (OTAY FORMATION)
SANDSTONE, medium light gray, moderately weathered, hard, well cemented, with 100 mm thick CLAYSTONE lens at elev 135.01 m to 134.31 m, moderately fractured.

134 m

Moderately hard to hard, moderately well cemented to well cemented, homogeneous SANDSTONE, fine to medium grained, slightly fractured.
Interbedded, moderately hard to hard SANDSTONE, SILTSTONE and CLAYSTONE layers, moderately weathered, moderately fractured on horizontal bedding surfaces, thickly to moderately bedded, light brownish gray color.

131 m

Predominantly fine grained SANDSTONE with scattered thin interbedded SILTSTONE and CLAYSTONE layers, moderately hard to hard, moderately weathered, slightly fractured.
SANDSTONE, brownish gray, moderately weathered, hard, fine to medium grained, non-fractured.
CLAYSTONE, brownish gray, moderately weathered, hard, non-fractured, with approx 20-30% SILT content.

128 m

199+00 | 199+50 | 200+00 | 200+50 | 201+00 | 201+50

PROFILE
HOR. 1:500
VER. 1:100

DIST	COUNTY	ROUTE	TOTAL PROJECT	NO.	SHEET
11	SD	905		1337	

REGISTERED CIVIL ENGINEER 3-2-04
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Caltrans Metric

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO. 57-1148L/R	AIRWAY ROAD UNDERCROSSING
DRAWN BY F. Nguyen 12/03, W. Tang 12/03		E. Neupert			KILOMETER POST 17.6	LOG OF TEST BORINGS 2 OF 4
CHECKED BY E. Neupert				CU 11224 EA 091821		SHEET 23 OF 25

OGS GEOLOGIST LOG OF TEST BORINGS SHEET (METRIC) (REV. 1/03)
ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100
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FOR PLAN VIEW, SEE "LOG OF TEST BORINGS" 1 OF 4

DIST	COUNTY	ROUTE	TOTAL PROJECT	NO.	SHEETS
11	SD	905		1388	

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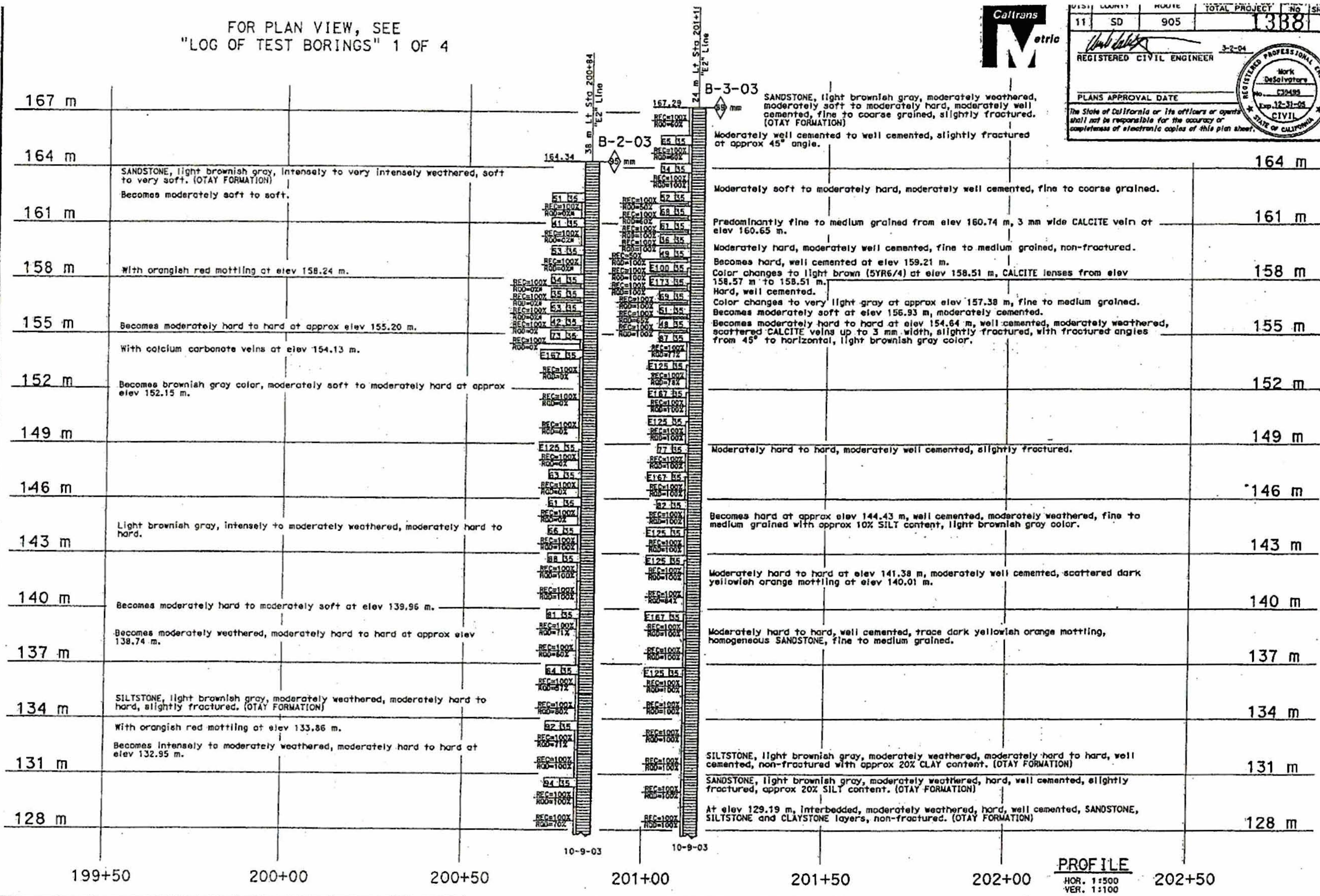

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CONSISTENCY CLASSIFICATION SOILS

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:
DRAWN BY: F. Nguyen 12/03, W. Tang 12/03		
CHECKED BY: E. Neupert		E. Neupert, F. Syed

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES — STRUCTURE DESIGN

BRIDGE NO. 57-1148L/R — KILOMETER POST 17.6

AIRWAY ROAD UNDERCROSSING

LOG OF TEST BORINGS 3 OF 4

OGS GEOLOGIST LOG OF TEST BORINGS SHEET (METRIC) (REV. 3/02)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

CU 11224
EA 091821

SHEET 24 OF 25

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11	SD	905	1389

REGISTERED CIVIL ENGINEER 3-2-04

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Caltrans Metric

WEATHERING DESCRIPTORS

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

Descriptors		Diagnostic features: Chemical weathering-Discoloration and/or oxidation		Diagnostic features: Mechanical weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Diagnostic features: Texture and solutioning		General characteristics (strength, excavation, etc.)§
Alphanumeric descriptor	Descriptive term	Body of rock	Fracture surfaces†		Texture	Solutioning	
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for naturally weak or weakly cemented rocks such as siltstones or shales.
W2	Slightly weathered to fresh°						
W3	Slightly weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened. With few exceptions, such as siltstones or shales, classified as rock excavation.
W4	Moderately to slightly weathered°						
W5	Moderately weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.
W6	Intensely to moderately weathered°						
W7	Intensely weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened. Usually common excavation.
W8	Very intensely weathered						
W9	Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Always common excavation. Resistant minerals such as quartz may be present as "stringers" or "dikes."

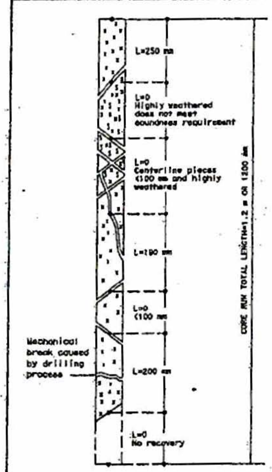
Note: This chart and its horizontal categories are more readily applied to rocks with feldspars and mafic minerals. Weathering in various sedimentary rocks, particularly limestones and poorly indurated sediments, will not always fit the categories established. This chart and weathering categories may have to be modified for particular site conditions or alteration such as hydrothermal effects; however, the basic framework and similar descriptors are to be used.

°Combination descriptors are permissible where equal distribution of both weathering characteristics are present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, dual descriptors should not be used where significant, identifiable zones can be delineated. When given as a range only two adjacent terms may be combined. "Decomposed to slightly weathered," or "moderately weathered to fresh" are not acceptable.

† Does not include directional weathering along shears or faults and their associated features. For example, a shear zone that carried weathering to great depths into a fresh rock mass would not require the rock mass to be classified as weathered.

§ These are generalizations and should not be used as diagnostic features for weathering or excavation classification. These characteristics vary to a large extent based on naturally weak materials or cementation and type of excavation.

ROCK QUALITY DESIGNATION (RQD) & PERCENT RECOVERY (REC) LOGGING



RQD (ROCK QUALITY DESIGNATION)	DESCRIPTION OF ROCK QUALITY
0 - 25%	VERY POOR
25 - 50%	POOR
50 - 75%	FAIR
75 - 90%	GOOD
90 - 100%	EXCELLENT

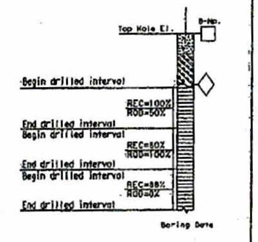
REC = Percent Core Recovery

$$REC = \frac{\sum \text{Length of all core pieces}}{\text{Total core run length}}$$

$$RQD = \frac{\sum \text{Length of sound core pieces} \geq 100 \text{ mm}}{\text{Total core run length}}$$

$$RQD = \frac{250+190+200}{1200} \times 100\%$$

RQD = 53% (fair)



(No Scale)
After Deere & Deere, 1989

FRACTURE DENSITY

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

FRACTURE DENSITY- Based on the spacing of all natural fractures in an exposure or core recovery lengths in boreholes; excludes mechanical breaks, shears, and shear zones; however, shear-disturbed zones (fracturing outside the shear) are included. Descriptors for fracture density apply to all rock exposures such as tunnel walls, dozer trenches, outcrops, or foundation cut slopes and inverts, as well as boreholes. Descriptive criteria presented below are based on borehole cores where lengths are measured along the core axis, for other exposures the criteria is distance measured between fractures (size of blocks).

UNFRACTURED (FD0): No fractures.

VERY SLIGHTLY FRACTURED (FD1): Core recovered mostly in lengths greater than 1 m.

SLIGHTLY TO VERY SLIGHTLY FRACTURED (FD2)*

SLIGHTLY FRACTURED (FD3): Core recovered mostly in lengths from 300 to 1000 mm, with few scattered lengths less than 300 mm or greater than 1000 mm.

MODERATELY TO SLIGHTLY FRACTURED (FD4)*

MODERATELY FRACTURED (FD5): Core recovered mostly in 100 to 300 mm lengths with most lengths about 200 mm.

INTENSELY TO MODERATELY FRACTURED (FD6)*

INTENSELY FRACTURED (FD7): Lengths average from 30 to 100 mm with scattered fragmented intervals. Core recovered mostly in lengths less than 100 mm.

VERY INTENSELY TO INTENSELY FRACTURED (FD8)*

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few scattered short core lengths.

* Combinations of fracture densities (e.g. very intensely to intensely fractured, or moderately to slightly fractured) are used where equal distribution of both fracture density characteristics are present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

ROCK HARDNESS DESCRIPTORS

Alphanumeric Descriptor	Descriptor	Criteria
H1	Extremely hard	Core, fragment, or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows.
H2	Very hard	Cannot be scratched with knife of sharp pick. Core or fragment breaks with repeated heavy hammer blows.
H3	Hard	Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.
H4	Moderately hard	Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.
H5	Moderately soft	Can be grooved 2 mm deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.
H6	Soft	Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
H7	Very soft	Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Any bedrock unit softer than H7, very soft, is to be described using ASTM D-2488 consistency descriptors.

Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria.

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

BEDDING, FOLIATION, OR FLOW TEXTURE DESCRIPTORS

Descriptors	Thickness / Spacing
Massive	Greater than 3 m
Very thickly (bedded, foliated, or banded)	1 to 3 m
Thickly	300 mm to 1 m
Moderately	100 to 300 mm
Thinly	30 to 100 mm
Very thinly	10 to 30 mm
Laminated (intensely foliated or banded)	Less than 10 mm

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

ENGINEERING SERVICE CENTER	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN 14	BRIDGE NO. 57-1148L/R; KILOMETER POST 17.6	AIRWAY ROAD UNDERCROSSING LOG OF TEST BORINGS 4 OF 4
PREPARED BY F. Nguyen 12/03			CU 11224		
CHECKED BY E. Neupert			EA 091821		SHEET 25 OF 25

OSF GEOLOGIST LOG OF TEST BORINGS SHEET (METRIC) (REV. 5/2003)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

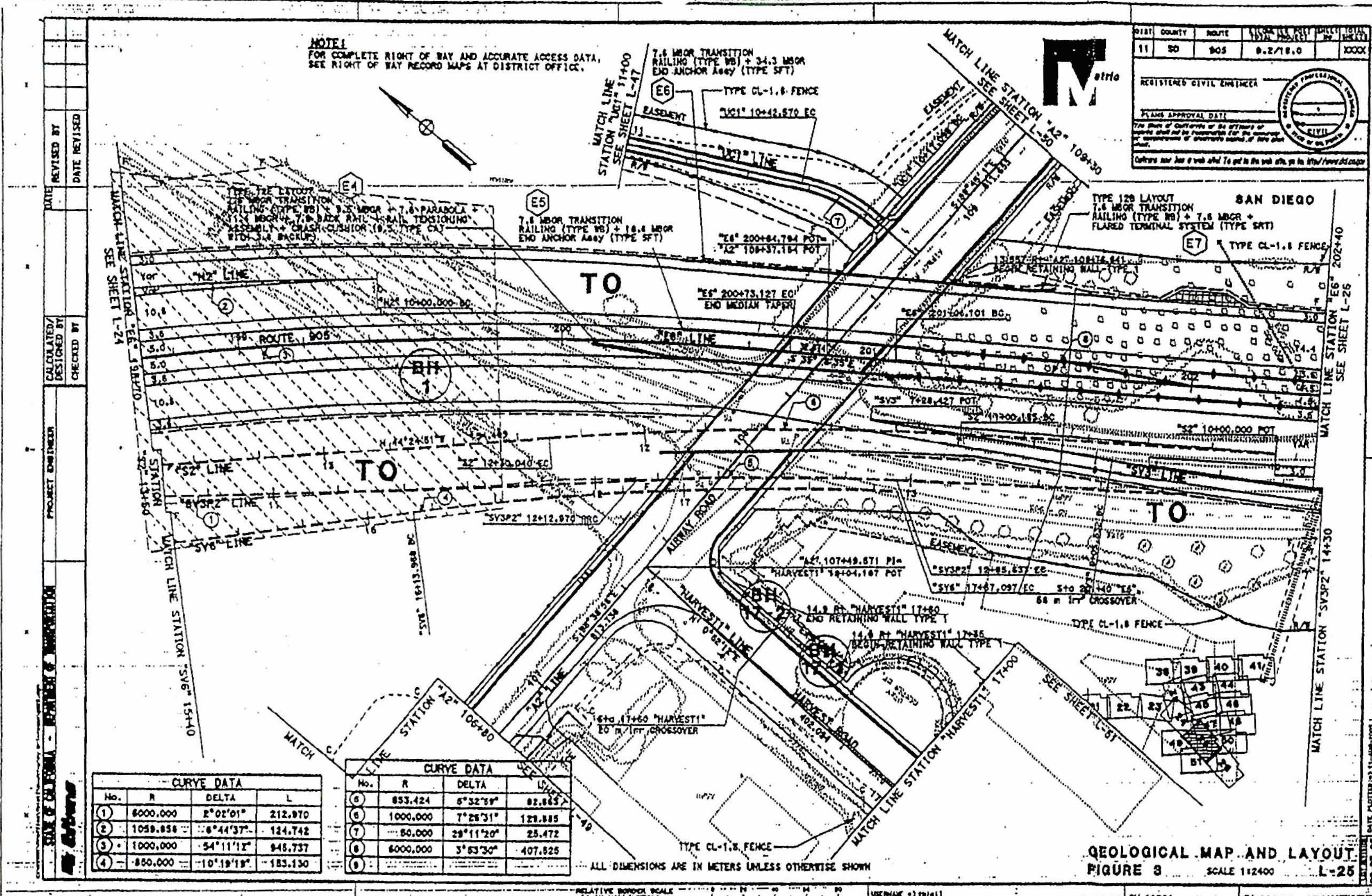
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

FILE => 1148new_lotb4.dgn

Appendix D.4

Geotechnical Design Report, 11-SD-905, KP 9.2/18.0, 11-091821, prepared by Caltrans, dated September 14, 2005.



No.	R	DELTA	L
1	6000.000	2°02'01"	212.970
2	1059.856	6°44'37"	124.742
3	1000.000	54°11'12"	945.737
4	850.000	10°19'19"	153.130

No.	R	DELTA	L
5	853.424	5°32'59"	82.663
6	1000.000	7°26'31"	129.885
7	50.000	29°11'20"	25.472
8	6000.000	3°53'30"	407.625
9			

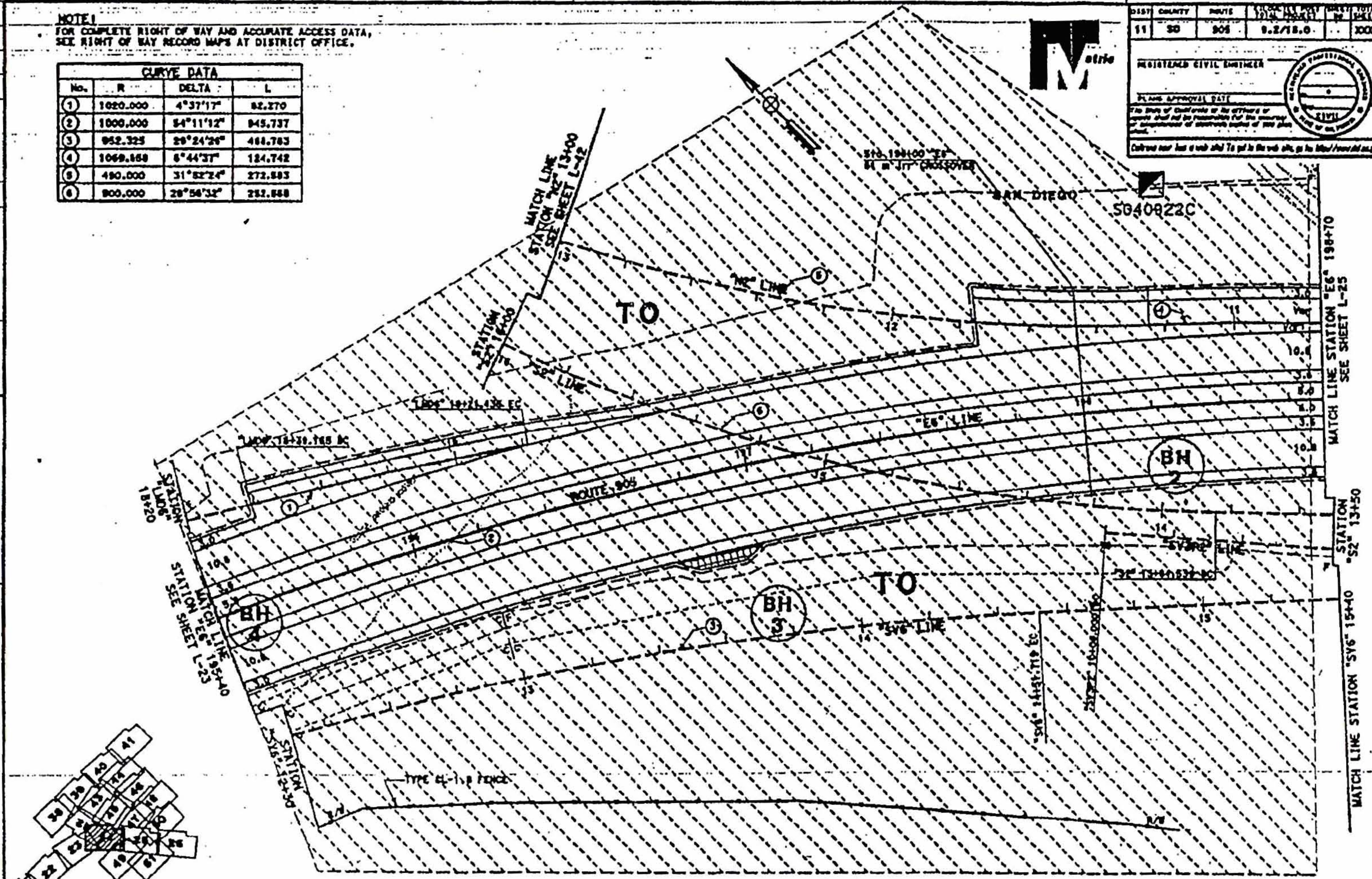
GEOLOGICAL MAP AND LAYOUT
FIGURE 3 SCALE 1:2400 L-25

DIST	COUNTY	ROUTE	TOTAL PROJECT
11	SD	905	9.2/18.0

CU 11224 EA 091821

NOTE:
FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

CURVE DATA			
No.	R	DELTA	L
(1)	1020.000	4°37'17"	82.270
(2)	1000.000	54°11'12"	945.737
(3)	952.325	29°24'26"	488.783
(4)	1060.868	6°44'37"	124.742
(5)	490.000	31°52'24"	272.583
(6)	500.000	28°56'32"	252.558



DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	905	9.2/15.0		XXXX

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

GEOLOGICAL MAP AND LAYOUT
FIGURE 3 SCALE 1:2400 **L-24**

CU 11224 EA 091821

STATE OF CALIFORNIA — DEPARTMENT OF TRANSPORTATION

PROJECT ENGINEER | CALCULATED/DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

RELATIVE BORDER SCALE IS IN MILLIMETERS

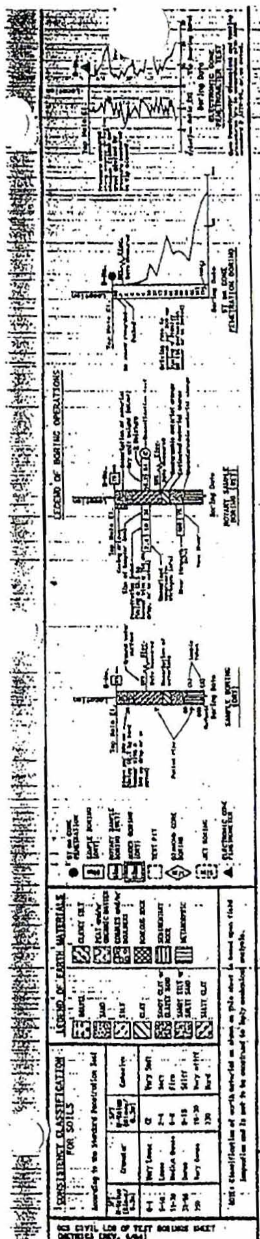
DIST	COUNTY	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
11	SD			

REGISTERED CIVIL ENGINEER 08-31-05

PLANS APPROVAL DATE

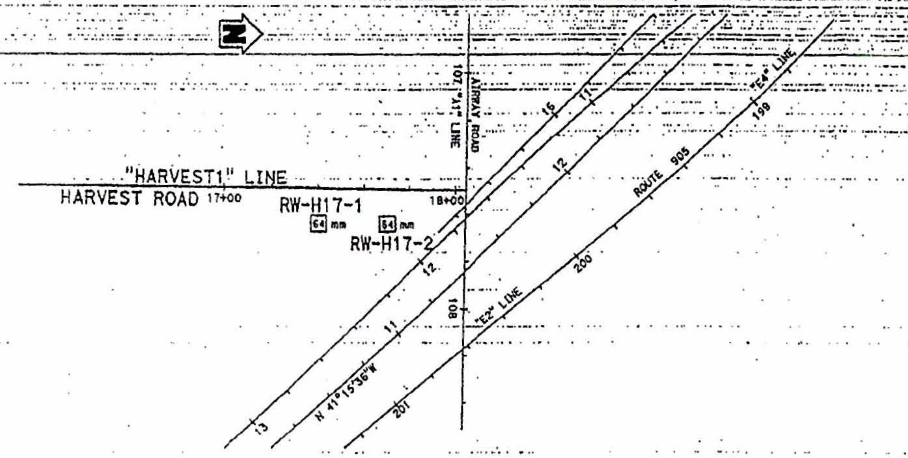
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — Ali Lori — No. C55816 — Exp. 12-31-05 — CIVIL — STATE OF CALIFORNIA



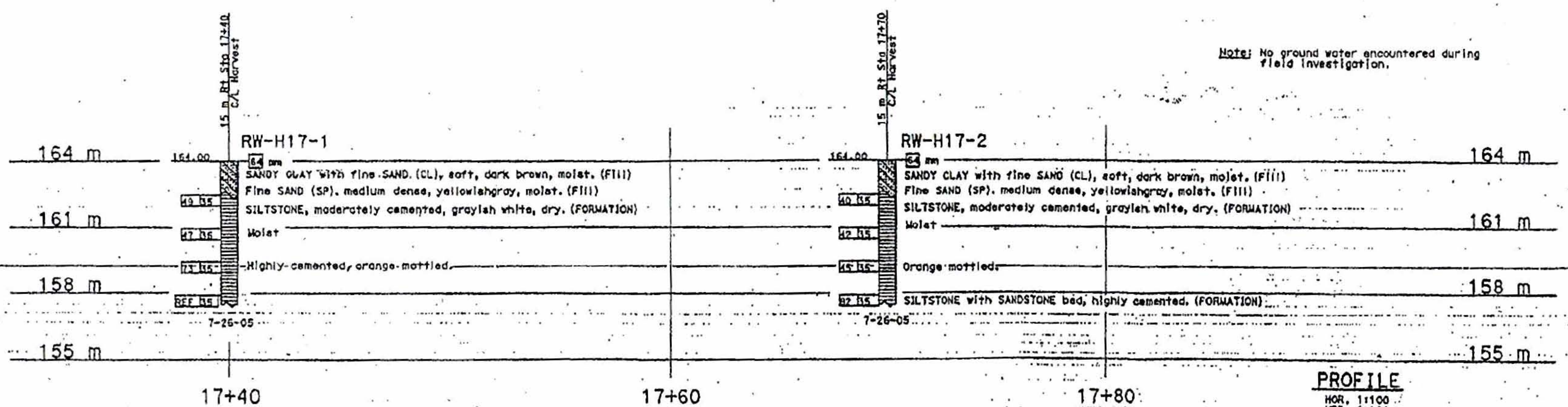
BENCH MARK

The elevations have been derived from the cross sections prepared by District 11 Design.



PLAN
1:1000

Note: No ground water encountered during field investigation.



PROFILE
HOR. 1:100
VER. 1:100

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

Caltrans Metric	GEOTECHNICAL SERVICES		FIELD INVESTIGATION BY: A. Lori	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH	BRIDGE NO. / KILOMETER POST PM6.0-11.1	RETAINING WALL H17 — LOG OF TEST BORINGS 1 OF 2
	DRAWN BY	W. Tong 08/05			CU 11 EA 091821		
	CHECKED BY	A. Lori					
	ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN						

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
SH1	10/22/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
199+48 13.65 m Rt.	161.2 m		11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
RIG: CHRISTENSON CS2000						ML	CLAYEY SILT (ML), FIRM, BROWN,
6" HOLLOW FLT AUGER							SLIGHTLY MOIST, SLIGHTLY ORGANIC
							TOPSOIL
					5		
	1	4					CLAYEY SILT (ML), VERY STIFF, TAN AND
		7					BROWN MOTTLED, SLIGHTLY MOIST
		11	18				LOW PLASTICITY, HORIZONTAL MICA
							STRATIFICATION, FORMATION
					10	SP	POORLY GRADED SAND W/SILT (SP)
	2	8					DENSE, BROWN, MOIST, FINE,
		18					FORMATION
		25	43				
					15		
	3	12					SAME, GRADES TO SILTY SAND
		16					FORMATION
		31	47				

STATE OF CALIFORNIA * DEPARTMENT OF TRANSPORTATION

ROTARY FIELD NOTES

-1271b (REV. 01/31/00)

NG NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH1	10/22/03	11	SD	905	11-091821
LOCATION (STA/OFFSET or NORTHING/EASTING)		TOP HOLE ELEVATION		BRIDGE #	EA NUMBER

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u. Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
						ML	
					20		GRADES TO - SILT W/SAND (ML)
	4	12					DENSE, BROWN, SLIGHTLY MOIST,
		21					FINE SAND, NON PLASTIC SILT,
		26	47				FORMATION
					25		GRADES TO - SILT (ML) DENSE/VERY STIFF
	5	10					BROWN, SLIGHTLY MOIST,
		15					NON PLASTIC, FORMATION
		20	35				
					30		
	6	9					CLAYEY SILT (ML) VERY STIFF
		11					LIGHT GREENISH GRAY, SLIGHTLY
		16	27				MOIST, LOW PLASTICITY, MOTTLED
					31.5'	TD	W/REDDISH ORANGE, FORMATION

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH 2	10/22/03	11	SP	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
[illegible] 21.4m RT	159.9m		11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc) Drill Rig reactions – chattering, skipping, blocking off)	SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
RIG: CHRISTENSON [illegible] 2000						ML	CLAYEY SILT (ML), FIRM, BROWN,
6" HOLLOW FLIGHT AUGER							DRY, SLIGHTLY ORGANIC
							TOPSOIL
					5		
	1	3					SILT (ML), LOOSE, MOTTLED TAN
		3					& BROWN, SLIGHTLY MOIST, SOME
		6	9				VERY FINE SAND, NON PLASTIC
					10		
		8					SILT (ML) TO SILTSTONE, DENSE
		12					TAN & BROWN, SLIGHTLY MOIST,
		17	29				NON PLASTIC, MASSIVE FORMATION
					15		
		15					SAME, VERY DENSE
		28					
		32	60				

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH2	10/22/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
			11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING N	S		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
				20		
	10				SP	POORLY GRADED SAND W/SILT (SP),
	19					DENSE, TAN TO BROWN, MOIST, VERY FINE
	20	39				SOME ORANGE RED SAND, FORMATION
					▽	PERCHED WATER
				25		
	10					SILTY SAND (SM)/SANDSTONE
	21					VERY DENSE, BROWN, MOIST, FINE,
	43	64				MASSIVE, FORMATION
				TD 26.5'		

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH3	10/22/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
196+96 60.6 RT	161.2 m		11-091821

REMARKS (Tool Sizes/Type • Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING: SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
CHRISTENSON CS 2000						ML	CLAYEY SILT (ML), FIRM, BROWN,
6" HOLLOW FLIGHT AUGER							DRY, SLIGHTLY ORGANIC
							TOP SOIL
					5		SILTSTONE / SANDSTONE, DENSE
		10					TAN, SLIGHTLY MOIST, VERY FINE
		13					MASSIVE, FORMATION
		19	32				
		10			10		SAME SILTSTONE
		18					
		25	43				
					15		
		23					SAME
		44					
20 BLOWS FOR 2"		20+	64+				

STATE OF CALIFORNIA * DEPARTMENT OF TRANSPORTATION

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH3	10/22/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
			11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	FIELD TESTING: SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u. Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
					20		
		6					SAME, SILTSTONE, BROWN
		13					
		28	41				
					25		
		8					SAME
		14					
		30	44				
					30	SP	POORLY GRADED SAND (SP), DENSE
		6					BROWN, WET, VERY FINE
		13				▽	
		22	35				
						TD	31.5'

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH4	10/23/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
195+47 3.8 RT	158.9 m		11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	SAMPLE #	BLOWS PER	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u, Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
CHRISTENSON CS 2000						ML	SURFACE SOIL - SILT (ML), LOOSE,
6" HOLLOW FLIGHT AUGER							DARK BROWN, DRY, ORGANIC, AGRICU.
						CL	CLAY (CL), STIFF, DARK BROWN,
							SLIGHTLY MOIST
						SM	
					5		SILTY SAND (SM), LOOSE, TAN W/
		5					ORANGE MOTTLING, SLIGHTLY MOIST
		5					VERY FINE, MASSIVE
		4	9				
						CL	
					10		CLAY (CL), VERY STIFF, WHITE TAN
		5					& GREENISH MOTTLING, SLIGHTLY
		9					MOIST, LOW PLASTICITY
		16	25				
						SP	
					15		POORLY GRADED SAND W/ SILT (SP)
		7					MEDIUM DENSE, BROWN, MOIST,
		10					VERY FINE
		12	22				

ROTARY FIELD NOTES

TL-1271b (REV. 01/31/00)

BORING NUMBER	DATE	DIST.	CO.	RTE.	P.M. (K.P.)
BH4	10/22/03	11	SD	905	

LOCATION (STA/OFFSET or NORTHING/EASTING)	TOP HOLE ELEVATION	BRIDGE #	EA NUMBER
			11-091821

REMARKS (Tool Sizes/Type - Rods & Bits, etc) (Hole Condition – Caving, Squeezing, Loss of Circulation, etc. Drill Rig reactions – slowing, chattering, skipping, blocking off)	SAMPLE #	BLOWS PER 6"	SPT (N)		DEPTH (ft) (m)	GRAPHIC LOG	DESCRIPTION Soil Classification (group name, group symbol, consistency/relative density, color, moisture, particle size, gradation, plasticity, structure, cementation, organics, fill, q_u, s_u. Other characteristics) Rock Classification (rock name, color, degree of weathering, relative hardness, bedding, discontinuity characteristics, voids, slaking, odor, other characteristics)
					20		CLAYSTONE, VERY STIFF, GREENISH GRAY, SLIGHTLY MOIST, MASSIVE FORMATION
		13					
		18					
		25	43				
					25		SILTSTONE, HARD, GREENISH GRAY SLIGHTLY MOIST, MASSIVE, FORMATION
		8					
		15					
50 BLOWS FOR 0.45 FT		50	65+				
					30		SAME
		10					
		17					
		29	46				
							TD = 31.5'

Division of Engineering Services
Materials Engineering and Testing Services
Corrosion Technology Branch
Report Date: 11/16/2004
Reported By: Lopez, Rudy

CORROSION TEST SUMMARY REPORT - Soil/Water

Bridge Name:
Bridge Number:
EA No.: 11-091821
Dist/Co/Rte/PM or KP: 11 / SD / 905 / 9.2/18.0

SIC Number (TL101)	Sample Location	Sample Type	Sample Depth	Minimum Resistivity[1] (ohm-cm)	pH[2]	Chloride Content[3] (ppm)	Sulfate Content[4] (ppm)
C578529C	SAN DIEGO-905	SOIL	SURFACE / SAMPLE #5040903B	820	7.86	46	69
C578529E	SAN DIEGO-905	SOIL	SURFACE/ SAMPLE #5040922A	450	8.14	340	460
C578529G	SAN DIEGO-905	SOIL	SURFACE/ SAMPLE #5040922B	2600	6.95		
C578529H	SAN DIEGO 905	SOIL	SURFACE/ #S040922C	780	7.47	24	29
C578529K	SAN DIEGO 905	SOIL	SURFACE/ #S040922D2	65	7.65	9000	770

☐ This site is not corrosive to foundation elements (see note below for MSE wall backfill)

☒ This site is corrosive (if checked). Controlling corrosion parameters are as follows:

- 6.95 pH
- 9000 ppm Chloride
- 770 ppm Sulfate

Note: For MSE wall structure backfill material; minimum resisitivity must be 1500 ohm-cm or greater, pH must be between 5.5 and 10.0, chloride content must not be greater than 500 ppm, and sulfate content must not be greater than 2000 ppm.

[1,2]CTM 643, [3]CTM 422, [4]CTM 417

CALCULATION COVER SHEET

PROJECT:	SR125/SR905 Connector	**Job No:** 600158-905 **Date:** February 5, 2008
TITLE:	PAVEMENT CALCULATIONS	
SUBJECT:	New AC over Base pavement section	
PROBLEM STATEMENT:	Calculate pavement section for range of Traffic Indexes	
OBJECTIVE:	Provide table of pavement sections for range of Traffic Indexes	
DATA SOURCES:	Lab Test – R-Value	
REFERENCES:	Caltrans, Highway Design Manual, June 2006 Caltrans CalFP Software, Version 1.1	

REVISION NO.	CALCULATED BY	DATE	CHECKED BY	DATE	REVIEWED BY	DATE
-	SAC	1-10-08	DXB	1-21-08		

Leighton

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 05.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0001.36 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.35 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.54	00.25	00.15	02.54	00.38
00.20	02.54	00.51	00.25	02.54	00.64
00.30	02.54	00.76	00.35	02.54	00.89
00.40	02.54	01.02	00.45	02.54	01.14
00.50	02.54	01.27	00.55	02.56	01.41
00.60	02.64	01.58	00.65	02.71	01.76

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0000.65 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.20	00.00	00.75	00.00	00.00	-00.03	0000.00	02.54
00.25	00.00	00.65	00.00	00.00	-00.01	0000.00	02.54
00.30	00.00	00.55	00.00	00.00	00.01	0000.00	02.54
00.35	00.00	00.45	00.00	00.00	00.02	0000.00	02.54
00.40	00.00	00.35	00.00	00.00	00.04	0000.00	02.54
00.45	00.00	00.35	00.00	00.00	00.17	0000.00	02.54
00.50	00.00	00.35	00.00	00.00	00.30	0000.00	02.54
00.55	00.00	00.35	00.00	00.00	00.43	0000.00	02.56
00.60	00.00	00.35	00.00	00.00	00.61	0000.00	02.64

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 05.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0001.50 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.39 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.42	00.24	00.15	02.42	00.36
00.20	02.42	00.48	00.25	02.42	00.61
00.30	02.42	00.73	00.35	02.42	00.85
00.40	02.42	00.97	00.45	02.42	01.09
00.50	02.42	01.21	00.55	02.45	01.35
00.60	02.52	01.51	00.65	02.59	01.68
00.70	02.65	01.86	00.75	02.71	02.03

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0000.75 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.25	00.00	00.80	00.00	00.00	-00.01	0000.00	02.42
00.30	00.00	00.70	00.00	00.00	00.00	0000.00	02.42
00.35	00.00	00.60	00.00	00.00	00.01	0000.00	02.42
00.40	00.00	00.50	00.00	00.00	00.02	0000.00	02.42
00.45	00.00	00.35	00.00	00.00	-00.02	0000.00	02.42
00.50	00.00	00.35	00.00	00.00	00.10	0000.00	02.42
00.55	00.00	00.35	00.00	00.00	00.24	0000.00	02.45
00.60	00.00	00.35	00.00	00.00	00.40	0000.00	02.52
00.65	00.00	00.35	00.00	00.00	00.57	0000.00	02.59

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 06.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0001.63 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.42 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.31	00.23	00.15	02.31	00.35
00.20	02.31	00.46	00.25	02.31	00.58
00.30	02.31	00.69	00.35	02.31	00.81
00.40	02.31	00.92	00.45	02.31	01.04
00.50	02.31	01.16	00.55	02.34	01.29
00.60	02.41	01.45	00.65	02.48	01.61
00.70	02.54	01.78	00.75	02.60	01.95
00.80	02.65	02.12	00.85	02.71	02.30

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0000.80 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.25	00.00	00.95	00.00	00.00	-00.01	0000.00	02.31
00.30	00.00	00.85	00.00	00.00	-00.00	0000.00	02.31
00.35	00.00	00.75	00.00	00.00	00.00	0000.00	02.31
00.40	00.00	00.65	00.00	00.00	00.01	0000.00	02.31
00.45	00.00	00.55	00.00	00.00	00.01	0000.00	02.31
00.50	00.00	00.45	00.00	00.00	00.02	0000.00	02.31
00.55	00.00	00.35	00.00	00.00	00.04	0000.00	02.34
00.60	00.00	00.35	00.00	00.00	00.20	0000.00	02.41
00.65	00.00	00.35	00.00	00.00	00.37	0000.00	02.48
00.70	00.00	00.35	00.00	00.00	00.53	0000.00	02.54

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 06.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0001.77 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.46 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.22	00.22	00.15	02.22	00.33
00.20	02.22	00.44	00.25	02.22	00.56
00.30	02.22	00.67	00.35	02.22	00.78
00.40	02.22	00.89	00.45	02.22	01.00
00.50	02.22	01.11	00.55	02.25	01.24
00.60	02.32	01.39	00.65	02.38	01.55
00.70	02.44	01.71	00.75	02.49	01.87
00.80	02.55	02.04	00.85	02.60	02.21

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0000.85 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.30	00.00	01.00	00.00	00.00	-00.00	0000.00	02.22
00.35	00.00	00.90	00.00	00.00	-00.00	0000.00	02.22
00.40	00.00	00.80	00.00	00.00	00.00	0000.00	02.22
00.45	00.00	00.70	00.00	00.00	00.00	0000.00	02.22
00.50	00.00	00.60	00.00	00.00	00.00	0000.00	02.22
00.55	00.00	00.50	00.00	00.00	00.02	0000.00	02.25
00.60	00.00	00.35	00.00	00.00	00.01	0000.00	02.32
00.65	00.00	00.35	00.00	00.00	00.16	0000.00	02.38
00.70	00.00	00.35	00.00	00.00	00.33	0000.00	02.44
00.75	00.00	00.35	00.00	00.00	00.48	0000.00	02.49
00.80	00.00	00.35	00.00	00.00	00.66	0000.00	02.55

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 07.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0001.90 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.49 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.14	00.21	00.15	02.14	00.32
00.20	02.14	00.43	00.25	02.14	00.54
00.30	02.14	00.64	00.35	02.14	00.75
00.40	02.14	00.86	00.45	02.14	00.96
00.50	02.14	01.07	00.55	02.17	01.19
00.60	02.23	01.34	00.65	02.29	01.49
00.70	02.35	01.65	00.75	02.40	01.80
00.80	02.46	01.97	00.85	02.51	02.13
00.90	02.55	02.30	00.95	02.60	02.47

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0000.95 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.35	00.00	01.05	00.00	00.00	00.00	0000.00	02.14
00.40	00.00	00.95	00.00	00.00	-00.00	0000.00	02.14
00.45	00.00	00.85	00.00	00.00	-00.01	0000.00	02.14
00.50	00.00	00.75	00.00	00.00	-00.01	0000.00	02.14
00.55	00.00	00.65	00.00	00.00	00.00	0000.00	02.17
00.60	00.00	00.50	00.00	00.00	-00.02	0000.00	02.23
00.65	00.00	00.40	00.00	00.00	00.02	0000.00	02.29
00.70	00.00	00.35	00.00	00.00	00.13	0000.00	02.35
00.75	00.00	00.35	00.00	00.00	00.28	0000.00	02.40
00.80	00.00	00.35	00.00	00.00	00.45	0000.00	02.46
00.85	00.00	00.35	00.00	00.00	00.61	0000.00	02.51

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 07.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.04 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.53 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.07	00.21	00.15	02.07	00.31
00.20	02.07	00.41	00.25	02.07	00.52
00.30	02.07	00.62	00.35	02.07	00.72
00.40	02.07	00.83	00.45	02.07	00.93
00.50	02.07	01.04	00.55	02.09	01.15
00.60	02.16	01.30	00.65	02.21	01.44
00.70	02.27	01.59	00.75	02.32	01.74
00.80	02.37	01.90	00.85	02.42	02.06
00.90	02.47	02.22	00.95	02.51	02.38
01.00	02.56	02.56	01.05	02.60	02.73

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.00 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.35	00.00	01.20	00.00	00.00	00.00	0000.00	02.07
00.40	00.00	01.10	00.00	00.00	-00.00	0000.00	02.07
00.45	00.00	01.00	00.00	00.00	-00.01	0000.00	02.07
00.50	00.00	00.90	00.00	00.00	-00.02	0000.00	02.07
00.55	00.00	00.80	00.00	00.00	-00.01	0000.00	02.09
00.60	00.00	00.70	00.00	00.00	00.03	0000.00	02.16
00.65	00.00	00.55	00.00	00.00	00.00	0000.00	02.21
00.70	00.00	00.40	00.00	00.00	-00.01	0000.00	02.27
00.75	00.00	00.35	00.00	00.00	00.09	0000.00	02.32
00.80	00.00	00.35	00.00	00.00	00.24	0000.00	02.37
00.85	00.00	00.35	00.00	00.00	00.40	0000.00	02.42
00.90	00.00	00.35	00.00	00.00	00.57	0000.00	02.47

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR05 Connector
Traffic Index (TI) = 08.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.18 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.56 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.00	00.20	00.15	02.00	00.30
00.20	02.00	00.40	00.25	02.00	00.50
00.30	02.00	00.60	00.35	02.00	00.70
00.40	02.00	00.80	00.45	02.00	00.90
00.50	02.00	01.00	00.55	02.03	01.12
00.60	02.09	01.25	00.65	02.14	01.39
00.70	02.20	01.54	00.75	02.25	01.69
00.80	02.30	01.84	00.85	02.34	01.99
00.90	02.39	02.15	00.95	02.43	02.31
01.00	02.47	02.47	01.05	02.52	02.65
01.10	02.55	02.81	01.15	02.59	02.98

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.10 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.40	00.00	01.25	00.00	00.00	-00.00	0000.00	02.00
00.45	00.00	01.15	00.00	00.00	-00.01	0000.00	02.00
00.50	00.00	01.05	00.00	00.00	-00.02	0000.00	02.00
00.55	00.00	00.95	00.00	00.00	-00.01	0000.00	02.03
00.60	00.00	00.85	00.00	00.00	00.01	0000.00	02.09
00.65	00.00	00.70	00.00	00.00	-00.01	0000.00	02.14
00.70	00.00	00.60	00.00	00.00	00.02	0000.00	02.20
00.75	00.00	00.45	00.00	00.00	00.01	0000.00	02.25
00.80	00.00	00.35	00.00	00.00	00.05	0000.00	02.30
00.85	00.00	00.35	00.00	00.00	00.20	0000.00	02.34
00.90	00.00	00.35	00.00	00.00	00.36	0000.00	02.39
00.95	00.00	00.35	00.00	00.00	00.52	0000.00	02.43

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 08.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.31 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.60 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.94	00.19	00.15	01.94	00.29
00.20	01.94	00.39	00.25	01.94	00.49
00.30	01.94	00.58	00.35	01.94	00.68
00.40	01.94	00.78	00.45	01.94	00.87
00.50	01.94	00.97	00.55	01.97	01.08
00.60	02.03	01.22	00.65	02.08	01.35
00.70	02.13	01.49	00.75	02.18	01.64
00.80	02.23	01.78	00.85	02.27	01.93
00.90	02.32	02.09	00.95	02.36	02.24
01.00	02.40	02.40	01.05	02.44	02.56
01.10	02.48	02.73	01.15	02.52	02.90

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.15 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.40	00.00	01.40	00.00	00.00	00.00	0000.00	01.94
00.45	00.00	01.30	00.00	00.00	-00.01	0000.00	01.94
00.50	00.00	01.20	00.00	00.00	-00.02	0000.00	01.94
00.55	00.00	01.10	00.00	00.00	-00.02	0000.00	01.97
00.60	00.00	01.00	00.00	00.00	00.01	0000.00	02.03
00.65	00.00	00.85	00.00	00.00	-00.02	0000.00	02.08
00.70	00.00	00.75	00.00	00.00	00.00	0000.00	02.13
00.75	00.00	00.60	00.00	00.00	-00.02	0000.00	02.18
00.80	00.00	00.50	00.00	00.00	00.02	0000.00	02.23
00.85	00.00	00.35	00.00	00.00	00.00	0000.00	02.27
00.90	00.00	00.35	00.00	00.00	00.16	0000.00	02.32
00.95	00.00	00.35	00.00	00.00	00.32	0000.00	02.36
01.00	00.00	00.35	00.00	00.00	00.47	0000.00	02.40

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 09.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.45 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.63 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.89	00.19	00.15	01.89	00.28
00.20	01.89	00.38	00.25	01.89	00.47
00.30	01.89	00.57	00.35	01.89	00.66
00.40	01.89	00.76	00.45	01.89	00.85
00.50	01.89	00.95	00.55	01.91	01.05
00.60	01.97	01.18	00.65	02.02	01.31
00.70	02.07	01.45	00.75	02.12	01.59
00.80	02.17	01.74	00.85	02.21	01.88
00.90	02.25	02.03	00.95	02.29	02.18
01.00	02.33	02.33	01.05	02.37	02.49
01.10	02.41	02.65	01.15	02.44	02.81
01.20	02.48	02.98	01.25	02.51	03.14

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.25 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.45	00.00	01.45	00.00	00.00	-00.00	0000.00	01.89
00.50	00.00	01.35	00.00	00.00	-00.02	0000.00	01.89
00.55	00.00	01.25	00.00	00.00	-00.02	0000.00	01.91
00.60	00.00	01.15	00.00	00.00	-00.00	0000.00	01.97
00.65	00.00	01.05	00.00	00.00	00.02	0000.00	02.02
00.70	00.00	00.90	00.00	00.00	-00.01	0000.00	02.07
00.75	00.00	00.80	00.00	00.00	00.02	0000.00	02.12
00.80	00.00	00.65	00.00	00.00	00.00	0000.00	02.17
00.85	00.00	00.50	00.00	00.00	-00.02	0000.00	02.21
00.90	00.00	00.40	00.00	00.00	00.02	0000.00	02.25
00.95	00.00	00.35	00.00	00.00	00.11	0000.00	02.29
01.00	00.00	00.35	00.00	00.00	00.27	0000.00	02.33
01.05	00.00	00.35	00.00	00.00	00.43	0000.00	02.37

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 09.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.58 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.67 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.84	00.18	00.15	01.84	00.28
00.20	01.84	00.37	00.25	01.84	00.46
00.30	01.84	00.55	00.35	01.84	00.64
00.40	01.84	00.74	00.45	01.84	00.83
00.50	01.84	00.92	00.55	01.86	01.02
00.60	01.92	01.15	00.65	01.97	01.28
00.70	02.02	01.41	00.75	02.06	01.55
00.80	02.11	01.69	00.85	02.15	01.83
00.90	02.19	01.97	00.95	02.23	02.12
01.00	02.27	02.27	01.05	02.31	02.43
01.10	02.34	02.57	01.15	02.38	02.74
01.20	02.41	02.89	01.25	02.45	03.06
01.30	02.48	03.22	01.35	02.51	03.39

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.30 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.50	00.00	01.50	00.00	00.00	-00.01	0000.00	01.84
00.55	00.00	01.40	00.00	00.00	-00.02	0000.00	01.86
00.60	00.00	01.30	00.00	00.00	-00.00	0000.00	01.92
00.65	00.00	01.20	00.00	00.00	00.02	0000.00	01.97
00.70	00.00	01.05	00.00	00.00	-00.01	0000.00	02.02
00.75	00.00	00.95	00.00	00.00	00.01	0000.00	02.06
00.80	00.00	00.80	00.00	00.00	-00.02	0000.00	02.11
00.85	00.00	00.70	00.00	00.00	00.01	0000.00	02.15
00.90	00.00	00.55	00.00	00.00	-00.01	0000.00	02.19
00.95	00.00	00.40	00.00	00.00	-00.03	0000.00	02.23
01.00	00.00	00.35	00.00	00.00	00.07	0000.00	02.27
01.05	00.00	00.35	00.00	00.00	00.23	0000.00	02.31
01.10	00.00	00.35	00.00	00.00	00.38	0000.00	02.34

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connecotr
Traffic Index (TI) = 10.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.72 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.70 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.79	00.18	00.15	01.79	00.27
00.20	01.79	00.36	00.25	01.79	00.45
00.30	01.79	00.54	00.35	01.79	00.63
00.40	01.79	00.72	00.45	01.79	00.81
00.50	01.79	00.90	00.55	01.81	01.00
00.60	01.87	01.12	00.65	01.92	01.25
00.70	01.97	01.38	00.75	02.01	01.51
00.80	02.05	01.64	00.85	02.10	01.79
00.90	02.14	01.93	00.95	02.18	02.07
01.00	02.21	02.21	01.05	02.25	02.36
01.10	02.29	02.52	01.15	02.32	02.67
01.20	02.35	02.82	01.25	02.38	02.98
01.30	02.42	03.15	01.35	02.45	03.31

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.35 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.50	00.00	01.65	00.00	00.00	-00.01	0000.00	01.79
00.55	00.00	01.55	00.00	00.00	-00.02	0000.00	01.81
00.60	00.00	01.45	00.00	00.00	-00.00	0000.00	01.87
00.65	00.00	01.35	00.00	00.00	00.01	0000.00	01.92
00.70	00.00	01.20	00.00	00.00	-00.02	0000.00	01.97
00.75	00.00	01.10	00.00	00.00	-00.00	0000.00	02.01
00.80	00.00	01.00	00.00	00.00	00.02	0000.00	02.05
00.85	00.00	00.85	00.00	00.00	00.00	0000.00	02.10
00.90	00.00	00.70	00.00	00.00	-00.02	0000.00	02.14
00.95	00.00	00.60	00.00	00.00	00.01	0000.00	02.18
01.00	00.00	00.45	00.00	00.00	-00.01	0000.00	02.21
01.05	00.00	00.35	00.00	00.00	00.03	0000.00	02.25
01.10	00.00	00.35	00.00	00.00	00.18	0000.00	02.29

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 10.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.86 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.74 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.75	00.18	00.15	01.75	00.26
00.20	01.75	00.35	00.25	01.75	00.44
00.30	01.75	00.53	00.35	01.75	00.61
00.40	01.75	00.70	00.45	01.75	00.79
00.50	01.75	00.88	00.55	01.77	00.97
00.60	01.82	01.09	00.65	01.87	01.22
00.70	01.92	01.34	00.75	01.96	01.47
00.80	02.01	01.61	00.85	02.05	01.74
00.90	02.09	01.88	00.95	02.12	02.01
01.00	02.16	02.16	01.05	02.20	02.31
01.10	02.23	02.45	01.15	02.26	02.60
01.20	02.30	02.76	01.25	02.33	02.91
01.30	02.36	03.07	01.35	02.39	03.23
01.40	02.42	03.39	01.45	02.45	03.55

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.45 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.55	00.00	01.70	00.00	00.00	-00.01	0000.00	01.77
00.60	00.00	01.60	00.00	00.00	-00.00	0000.00	01.82
00.65	00.00	01.50	00.00	00.00	00.01	0000.00	01.87
00.70	00.00	01.35	00.00	00.00	-00.03	0000.00	01.92
00.75	00.00	01.25	00.00	00.00	-00.01	0000.00	01.96
00.80	00.00	01.15	00.00	00.00	00.02	0000.00	02.01
00.85	00.00	01.00	00.00	00.00	-00.01	0000.00	02.05
00.90	00.00	00.90	00.00	00.00	00.02	0000.00	02.09
00.95	00.00	00.75	00.00	00.00	-00.02	0000.00	02.12
01.00	00.00	00.65	00.00	00.00	00.02	0000.00	02.16
01.05	00.00	00.50	00.00	00.00	00.00	0000.00	02.20
01.10	00.00	00.35	00.00	00.00	-00.02	0000.00	02.23
01.15	00.00	00.35	00.00	00.00	00.13	0000.00	02.26

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 11.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0002.99 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.77 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.71	00.17	00.15	01.71	00.26
00.20	01.71	00.34	00.25	01.71	00.43
00.30	01.71	00.51	00.35	01.71	00.60
00.40	01.71	00.68	00.45	01.71	00.77
00.50	01.71	00.86	00.55	01.73	00.95
00.60	01.78	01.07	00.65	01.83	01.19
00.70	01.87	01.31	00.75	01.92	01.44
00.80	01.96	01.57	00.85	02.00	01.70
00.90	02.04	01.84	00.95	02.07	01.97
01.00	02.11	02.11	01.05	02.15	02.26
01.10	02.18	02.40	01.15	02.21	02.54
01.20	02.24	02.69	01.25	02.27	02.84
01.30	02.30	02.99	01.35	02.33	03.15
01.40	02.36	03.30	01.45	02.39	03.47
01.50	02.42	03.63	01.55	02.44	03.78

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.50 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.55	00.00	01.85	00.00	00.00	-00.01	0000.00	01.73
00.60	00.00	01.75	00.00	00.00	00.00	0000.00	01.78
00.65	00.00	01.65	00.00	00.00	00.01	0000.00	01.83
00.70	00.00	01.55	00.00	00.00	00.02	0000.00	01.87
00.75	00.00	01.40	00.00	00.00	-00.01	0000.00	01.92
00.80	00.00	01.30	00.00	00.00	00.01	0000.00	01.96
00.85	00.00	01.15	00.00	00.00	-00.03	0000.00	02.00
00.90	00.00	01.05	00.00	00.00	-00.00	0000.00	02.04
00.95	00.00	00.95	00.00	00.00	00.02	0000.00	02.07
01.00	00.00	00.80	00.00	00.00	-00.00	0000.00	02.11
01.05	00.00	00.65	00.00	00.00	-00.02	0000.00	02.15
01.10	00.00	00.55	00.00	00.00	00.01	0000.00	02.18
01.15	00.00	00.40	00.00	00.00	-00.01	0000.00	02.21

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 11.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0003.13 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.81 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.67	00.17	00.15	01.67	00.25
00.20	01.67	00.33	00.25	01.67	00.42
00.30	01.67	00.50	00.35	01.67	00.58
00.40	01.67	00.67	00.45	01.67	00.75
00.50	01.67	00.84	00.55	01.69	00.93
00.60	01.74	01.04	00.65	01.79	01.16
00.70	01.83	01.28	00.75	01.88	01.41
00.80	01.92	01.54	00.85	01.96	01.67
00.90	01.99	01.79	00.95	02.03	01.93
01.00	02.06	02.06	01.05	02.10	02.21
01.10	02.13	02.34	01.15	02.16	02.48
01.20	02.19	02.63	01.25	02.22	02.78
01.30	02.25	02.93	01.35	02.28	03.08
01.40	02.31	03.23	01.45	02.34	03.39
01.50	02.36	03.54	01.55	02.39	03.70
01.60	02.41	03.86	01.65	02.44	04.03

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.60 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.60	00.00	01.90	00.00	00.00	00.01	0000.00	01.74
00.65	00.00	01.80	00.00	00.00	00.02	0000.00	01.79
00.70	00.00	01.70	00.00	00.00	00.02	0000.00	01.83
00.75	00.00	01.55	00.00	00.00	-00.01	0000.00	01.88
00.80	00.00	01.45	00.00	00.00	00.00	0000.00	01.92
00.85	00.00	01.35	00.00	00.00	00.02	0000.00	01.96
00.90	00.00	01.20	00.00	00.00	-00.02	0000.00	01.99
00.95	00.00	01.10	00.00	00.00	00.01	0000.00	02.03
01.00	00.00	00.95	00.00	00.00	-00.02	0000.00	02.06
01.05	00.00	00.85	00.00	00.00	00.01	0000.00	02.10
01.10	00.00	00.70	00.00	00.00	-00.01	0000.00	02.13
01.15	00.00	00.60	00.00	00.00	00.02	0000.00	02.16
01.20	00.00	00.45	00.00	00.00	-00.00	0000.00	02.19

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 12.0
R.Value of Subgrade (Native Soil) = 15
Required GE = 0003.26 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.84 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.64	00.16	00.15	01.64	00.25
00.20	01.64	00.33	00.25	01.64	00.41
00.30	01.64	00.49	00.35	01.64	00.57
00.40	01.64	00.66	00.45	01.64	00.74
00.50	01.64	00.82	00.55	01.66	00.91
00.60	01.70	01.02	00.65	01.75	01.14
00.70	01.79	01.25	00.75	01.84	01.38
00.80	01.88	01.50	00.85	01.91	01.62
00.90	01.95	01.76	00.95	01.99	01.89
01.00	02.02	02.02	01.05	02.05	02.15
01.10	02.09	02.30	01.15	02.12	02.44
01.20	02.15	02.58	01.25	02.18	02.73
01.30	02.21	02.87	01.35	02.23	03.01
01.40	02.26	03.16	01.45	02.29	03.32
01.50	02.31	03.47	01.55	02.34	03.63
01.60	02.36	03.78	01.65	02.39	03.94

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.65 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.60	00.00	02.00	00.00	00.00	-00.04	0000.00	01.70
00.65	00.00	01.95	00.00	00.00	00.02	0000.00	01.75
00.70	00.00	01.85	00.00	00.00	00.02	0000.00	01.79
00.75	00.00	01.70	00.00	00.00	-00.01	0000.00	01.84
00.80	00.00	01.60	00.00	00.00	00.00	0000.00	01.88
00.85	00.00	01.50	00.00	00.00	00.01	0000.00	01.91
00.90	00.00	01.35	00.00	00.00	-00.02	0000.00	01.95
00.95	00.00	01.25	00.00	00.00	00.00	0000.00	01.99
01.00	00.00	01.15	00.00	00.00	00.02	0000.00	02.02
01.05	00.00	01.00	00.00	00.00	-00.01	0000.00	02.05
01.10	00.00	00.90	00.00	00.00	00.03	0000.00	02.09
01.15	00.00	00.75	00.00	00.00	-00.00	0000.00	02.12
01.20	00.00	00.60	00.00	00.00	-00.02	0000.00	02.15

***** FINISH *****

CALFP Ver. 1.1

Unit System = E

Title: SR125/SR905 Connector
Traffic Index (TI) = 12.5
R.Value of Subgrade (Native Soil) = 15
Required GE = 0003.40 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10
Base R.Value = 0078.00
0.0032*TI*(100-R.VALUE) = 0000.88 ft
Base MAX. depth = 0002.00 ft
Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	01.60	00.16	00.15	01.60	00.24
00.20	01.60	00.32	00.25	01.60	00.40
00.30	01.60	00.48	00.35	01.60	00.56
00.40	01.60	00.64	00.45	01.60	00.72
00.50	01.60	00.80	00.55	01.62	00.89
00.60	01.67	01.00	00.65	01.72	01.12
00.70	01.76	01.23	00.75	01.80	01.35
00.80	01.84	01.47	00.85	01.88	01.60
00.90	01.91	01.72	00.95	01.95	01.85
01.00	01.98	01.98	01.05	02.01	02.11
01.10	02.04	02.24	01.15	02.07	02.38
01.20	02.10	02.52	01.25	02.13	02.66
01.30	02.16	02.81	01.35	02.19	02.96
01.40	02.21	03.09	01.45	02.24	03.25
01.50	02.27	03.41	01.55	02.29	03.55
01.60	02.32	03.71	01.65	02.34	03.86
01.70	02.36	04.01	01.75	02.39	04.18

HMA Safety Factor (GE) = 0000.20 ft
HMA Ultimate Depth = 0001.75 ft
(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.70	00.00	01.95	00.00	00.00	-00.02	0000.00	01.76
00.75	00.00	01.85	00.00	00.00	-00.01	0000.00	01.80
00.80	00.00	01.75	00.00	00.00	-00.00	0000.00	01.84
00.85	00.00	01.65	00.00	00.00	00.01	0000.00	01.88
00.90	00.00	01.55	00.00	00.00	00.02	0000.00	01.91
00.95	00.00	01.40	00.00	00.00	-00.01	0000.00	01.95
01.00	00.00	01.30	00.00	00.00	00.01	0000.00	01.98
01.05	00.00	01.15	00.00	00.00	-00.02	0000.00	02.01
01.10	00.00	01.05	00.00	00.00	-00.00	0000.00	02.04
01.15	00.00	00.95	00.00	00.00	00.03	0000.00	02.07
01.20	00.00	00.80	00.00	00.00	00.00	0000.00	02.10
01.25	00.00	00.65	00.00	00.00	-00.02	0000.00	02.13
01.30	00.00	00.55	00.00	00.00	00.01	0000.00	02.16

***** FINISH *****

CALCULATION COVER SHEET

PROJECT:	SR125/SR905 Connector	**Job No:** 600158-905 **Date:** February 5, 2008
TITLE:	SLOPE STABILITY CALCULATIONS Sections B-B′, C-C′ and D-D′	
SUBJECT:	Proposed Fill and Cut Slopes	
PROBLEM STATEMENT:	Evaluate static and pseudo static slope stability of proposed embankment fill and cut slopes.	
OBJECTIVE:	Verify proposed slopes attain a static factor of safety of 1.5 and pseudo static factor of safety of 1.1 for overall stability.	
DATA SOURCES:	Lab Tests – Direct Shear, Atterberg Limits, Hydrometer Analysis	
REFERENCES:	Stark, Choi and McCone (2005), Drained Shear Strength Parameters for Analysis of Landslides. SCEC (2002), Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Landslide Hazards in California.	

REVISION NO.	CALCULATED BY	DATE	CHECKED BY	DATE	REVIEWED BY	DATE
-	DXB	2-1-08	SAC	2-1-08		

Leighton

SR125-SR905 Connector Section B-B' North Bound Travelway Sta. 18+23 Static

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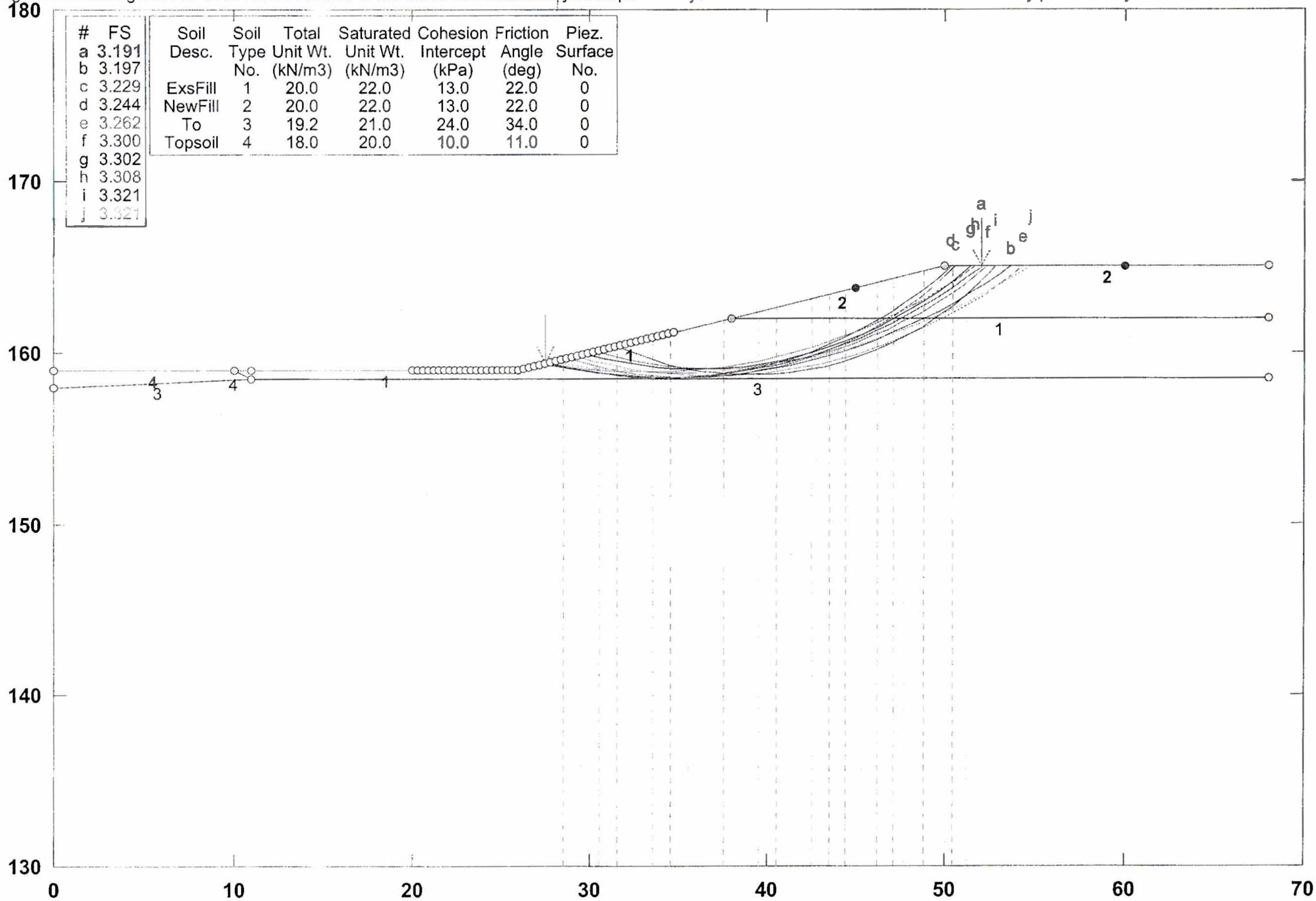

GSTABL7 v.2 FSmin=3.191

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

SR125-SR905 Connector Section B-B' NB Travelway Sta. 18+23 Pseudostatic

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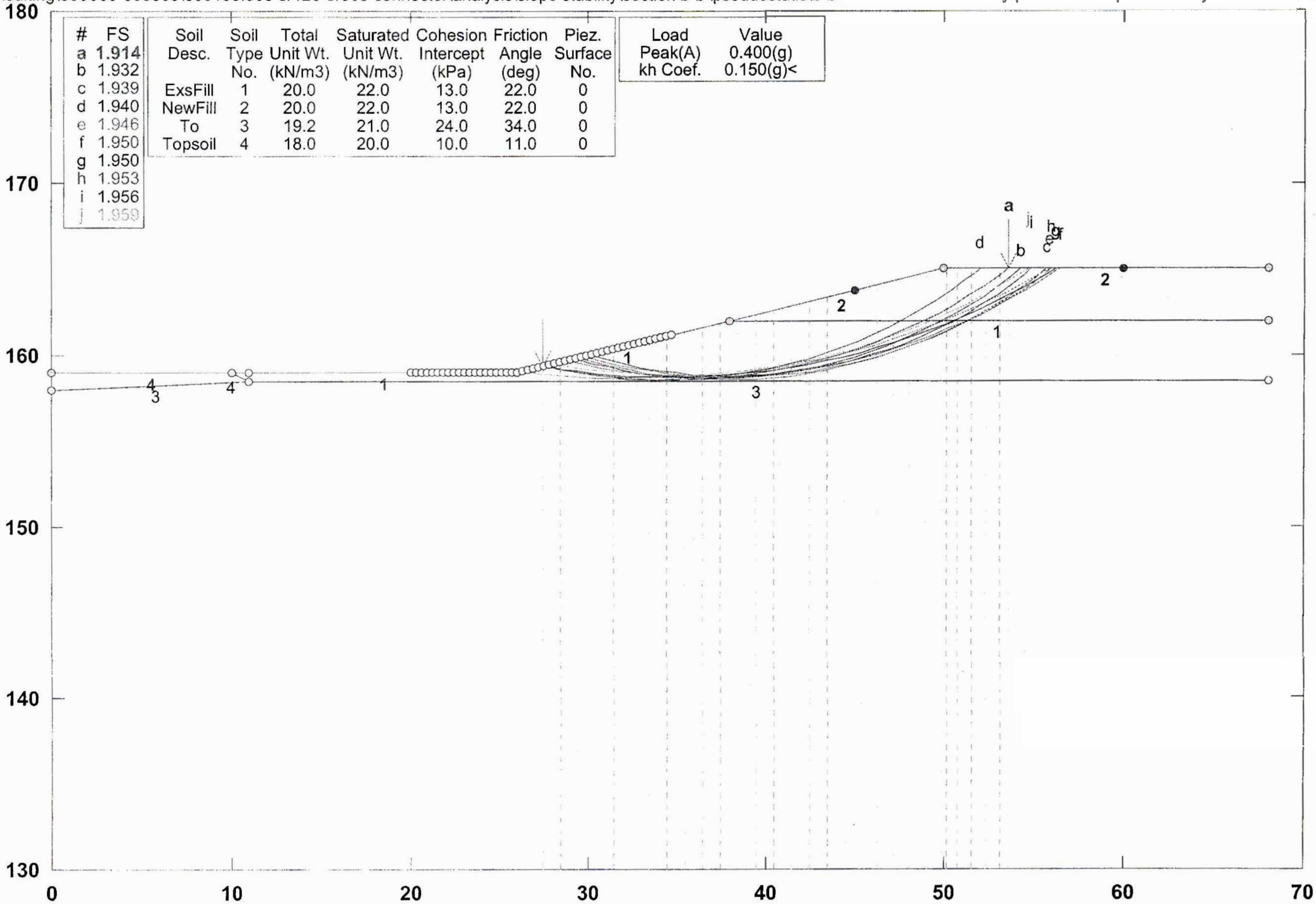

#	FS
a	1.914
b	1.932
c	1.939
d	1.940
e	1.946
f	1.950
g	1.950
h	1.953
i	1.956
j	1.959

Soil Desc.	Soil Type No.	Total Unit Wt. (kN/m3)	Saturated Unit Wt. (kN/m3)	Cohesion Intercept (kPa)	Friction Angle (deg)	Piez. Surface No.
ExsFill	1	20.0	22.0	13.0	22.0	0
NewFill	2	20.0	22.0	13.0	22.0	0
To	3	19.2	21.0	24.0	34.0	0
Topsoil	4	18.0	20.0	10.0	11.0	0

Load	Value
Peak(A)	0.400(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.914

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

SR125-SR905 Connector Section C-C' South Bound Travelway Sta.198 Static

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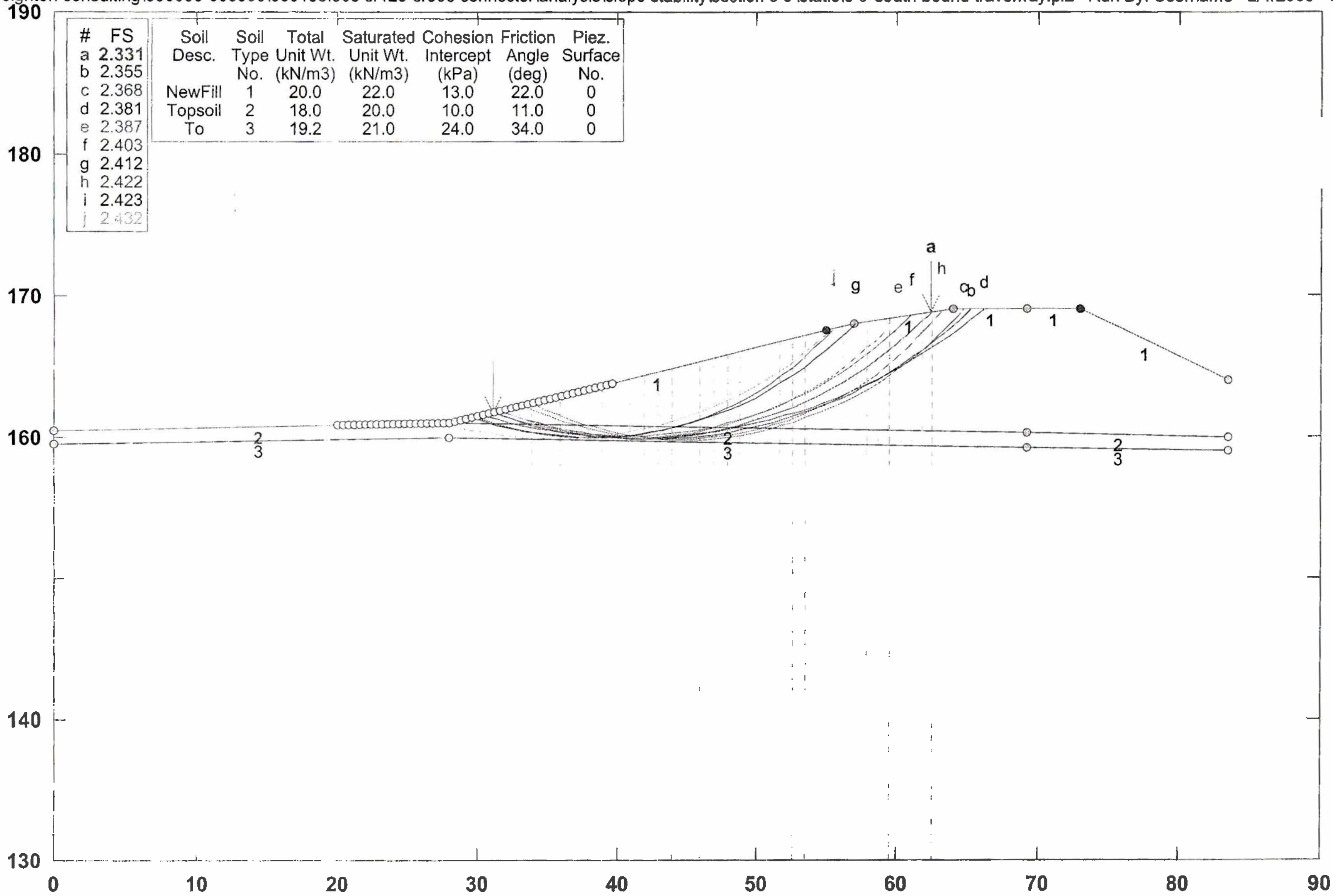

GSTABL7 v.2 FSmin=2.331

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

SR125-SR905 Connector Section C-C' SB Travelway Sta.198 Pseudostatic

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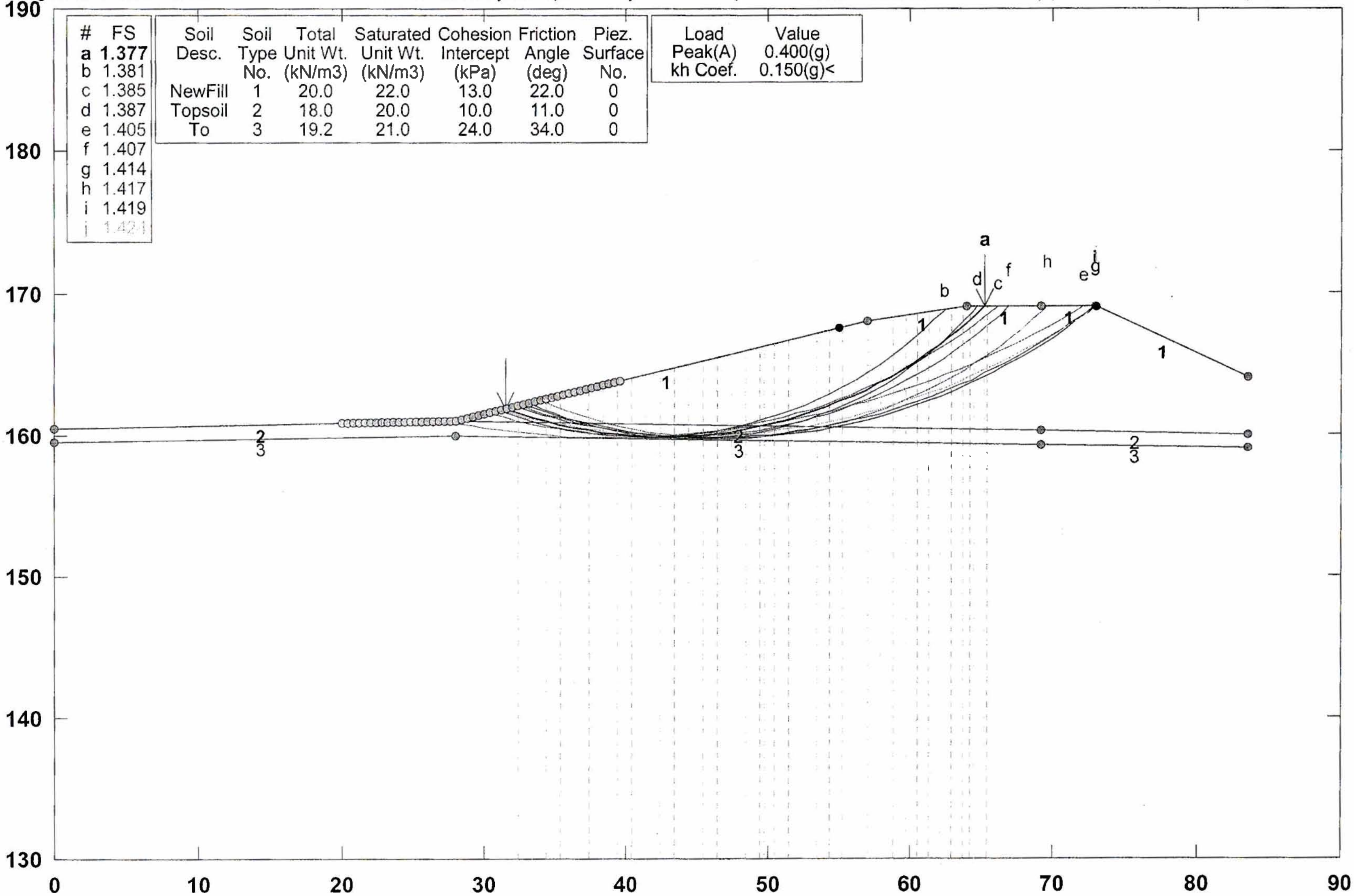

GSTABL7 v.2 FSmin=1.377

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

SR125-SR905 Connector Section C-C' South Bound Travelway Sta.198 Static

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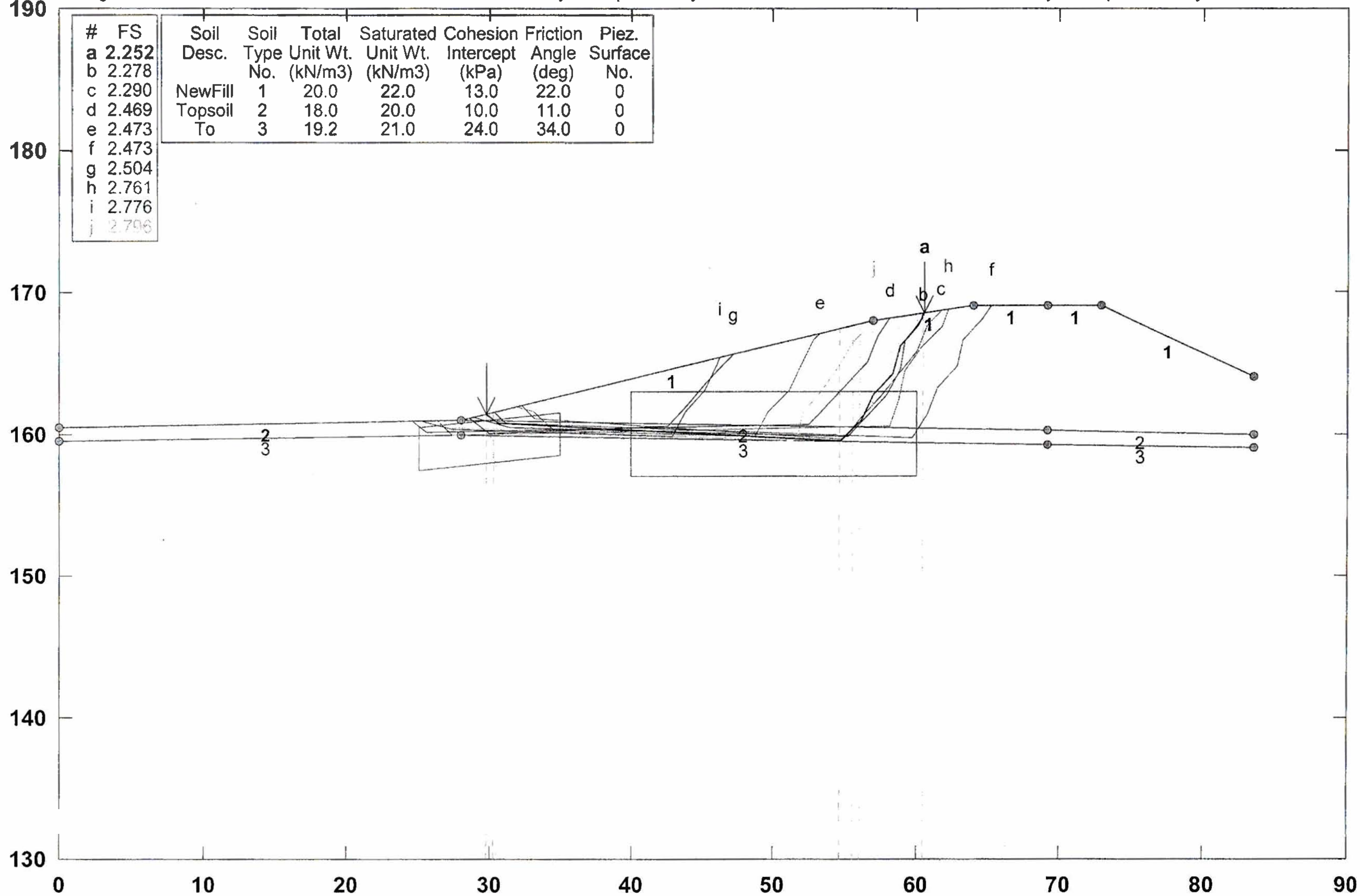


#	FS
a	**2.252**
b	2.278
c	2.290
d	2.469
e	2.473
f	2.473
g	2.504
h	2.761
i	2.776
j	2.796

Soil Desc.	Soil Type No.	Total Unit Wt. (kN/m3)	Saturated Unit Wt. (kN/m3)	Cohesion Intercept (kPa)	Friction Angle (deg)	Piez. Surface No.
NewFill	1	20.0	22.0	13.0	22.0	0
Topsoil	2	18.0	20.0	10.0	11.0	0
To	3	19.2	21.0	24.0	34.0	0

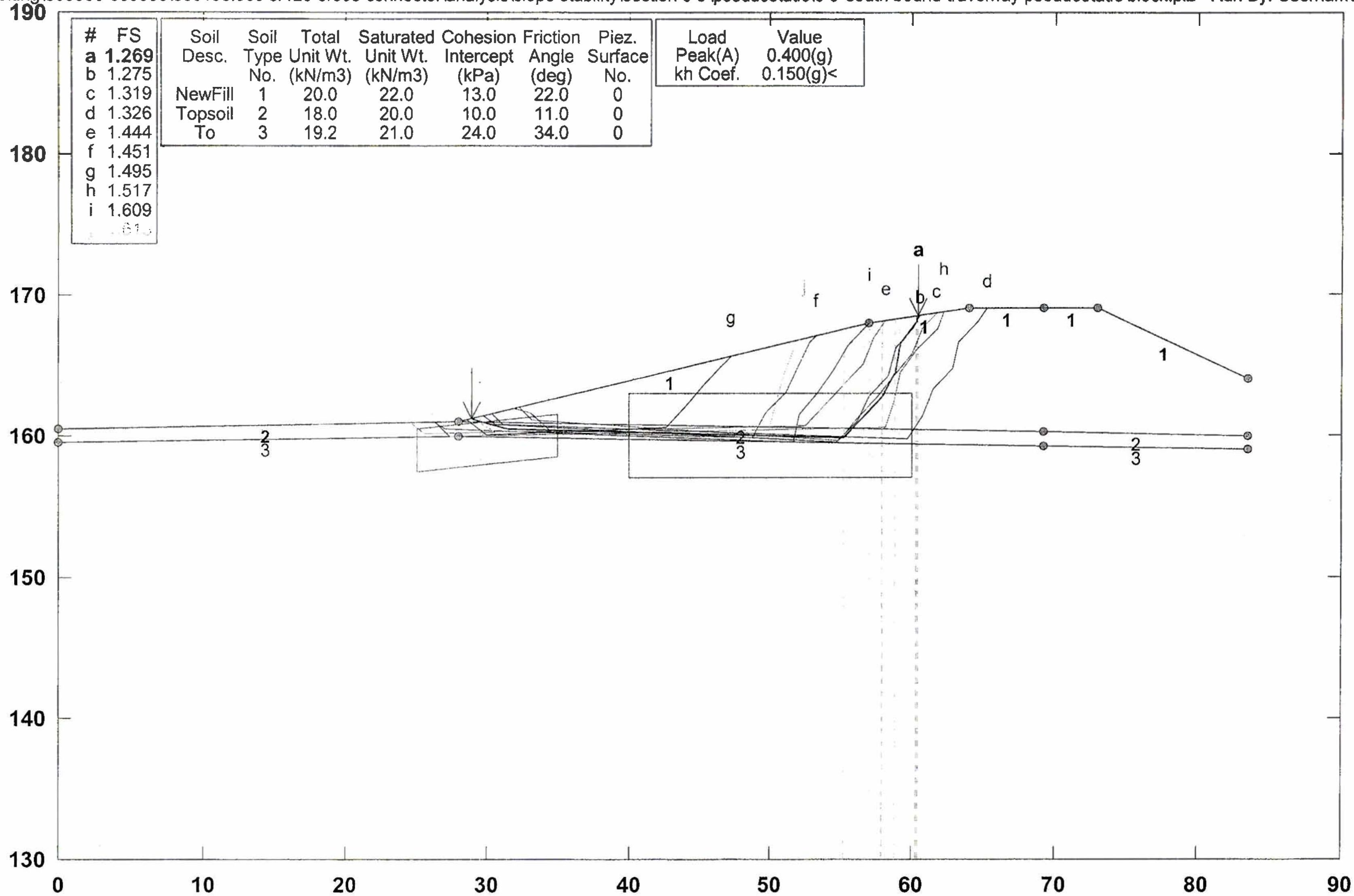
GSTABL7 v.2 FSmin=2.252

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

SR125-SR905 Connector Section C-C' SB Travelway Sta.198 Pseudostatic

p:\leighton consulting\600000-600500\600158.905 sr125-sr905 connector\analysis\slope stability\section c-c'\pseudostatic\c-c' south bound travelway pseudostatic block.pl2 Run By: Username 2/1/2008 05



GSTABL7 v.2 FSmin=1.269

Safety Factors Are Calculated By The Simplified Janbu Method

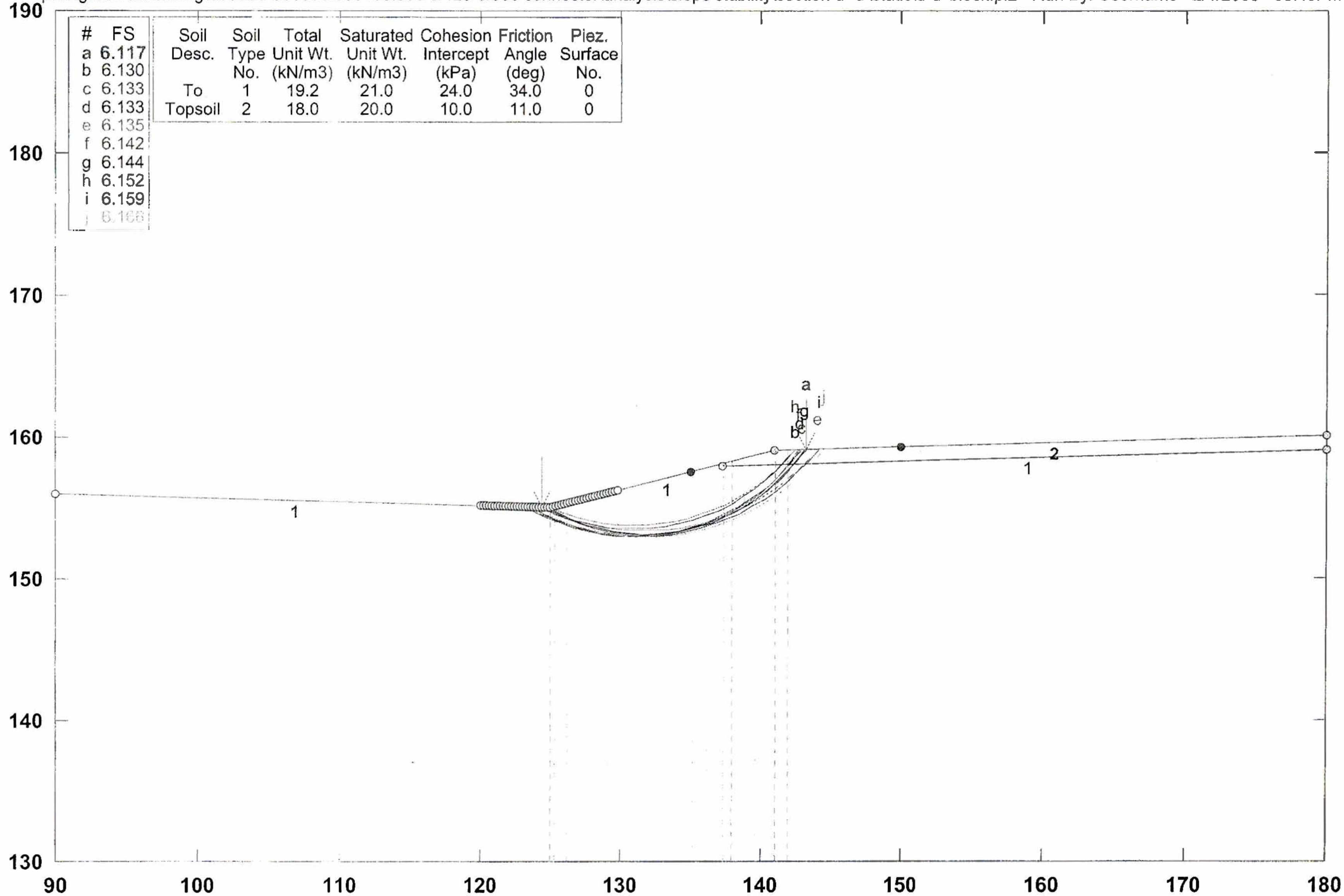
GSTABL7

SR125-SR905 Connector Section D-D' Static

p:\leighton consulting\600000-600500\600158.905 sr125-sr905 connector\analysis\slope stability\section d -d'\static\d-d' block.pl2 Run By: Username 2/1/2008 05:49PM

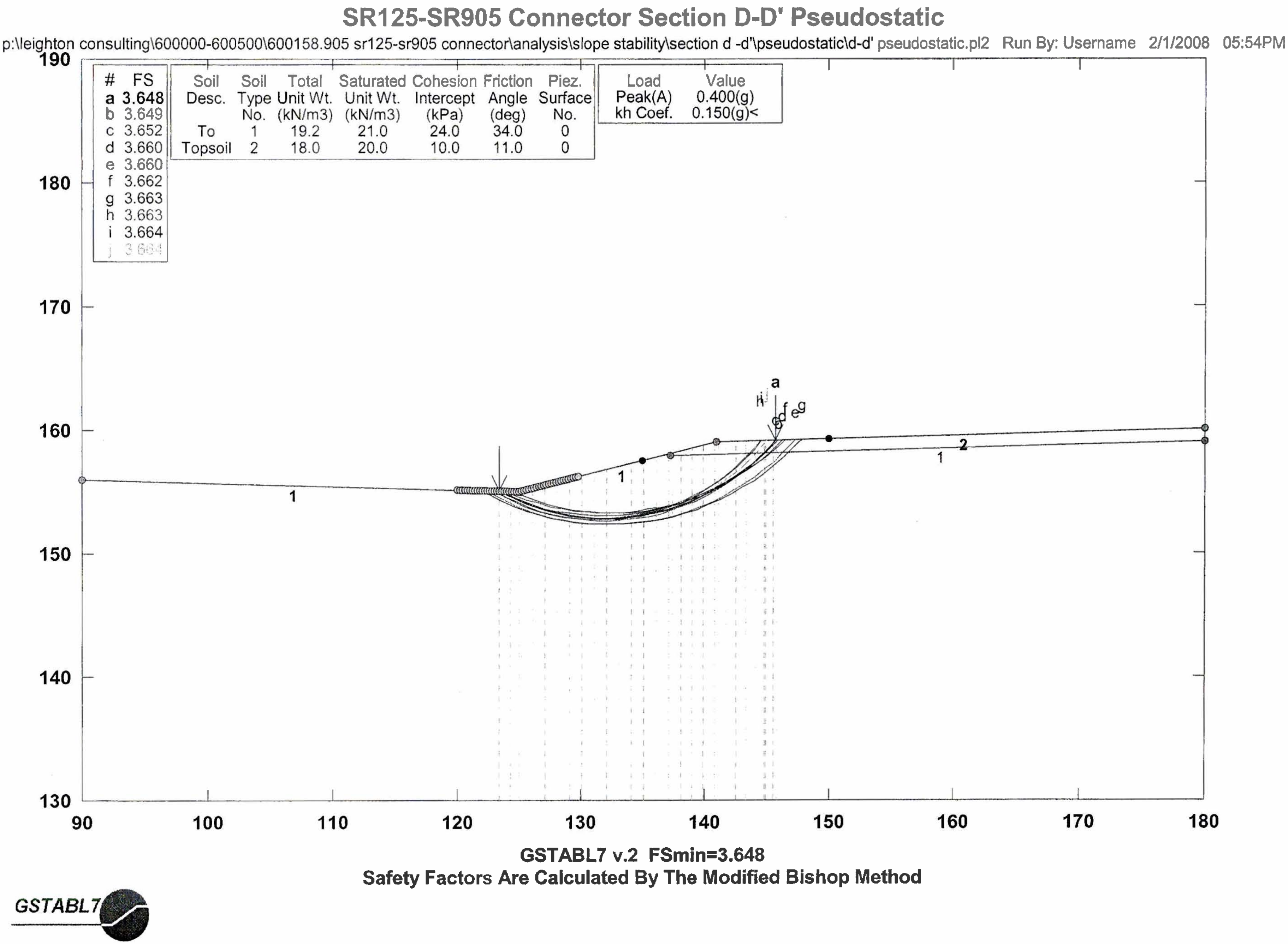
#	FS
a	6.117
b	6.130
c	6.133
d	6.133
e	6.135
f	6.142
g	6.144
h	6.152
i	6.159
j	6.166

Soil Desc.	Soil Type No.	Total Unit Wt. (kN/m3)	Saturated Unit Wt. (kN/m3)	Cohesion Intercept (kPa)	Friction Angle (deg)	Piez. Surface No.
To	1	19.2	21.0	24.0	34.0	0
Topsoil	2	18.0	20.0	10.0	11.0	0



GSTABL7 v.2 FSmin=6.117
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7



SR125-SR905 Connector Section D-D' Pseudostatic
p:\leighton consulting\600000-600500\600158.905 sr125-sr905 connector\analysis\slope stability\section d -d'\pseudostatic\d-d' pseudostatic.pl2 Run By: Username 2/1/2008 05:54PM
FS
a 3.648
b 3.649
c 3.652
d 3.660
e 3.660
f 3.662
g 3.663
h 3.663
i 3.664
j 3.664
Soil Desc. | Soil Type No. | Total Unit Wt. (kN/m3) | Saturated Unit Wt. (kN/m3) | Cohesion Intercept (kPa) | Friction Angle (deg) | Piez. Surface No.
To 1 19.2 21.0 24.0 34.0 0
Topsoil 2 18.0 20.0 10.0 11.0 0
Load Value
Peak(A) 0.400(g)
kh Coef. 0.150(g)<
190
180
170
160
150
140
130
90
100
110
120
130
140
150
160
170
180
GSTABL7 v.2 FSmin=3.648
Safety Factors Are Calculated By The Modified Bishop Method
GSTABL7

BASED ON LAB DATA: ULTIMATE STRENGTHS (COMPOSITES) AND CORRELATED RESIDUAL

NEW FILL

ϕ = 22 degrees

C = 13 Kpa

γ = 20 KN/m³

OLD FILL

ϕ = 22 degrees

C = 13 Kpa

γ = 20 KN/m³

BEDROCK OTAY FORMATION (To)

ϕ = 34 degrees

C = 24 Kpa

γ = 19.2 KN/m³

TOPSOIL

ϕ'_{res} = 11 degrees

C'_{res} = 10 Kpa

* UNIT WEIGHT OF FILL PER BORING B-8, R-1

* UNIT WEIGHT OF FORMATION AVERAGE FROM 0 - 11m

SOIL STRENGTH PARAMETERS

Project No. 600158-905

Project Name SR125/SR905 CONNECTOR

Engineer DXB/SAC

Date 02/01/08 Figure No.

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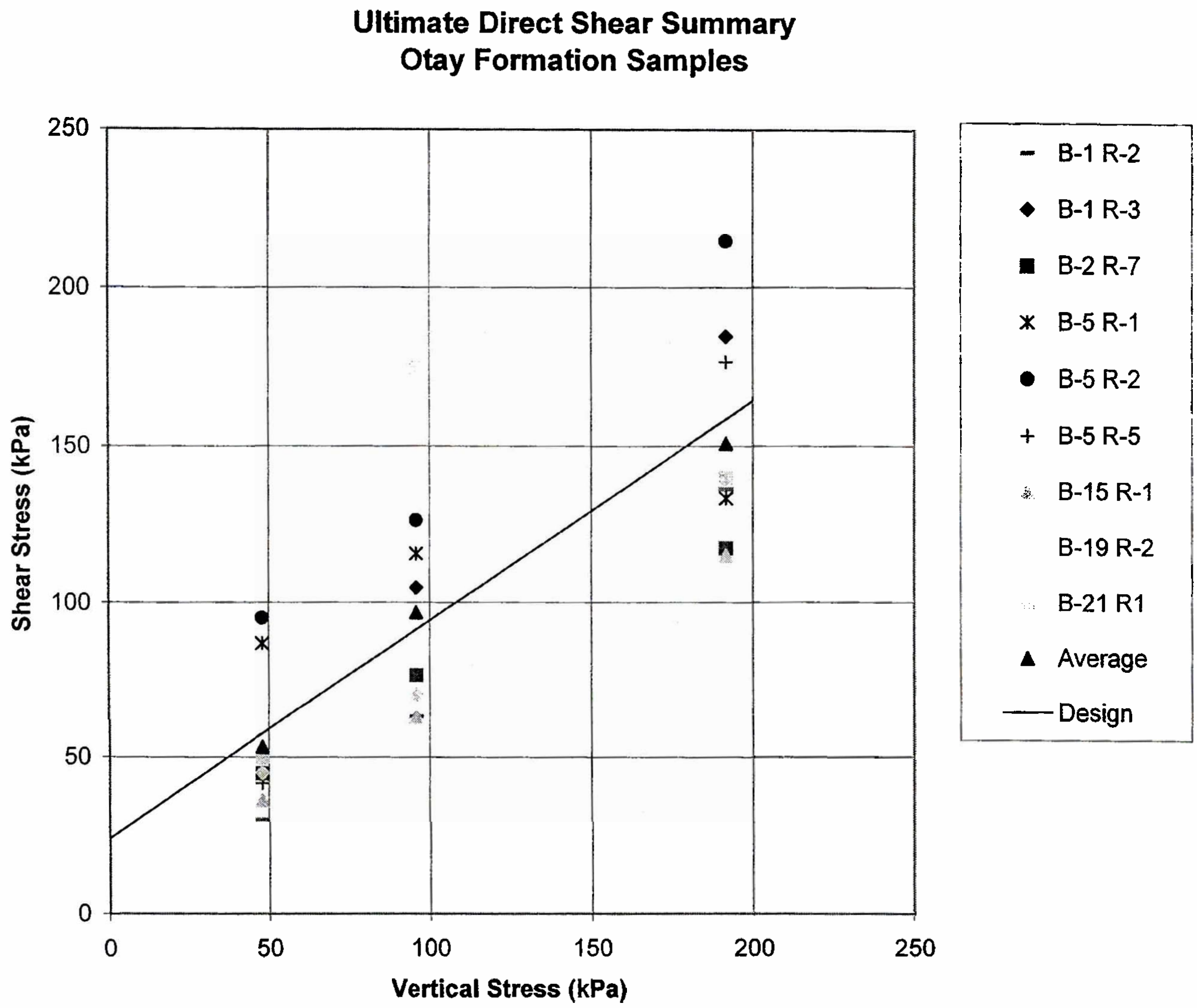
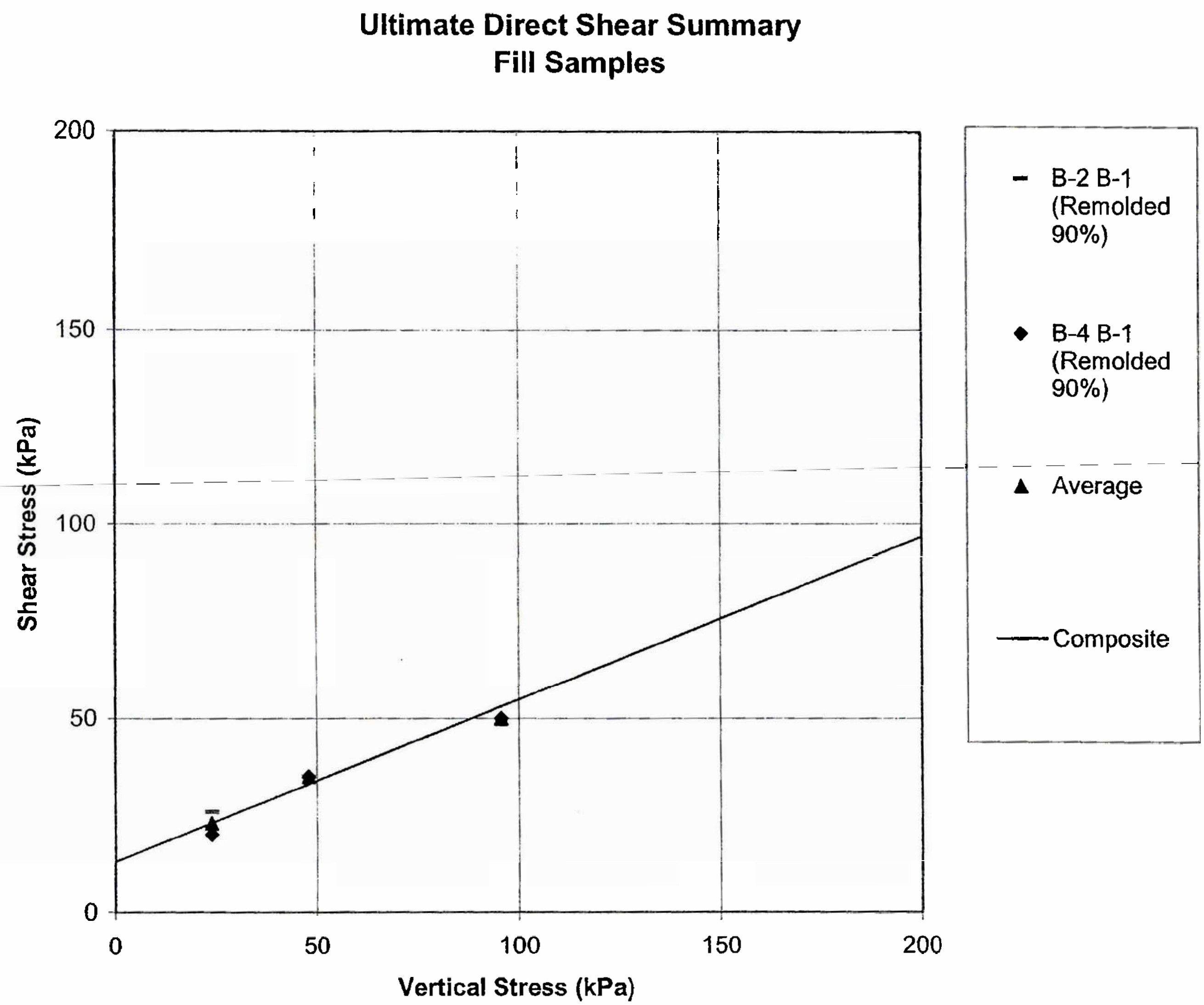


Composite Strength Parameters

Friction Angle, ϕ (degrees)	34
Cohesion, c (kPa)	24

DIRECT SHEAR SUMMARY	Project No. 600158-905 Project Name SR125 / SR905 Leighton



Composite Strength Parameters

Friction Angle, ϕ (degrees)	22
Cohesion, c (kPa)	13

DIRECT SHEAR SUMMARY

Project No. 600158-905
Project Name SR125 / SR905

Leighton

FIG 7.5e
RATIO FOR BALL MILLED AND ASTM VALUES OF LIQUID LIMIT
(STARK AND McCONE, 2001)

BORING B-14, B-1 TOPSOIL
LIQUID LIMIT = 42 CF = 44%

FROM FIGURE 7.5e

RATIO = 1.30

BALL MILLED DERIVED LL = ASTM × 1.30

= 42 × 1.30 = 54.6

FIGURE 7.5d
SECANT FULLY SOFTENED FRICTION ANGLE
(DEGREES) :
28° @ 50 kPa
25° @ 100 kPa
21° @ 400 kPa

FIGURE 7.5c
SECANT RESIDUAL FRICTION ANGLE
(DEGREES) :
17° @ 100 kPa
14.5 @ 400 kPa
12 @ 700 kPa

BORING B-18, B-1 TOPSOIL
LIQUID LIMIT = 49 CF = %

FROM FIGURE 7.5e
RATIO = 1.30

BALL MILLED DERIVED LL = ASTM × 1.30
= 49 × 1.30
= 63.7

FIGURE 7.5d
SECANT FULLY SOFTENED FRICTION ANGLE
(DEGREES) :
27.5° @ 50 kPa
24° @ 100 kPa
21.5° @ 400 kPa

FIGURE 7.5c
SECANT RESIDUAL FRICTION ANGLE
(DEGREES) :
15° @ 100 kPa
13° @ 400 kPa
10° @ 700 kPa

SOURCE: RECOMMENDED PROCEDURES FOR IMPLEMENTATION OF DMG SPECIAL PUBLICATION 117: GUIDELINES FOR ANALYZING AND MITIGATING LANDSLIDE HAZARDS IN CALIFORNIA

DETERMINATION OF TOPSOIL RESIDUAL AND FULLY SOFTENED FRICTION ANGLES.

Project No. 600158905
Project Name SR125 - SR905 CONNECTOR
Engineer DXB/SAC
Date 1/30/08 Figure No. ______

Leighton Consulting, Inc.
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using ball-milled samples differ from those obtained using standard ASTM techniques. Figures 7.5e and 7.5f can be used to relate those ASTM and ball-milled index properties for use with the friction angle correlations in Figure 7.5c and 7.5d. Additional information on the interpretation of direct shear test results for residual strength is provided in the following section.

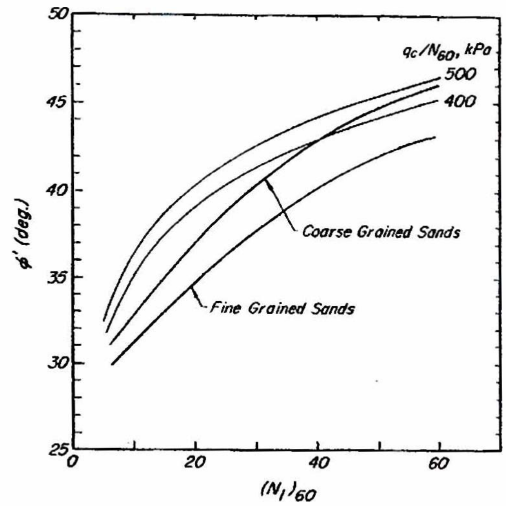


Figure 7.5a. Empirical Correlation Between Friction Angle of Sand and Normalized Standard Penetration Blow Count (Terzaghi et al., 1996)

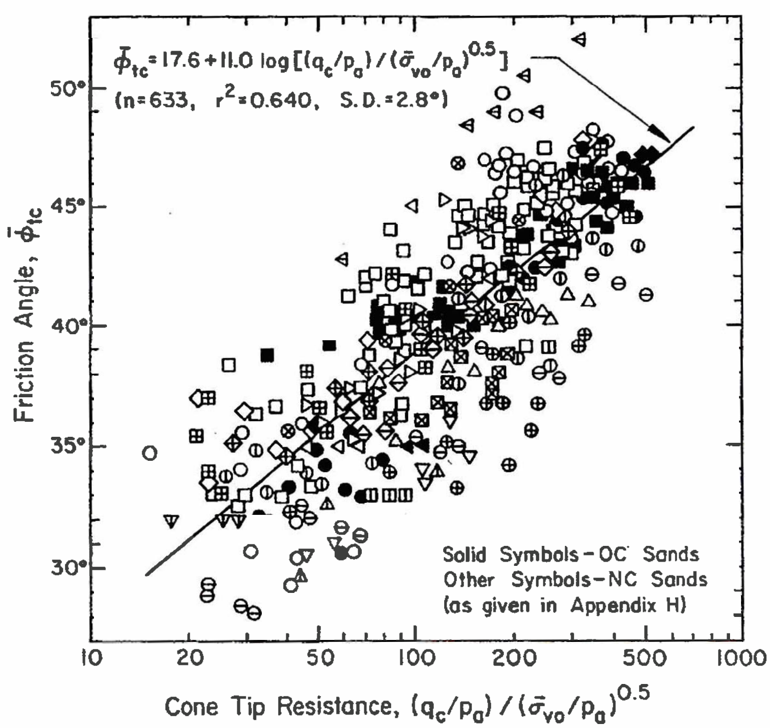


Figure 7.5b. Empirical Correlation Between Friction Angle of Sand and Normalized CPT Tip Resistance (Kulhawy and Mayne, 1990)

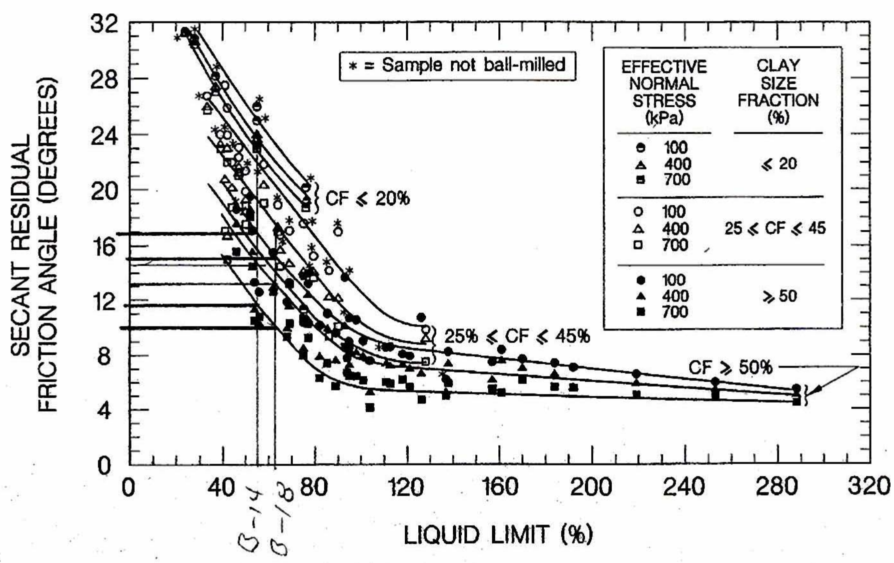


Figure 7.5c. Empirical Correlation Between Drained Residual Friction Angle of Fine-Grained Soil and Ball-Milled Liquid Limit (Stark and McCone, 2001)

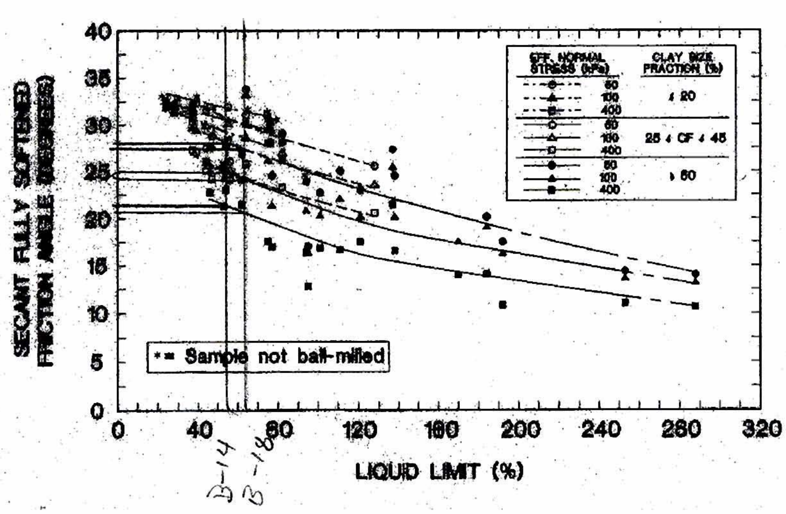


Figure 7.5d. Empirical Correlation Between Fully Softened Friction Angle of Fine-Grained Soil and Ball-Milled Liquid Limit (Stark and McCone, 2001)

B-14, B-19

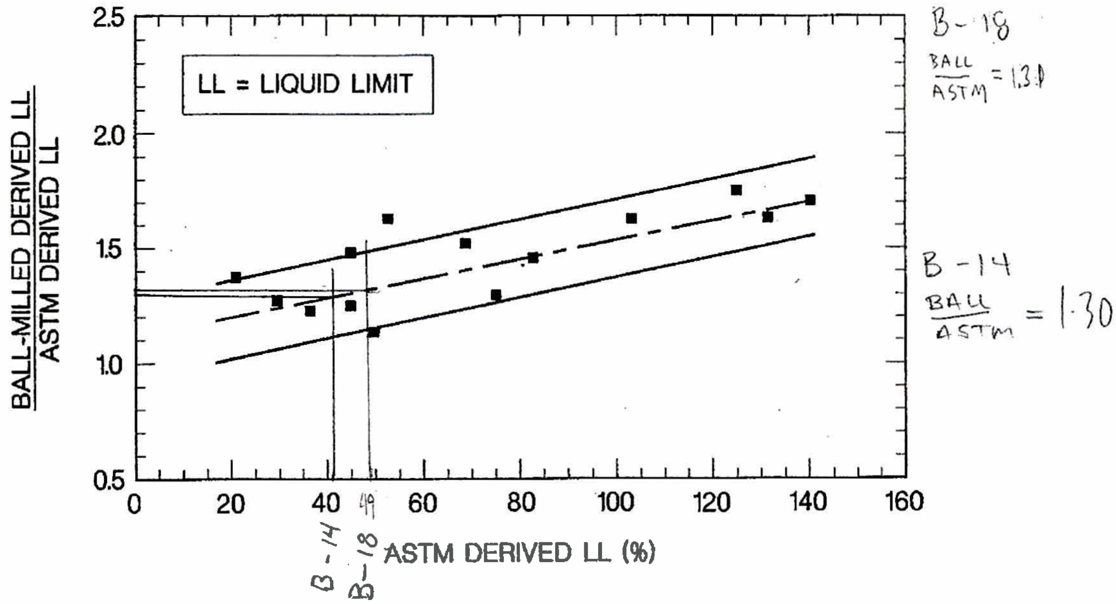


Figure 7.5e. Ratio for Ball-Milled and ASTM Values of Liquid Limit (Stark and McCone, 2001)

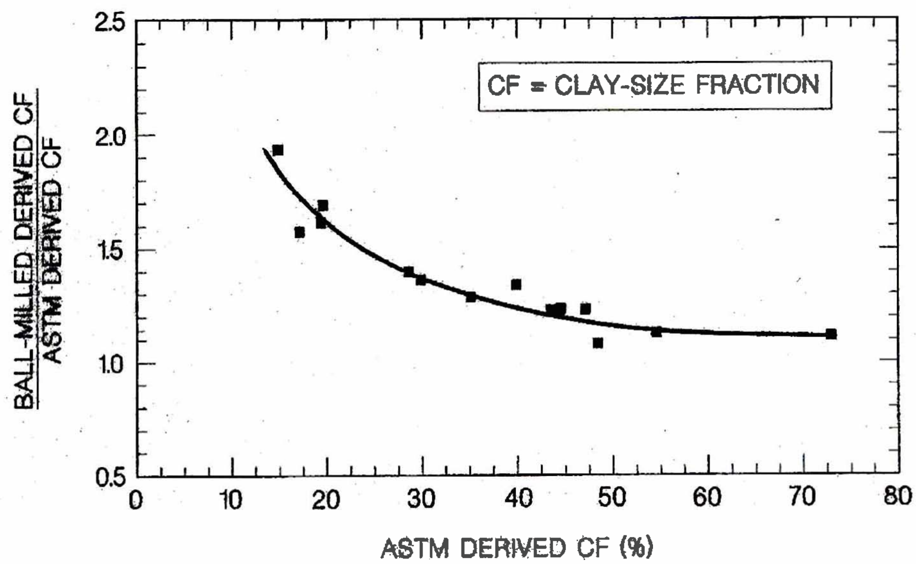
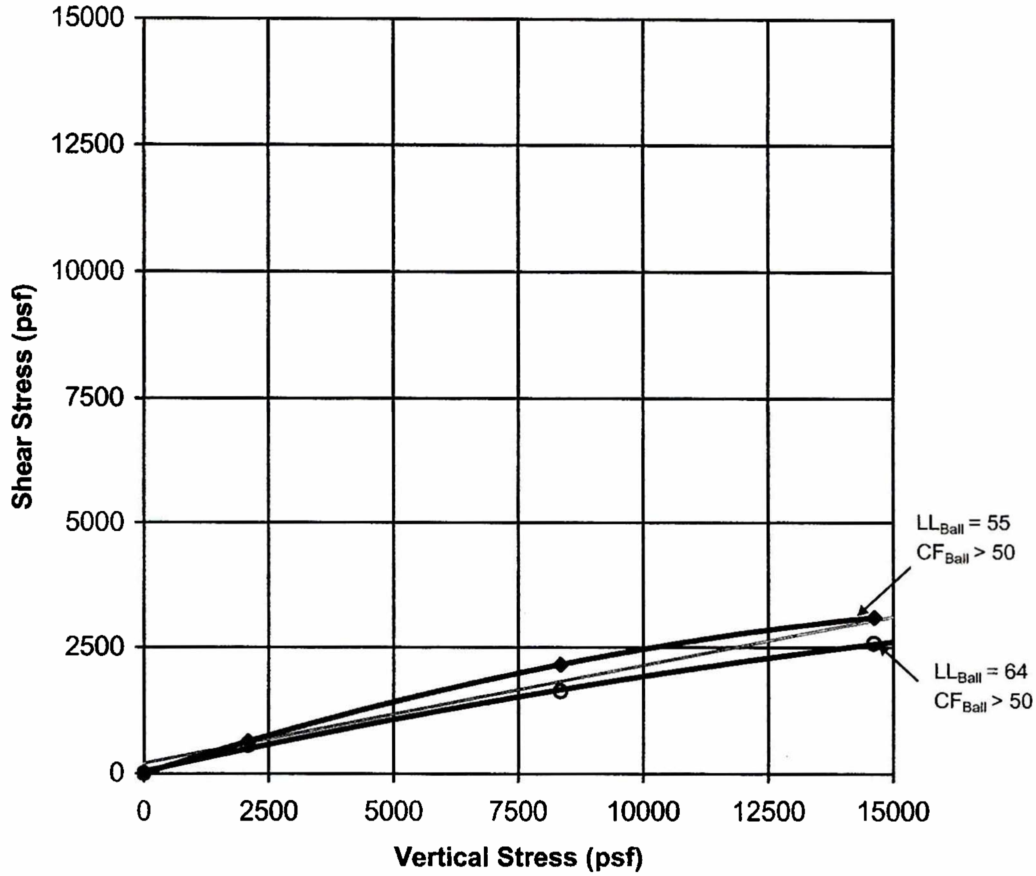


Figure 7.5f. Ratio of Ball-Milled and ASTM Values of Clay-Size Fraction (Stark and McCone, 2001)



Boring Location	**LB-1**
Sample Depth (feet)	**74**

Linear Strength Envelope

Friction Angle, ϕ'_{res} (deg)	**11**
Cohesion, c'_{res} (psf)	**200**

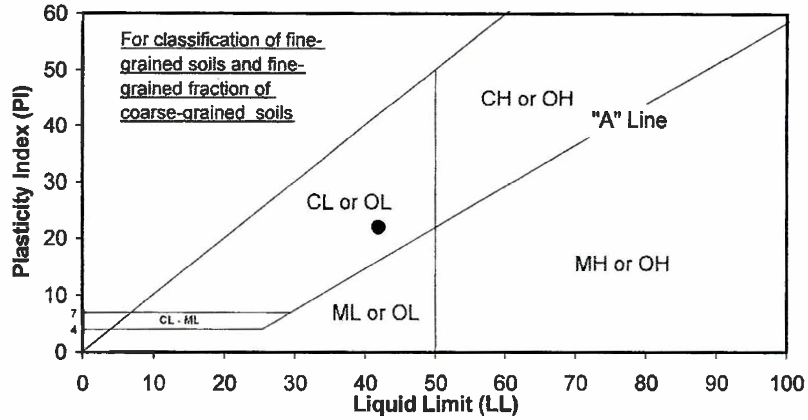
Legend

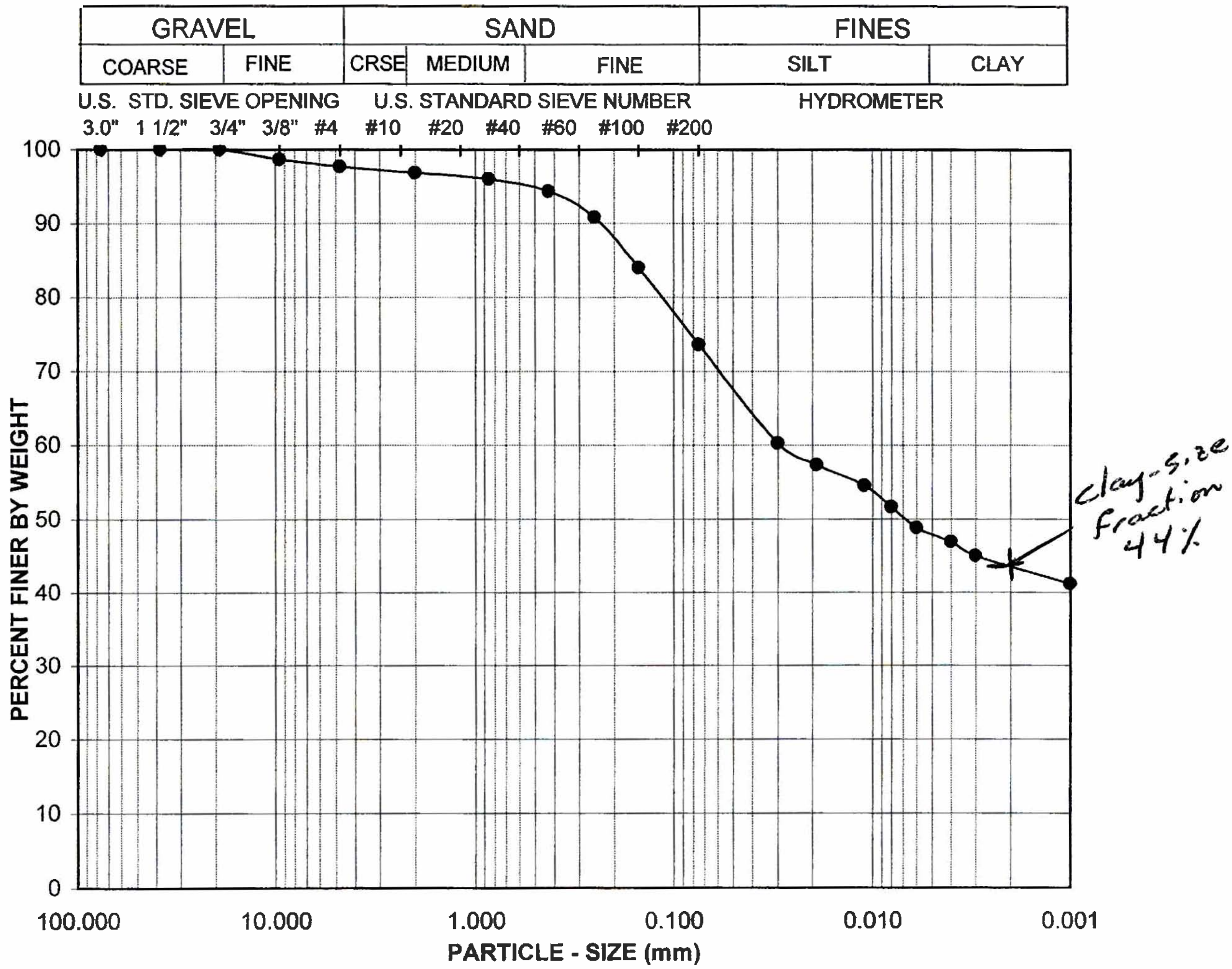
-o- Envelope by Correlation -◆- Envelope by Correlation (Stark, McCone, Choi, 2005) / Linear Envelope

Composite Plot
Residual Torsional Ring Shear and
Residual Strength By Correlation

Project No.	600158-905
Project Name	SR125/SR905 Connector

Leighton





Boring No.	Sample No.	Depth (m.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
B-14	B-1	0-1.2	(CL)s	2:24:74	42:20:22

Sample Description:
(CL)s, LIGHT BROWN LEAN CLAY WITH SAND AND TRACE GRAVEL.

Leighton

Project No.: 600158-905

SR-125 / 905

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Rev. 08-04

Leighton

ATTERBERG LIMITS

ASTM D 4318

Project Name:	SR-125 / 905	Tested By:	VRO/BRM	Date:	9/28/07
Project No. :	600158-905	Input By:	VRO	Date:	10/1/07
Boring No.:	B-16	Checked By:	JMB	Date:	10/1/07
Sample No.:	B-1	Depth (m.)	0-1.0		

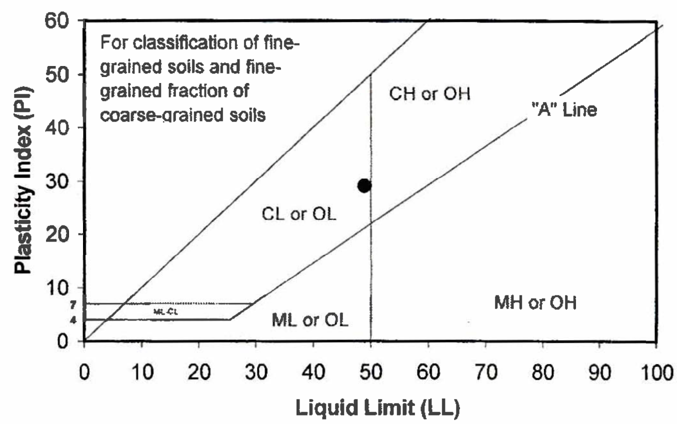
Sample Description: CL, DARK OLIVE BROWN SLIGHTLY SANDY LEAN CLAY.

	PLASTIC LIMIT		LIQUID LIMIT			**IN-SITU
TEST NO.	1	2	1	2	3	MOISTURE
Number of Blows [N]			35	27	17	
Wet Wt. of Soil + Cont. (gm)	15.285	15.759	62.480	60.170	65.180	33.905
Dry Wt. of Soil + Cont. (gm)	15.012	15.390	58.660	56.800	60.350	30.611
Wt. of Container (gm)	13.667	13.526	50.530	49.890	50.830	13.588
Moisture Content (%) [Wn]	20.3	19.8	47.0	48.8	50.7	19.4

Liquid Limit	**49**
Plastic Limit	**20**
Plasticity Index	**29**
Classification	**CL**

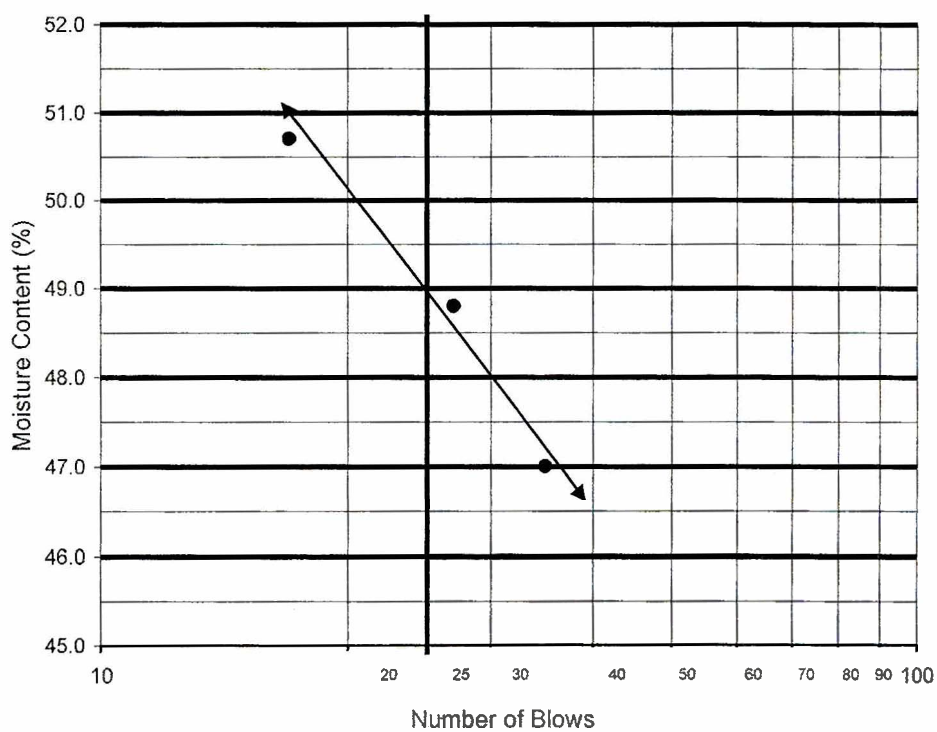
PI at "A" - Line = 0.73(LL-20) = 21.17

One - Point Liquid Limit Calculation
LL =Wn(N/25)



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



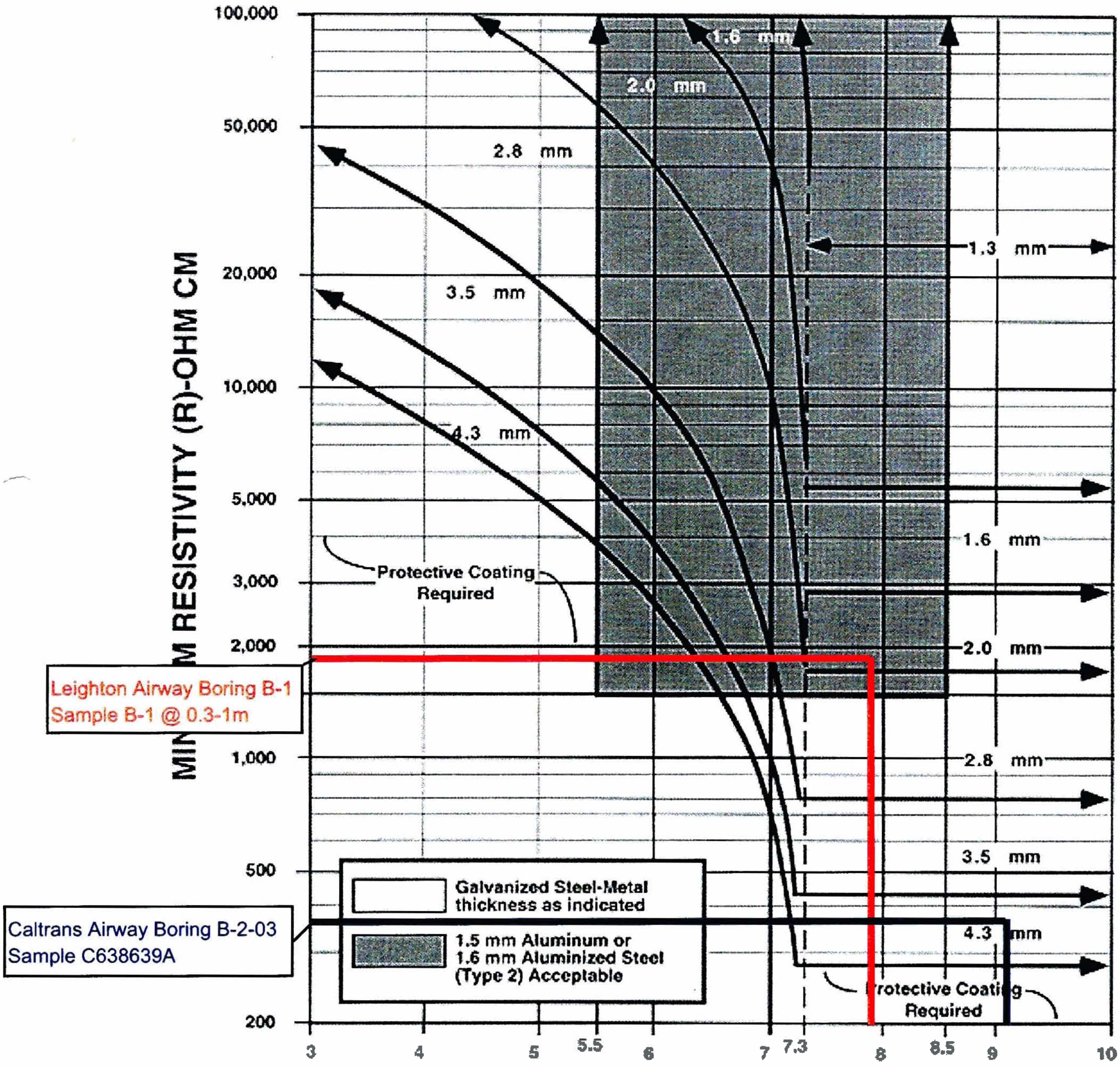
CALCULATION COVER SHEET

PROJECT:	SR125/SR905 Connector	**Job No:** 600158-905 **Date:** February 5, 2008
TITLE:	MINIMUM THICKNESS OF METAL PIPE FOR 50 YEAR SERVICE LIFE	
SUBJECT:	Calculate minimum metal thickness for 50 year service live of metal culverts.	
PROBLEM STATEMENT:	Evaluate corrosion effect of most critical test results obtained by Leighton and by Caltrans within Connector Alignment on metal service life.	
OBJECTIVE:	Provide guidance on minimum metal thickness based on corrosivity of soils. Abrasive nature of flow and cover influences are not considered.	
DATA SOURCES:	Lab Test – pH and Resistivity	
REFERENCES:	Caltrans, Highway Design Manual, June 2006, Figure 854.3B	

REVISION NO.	CALCULATED BY	DATE	CHECKED BY	DATE	REVIEWED BY	DATE
-	SAC	2-6-08				

Leighton

Figure 854.3B
Minimum Thickness of Metal Pipe for 50 Year Maintenance Free Service Life (2)



Notes:
1. For pH and minimum resistivity levels not shown refer to Fig. 854.3C steel pipes. (California Test 643)
2. Service life estimate are for various corrosive conditions only.
3. Refer to index 854.3(2) and 854.4(2) for appropriate selection of metal thickness and protection coating to achieve service life requirements.

GEOTECHNICAL MAP
SR125/905 CONNECTOR
SAN DIEGO, CALIFORNIA
Leighton
Proj: 600158-905
Scale: 1:100
Date: 02/08
Eng/Geol: SAC/RCS
Drafted By: MAM
CP By: SAC
PLATE 1
N
0 25 50
1:100 (METERS)
LEGEND
B-2 APPROXIMATE BORING LOCATION (RED LOCATIONS ON-HOLD)
TP-1 PROPOSED TEST PIT LOCATION (RED LOCATIONS ON-HOLD)
B-1 APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (NINYO & MOORE 1999)
TP-138 APPROXIMATE LOCATION OF EXISTING TEST PIT EXPLORATION (NINYO & MOORE 2005)
RW3 APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (CALTRANS 2005)
B-3-03 APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (CALTRANS 2003)
---?--- APPROXIMATE GEOLOGIC CONTACT
Afu UNDOCUMENTED FILL
Af DOCUMENTED FILL
To OTAY FORMATION
TP-141
TP-140
TP-139
TP-138
TP-137
TP-136
TP-1
TP-3
B-26
B-1
B-2
B-3
B-4
B-5
B-7
B-8
"B" LINE
Afu
Af
To
SEE PLATE 2

PLATE 2

GEOTECHNICAL MAP
SR125/905 CONNECTOR
SAN DIEGO, CALIFORNIA

Leighton	Proj: 600158-905	Scale: 1:100	Date: 02/08
	Eng/Geol: SAC/RCS	Drafted By: MAM	CP By: SAC

P:\DRAFTING\600158\905\OF_08-01-23\PLATES1&2GEOL.DWG (02-01-08 3:50:21PM) Plotted by: mmurphy

LEGEND

B-2	APPROXIMATE BORING LOCATION (RED LOCATIONS ON-HOLD)
TP-1	PROPOSED TEST PIT LOCATION (RED LOCATIONS ON-HOLD)
B-1	APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (NINYO & MOORE 1999)
TP-138	APPROXIMATE LOCATION OF EXISTING TEST PIT EXPLORATION (NINYO & MOORE 2005)
RW3	APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (CALTRANS 2005)
B-3-03	APPROXIMATE LOCATION OF EXISTING BORING EXPLORATION (CALTRANS 2003)
— — -?- — —	APPROXIMATE GEOLOGIC CONTACT
Afu	UNDOCUMENTED FILL
Af	DOCUMENTED FILL
To	OTAY FORMATION
C — — C'	CROSS-SECTION LINE

N

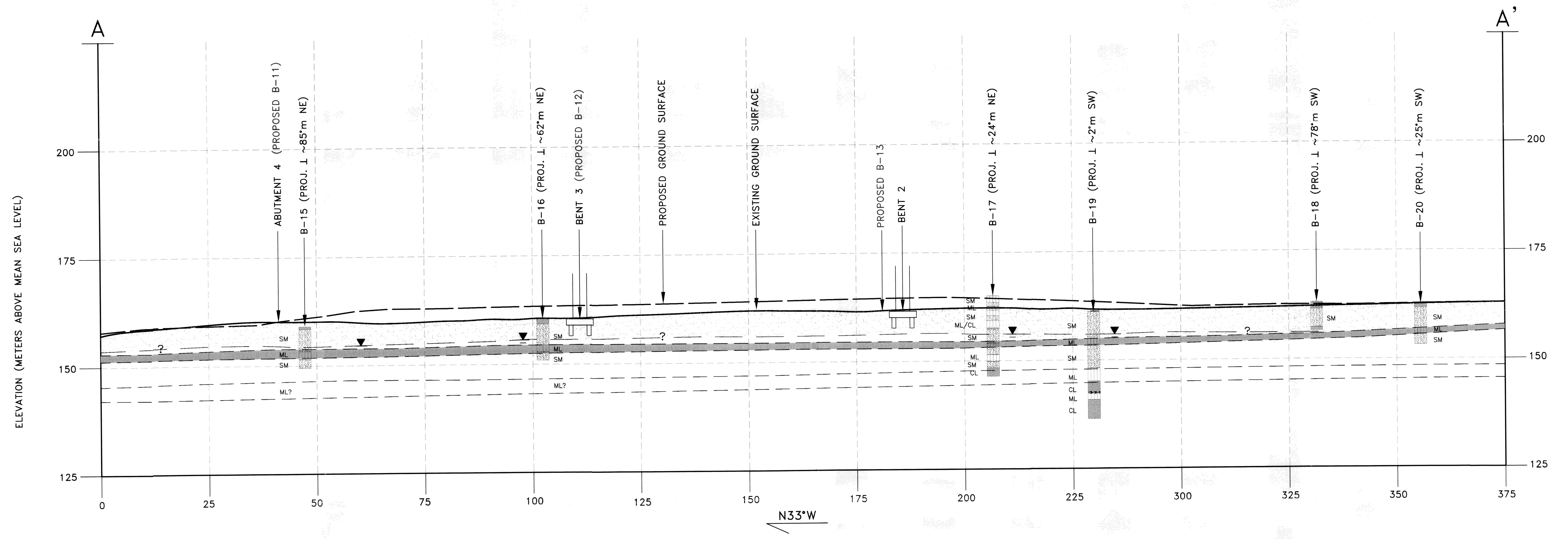
0 25 50
1:100
(METERS)

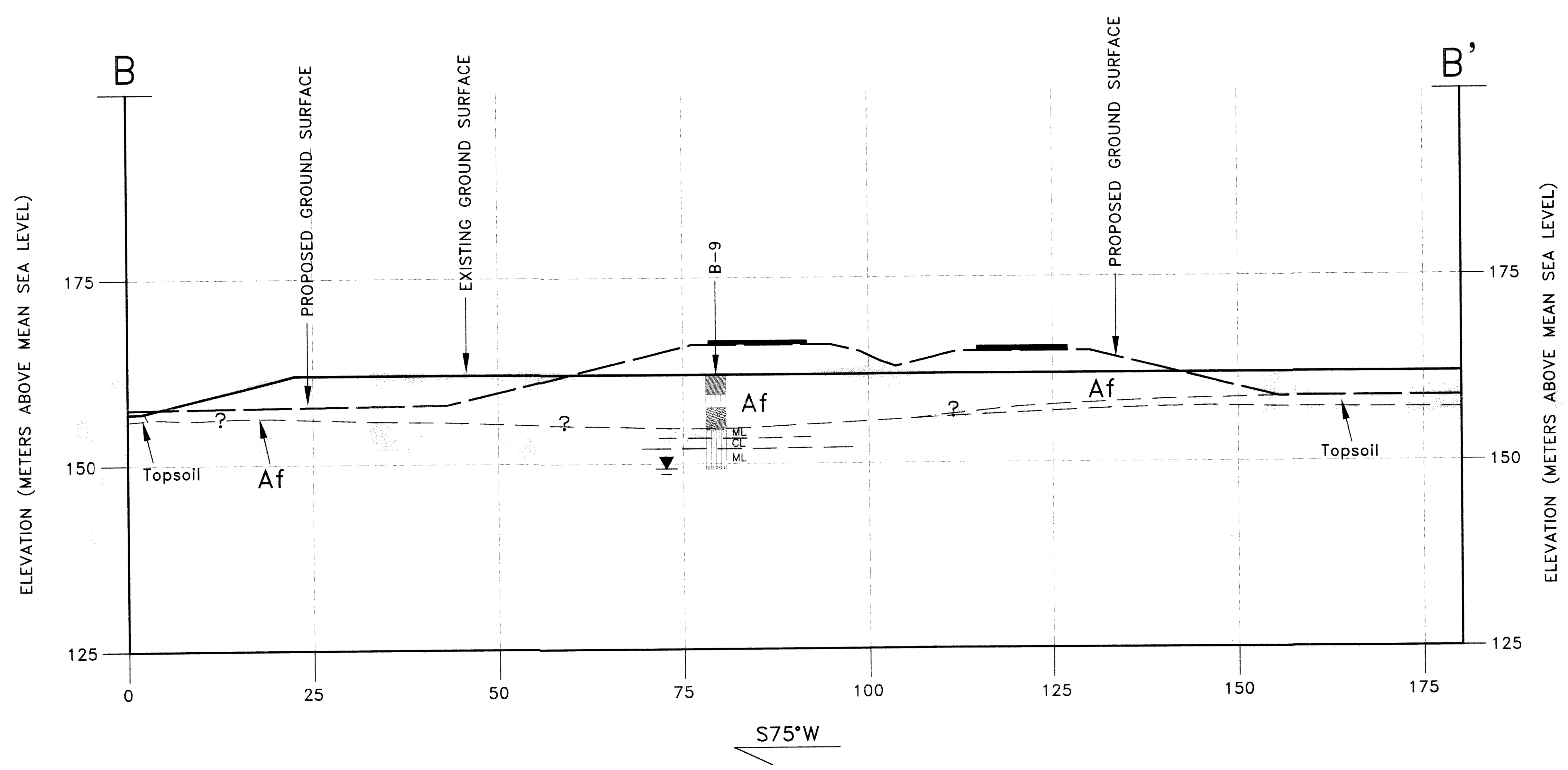
PLATE 3

GEOTECHNICAL MAP
SR125/905 CONNECTOR
SAN DIEGO, CALIFORNIA

Proj: 600158-905	Scale: 1:100	Date: 02/08
Eng/Geol: SAC/RCS	Drafted By: MAM	CP By: SAC

Leighton





LEGEND:

- GROUNDWATER (PERCHED)
- SILTY SANDSTONE
- SILTY/CLAYSTONE
- APPROXIMATE LITHOLOGIC CONTACT
- Af DOCUMENTED FILL
- To OTAY FORMATION

PLATE 4

GENERALIZED GEOLOGIC CROSS SECTIONS
A-A' AND B-B'
SR125/SR905 CONNECTOR
SAN DIEGO, CALIFORNIA

Leighton	Proj: 600158-905	Scale: 1:50	Date: 02/08
	Eng/Geol: SAC/RCS	Drafted By: MAM	CP By: --

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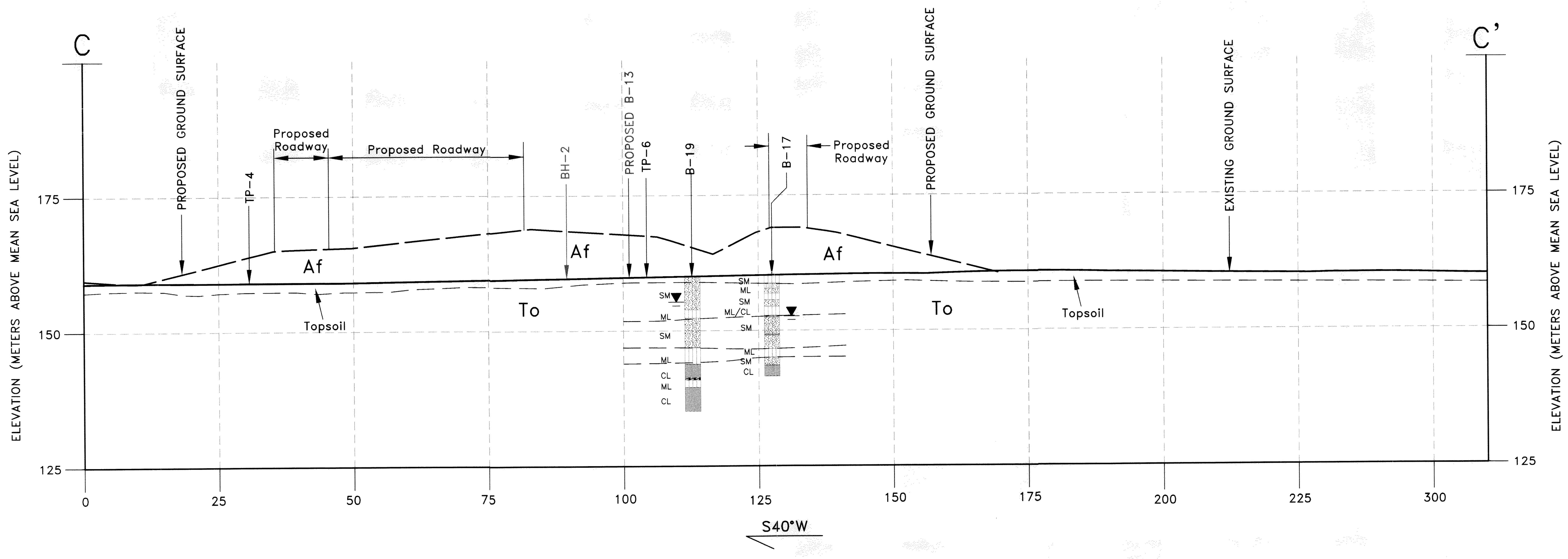
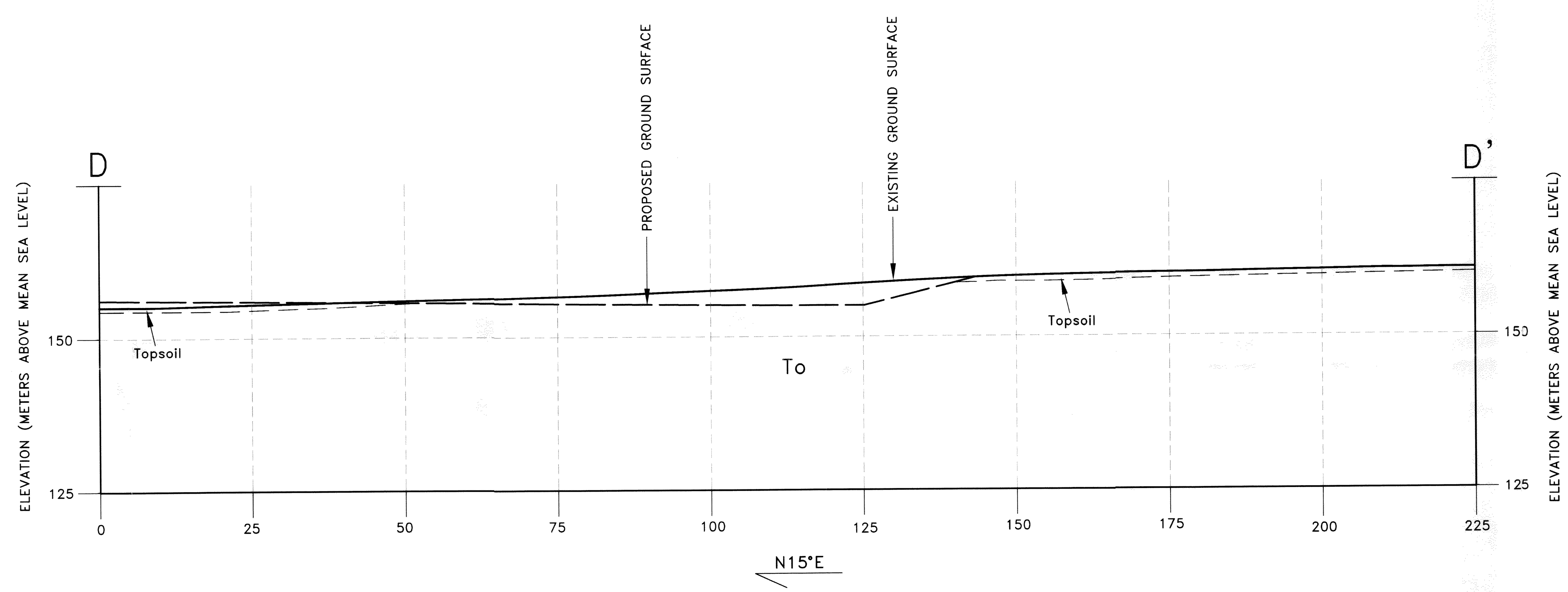




LEGEND:

GROUNDWATER (PERCHED)

APPROXIMATE LITHOLOGIC CONTACT

Af DOCUMENTED FILL

To OTAY FORMATION

PLATE 5

GENERALIZED GEOLOGIC CROSS SECTIONS C–C' AND D–D'

SR125/SR905 CONNECTOR

SAN DIEGO, CALIFORNIA

Proj: 600158-905	Scale: 1:50	Date: 02/08
Eng/Geol: SAC/RCS	Drafted By: MAM	CP By: --

Leighton

State of California

Department of Industrial Relations

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT

C122-073-14T

Van Nuys Office R5D2

Underground Classification

Drainage System # 10 / State Route 125 at Otay Mesa Road
California Department of Transportation
(NAME OF TUNNEL OR MINE AND COMPANY NAME)

of California Department of Transportation
4050 Taylor Street, San Diego, CA 92110
(MAILING ADDRESS)

at State Route 125 at Otay Mesa Road
San Diego, California
(LOCATION)

has been classified as *** POTENTIALLY GASSY ***
(CLASSIFICATION)

as required by the California Labor Code Section 7955.

The Division shall be notified if sufficient quantities of flammable gas or vapors have been encountered underground. Classifications are based on the California Labor Code Part 9, Tunnel Safety Orders and Mine Safety Orders.

Two 48 inch diameter steel casings (to accommodate 36 inch diameter reinforced concrete pipes) each approximately 31 feet in length to be installed by "jack and bore" method in the vicinity of Otay Mesa Road and State Route 125 in the City of San Diego.

April 8, 2014

Reference: Underground Classification Request & Submital from Caltrans dated 3/31/14.

District Manager

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: Mr. Michael Webster
Project Design Senior
Attention: Brooke Emery

Date: July 18, 2014

File: 11-SD-11/125/905-PM VAR
EA 11-288811
EFIS 1113000167

From: DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design-South 2, Branch-D

Subject: Geotechnical Design Report for State Route 11/125/905 Northbound Connectors Project Addendum.

Pursuant to your request, the Office of Geotechnical Design-South 2, Branch D (OGDS2) has prepared this addendum to the Geotechnical Design Report (GDR) for the State Route 11/905/125 Northbound Connectors Project (here after referred to as the Project). The Project is located on Otay Mesa which lies in southern San Diego County, California, just north of the international border. This addendum summarizes an assessment of subsurface ground conditions at the location of a planned pipe jacking operation, which is located approximately 213 feet right of Station 90+04 of the “WN” line. The pipe jacking location is depicted on an aerial photo map that is included as Figure 1 and on the Project drainage plan sheet”D-2” which is included as Figure 2.

To assess site conditions, OGDS2, with the assistance of Caltrans Construction, conducted a subsurface investigation comprised of geotechnical-trenching. A trench was developed in lieu of geotechnical borings because an excavator from an adjacent project was readily available and the trenching facilitated meeting the project schedule. Geotechnical drilling is more commonly used to characterize subsurface conditions, however, geotechnical drilling equipment and the necessary permits were not available on short notice and for the proposed pipe jacking operation, a geotechnical trench actually provided a superior site characterization over what would have otherwise been possible from geotechnical borings. Information obtained from the geotechnical trenching operation and a trench (soil) profile is summarized on a a geotechnical trench log, which is included as Figure 3. To complete the site assessment, the data developed from the geotechnical trenching operation was augmented by additional information gleaned from published maps and literature, geotechnical reports, logs of test borings, project plans, as-built plans, and site reconnaissance. The locations of borings used to augment the site assessment are plotted on Figure 1 and the Logs from these borings are included as attachments.

The geotechnical trench was excavated approximately sixty feet southeast of the location of the culvert layout line and the location of an anticipated launch/receiver pit needed to effect a trenchless culvert installation at this site, see Figure 4. The trench’s offset from the actual pipe alignment was necessary to avoid undermining existing power poles and Otay Mesa Road. The subsurface investigation revealed the presence of:

- Embankment fill.
- An eight foot thick clay soil.
- Sandstone and Siltstone of the Otay Formation.
- Perched Groundwater.

The fill was comprised of gravel, clayey sand and sandy clay. The embankment fill was founded upon an expansive clay soil comprised of interbedded fat and lean clays. This clay layer is believed to be a native (pedogenic) soil, and was observed to be in a moist condition, exhibited high plasticity, high toughness, and contained trace amounts of coarse gravel. In-situ pocket penetrometer (PP) testing conducted on the clay yielded a PP index range of 3.25 to 3.5 tons per square foot (TSF), which is equivalent to a consistency designation of very stiff clay. The clay, when dried, exhibited a very high dry strength. During the trenching operation desiccation cracks rapidly formed in freshly cut surfaces as the clay dried. The rapidity and severity with which desiccation cracks formed within the clay imply that steep cut faces will likely slake with time and that high, steep cuts develop through this stratum would require shoring. The clay soil contained trace amounts of coarse gravel.

The clay soil discussed in the previous paragraph conformably sits upon and grades into poorly indurated, soft to moderately soft, sedimentary rock comprised of interbedded sandstone and siltstone of the Otay Formation (After Kennedy and Tan, 1977). Bedding evident within the sedimentary rock strata was distinguished by color, gradation, and relative cementation. The bedding appeared as tabular strata exhibiting sub-horizontal dip angles. Fractures and jointing were not observed within the sedimentary rock exposed by trenching; however, minor slaking was observed in the sandstone and siltstone as the trenching progressed. Some of the sandstone beds exhibited cementation, which varied up to moderately cemented, while other beds were comprised of sand grains bound in a clay matrix. Beds with a clay matrix exhibited low to no apparent (visible) porosity while the non-cemented to moderately cemented beds exhibited varying degrees of porosity. Beds with low porosity impede vertical and horizontal water movement which could explain the presence of the perched water at the site; perched water is discussed in the following paragraph. Trace amounts of coarse gravel and trace amounts of cobble sized strongly cemented indurated concretions randomly occur within the sedimentary rock strata.

Perched ground water was encountered in the excavation at a depth of twenty-six (26 ft) feet below ground surface which is consistent with an elevation of approximately 505 feet. Perched water was observed in many of the geotechnical borings developed for this and adjacent projects in the area and was encountered in construction excavations adjacent to the Project. The perched water encountered in the geotechnical trench occurred as seepage that emanated from a sandstone bed that was sandwiched between two (apparently) impervious layers. The trench was backfilled before a stable groundwater surface (piezeometric surface) developed. It is noteworthy that in some of the borings where groundwater was encountered, the elevation of the stabilized groundwater surface was observed to occur above the elevation where the groundwater was first encountered during drilling operations.

Based upon this investigation, the site is conducive to trenchless culvert construction. Conditions controlling over trenchless excavation method, as identified in the Tunnelman's Ground Classification System (included as an attachment), were encountered in the subsurface. These conditions include:

- Perched groundwater (below the elevation of the pipe invert).
- Mixed face comprised of very stiff clay and soft to moderately soft rock.
- Slow slaking soils and soft rock.
- Swelling and or squeezing clay.
- Overhead Utilities.
- Existing Underground Utilities.

Soil strengths and recommendations concerning temporary excavations were provided within the Project GDR. The reader is directed to the Project GDR for this information.

The evaluations contained in this memorandum are based on the information discovered and data gathered. If conditions are encountered during the project that appear to differ from the conditions conveyed in this memorandum, or if construction difficulties related to soil conditions are encountered, a representative of OGDS2 should be consulted to assist with the assessment of the prevailing geotechnical conditions and to assist in formulating appropriate strategies to facilitate project completion.

Should project design features vary significantly from those described in this report an updated GDR should be prepared by OGDS2 Branch-D to address the geotechnical considerations related to those features. If you have any questions regarding this memorandum, please contact the Jeff Kermode at (858) 705-1339 or Brian Hinman at (858) 705-1344.

Written By:

Jeff Kermode.
Associate Engineering Geologist
Office of Geotechnical Design- South 2, Branch-D
(760) 639-4440

Reviewed By:

Brian Hinman
Senior Transportation Engineer (Civil)
Office of Geotechnical Design-South2, Branch-D

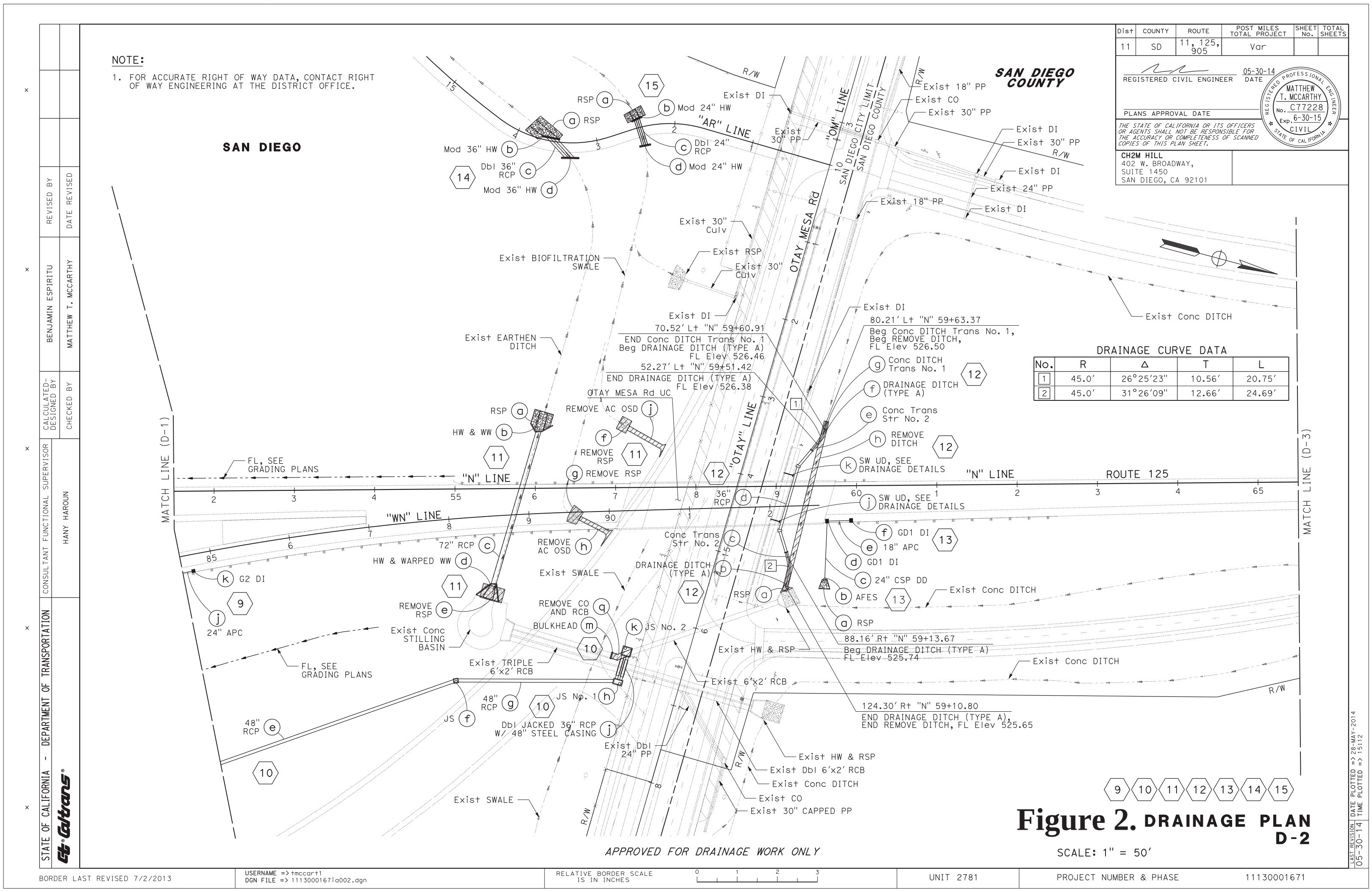
REGISTERED PROFESSIONAL ENGINEER
BRIAN K. HINMAN
No. 55654
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

Attachments:

- Figures
  - Figure 1 Aerial Photo Map.
  - Figure 2 Drainage Plan Sheet "D-2".
  - Figure 3 Trench Log.
  - Figure 4 Trench Location.
- Tunnelman's Ground Classification System
- Logs of Test Borings

cc:	Geotechnical Services Archives:	http://10.160.173.158/
	District Environmental Planning:	Olga Estrada
	District Materials Engineer:	Art Padilla

Figure 1. Aerial Photo Map.



DRAINAGE CURVE DATA

No.	R	Δ	T	L
1	45.0'	26°25'23"	10.56'	20.75'
2	45.0'	31°26'09"	12.66'	24.69'

Figure 2. DRAINAGE PLAN D-2

California DEPARTEMT OF TRANSPORTATION

11-SD-11/125/905-PM VAR
EA 11-288811
EFIS 1100020167

TRENCH LOG

SITE: 11-SD-11/125/905 P.M. Var.

DATE: 07/09/2014

TRENCH ID: T0114

TIME: 0800 to 1300 hours

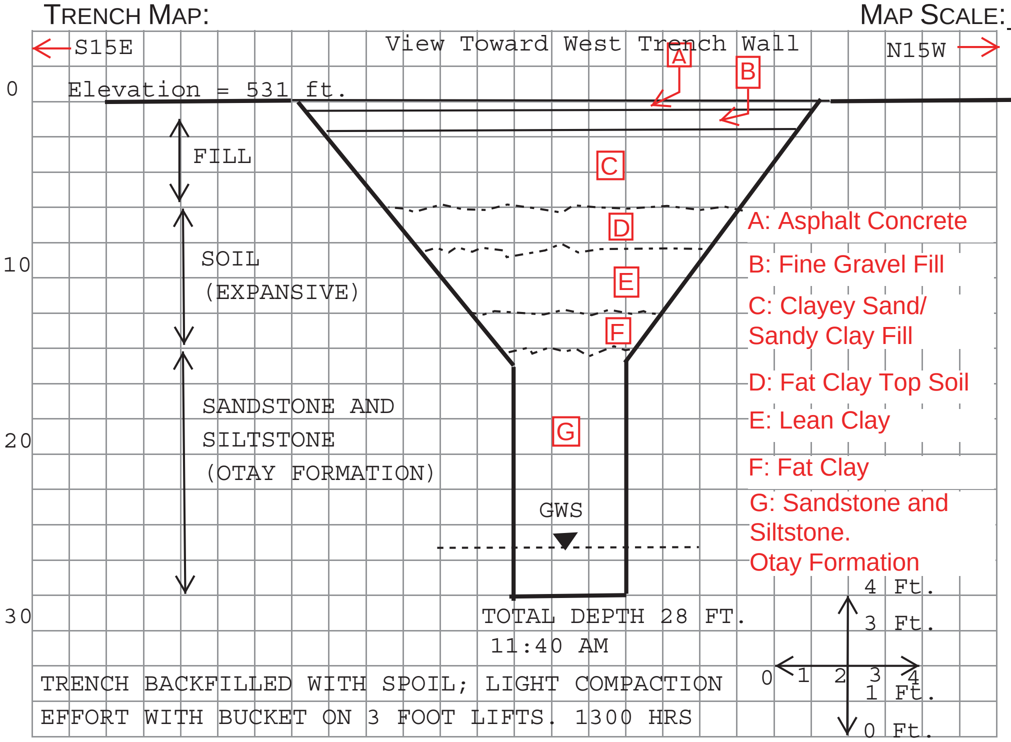
SAMPLER: Kermode: Catipillar 345 Excavator with 6 foot buket
0800 to 0930 equip i.d. 1155 bucket w blade
1115 to 1300 equip i.d. 1180 bucket w teeth

WEATHER: Clear, warm, dry.
>60 days since last sig. rain.

TRENCH MAP:

MAP SCALE: 1 inch = 8 Feet (Ft.)

PP= pocket penetrometer



FIELD_NOTES 08:30 A.M.

0-0.6 Ft. below ground surface (BGS).

A: Asphalt concrete (AC).

0.6 - 1.6 Ft. BGS

B: GRAVEL (GP), variegated dry mostly fine gravel, some fine to coarse sand FILL: CLASS II Subbase.

0.6-6.0 BGS

C: Clayey SAND/ Sandy CLAY (SC/CL), variegated, very pale brown, some fine SAND, and CLAY, little SILT, medium and coarse SAND. FILL.

Figure 3 Trench Log.

California DEPARTEMT OF TRANSPORTATION

11-SD-11/125/905-PM VAR
EA 11-288811
EFIS 1100020167

TRENCH LOG

SITE: 11-SD-11/125/905 P.M. Var.

DATE: 07/09/2014

TRENCH ID: T0114

TIME: 0800 to 1300 hours

SAMPLER: Kermode: Catipillar 345 with 6 foot buket
0800 to 0930 equip i.d. 1155 bucket w blade
1115 to 1300 equip i.d. 1180 bucket w teeth

WEATHER:

FIELD_NOTES

6.0-8.6 ft. BGS: FAT CLAY (CH),very stiff, dark brown, moist, highly plastic, very high dry strength, no dilatency. Pocket Penetrometer (PP) 3.25 ≤ PP ≤ 3.5 Tons per Square Foot (TSF).

8.6 -12.1 ft. LEAN CLAY (CL), very stiff, yellowish red (5YR4/6), moist, mostly clay, little fine and medium few coarse SAND, trace coarse GRAVELS comprised of slightly weathered, very hard, well rounded igneous rock (ANDESITE). 3.25 ≤ pp ≤ 3.5 TSF.

12.1-14.5 ft. FAT CLAY (CH), very stiff, yellowish red, moist, high plasticity, very high dry strength. 3.25 ≤ PP ≤3.5 TSF.

14.5-28 ft. SEDIMENTARY ROCK (poorly indurated SANDSTONE AND SILTSTONE), fine, medium grained with silt and clay, very thinly to moderately bedded, variegated light olive gray and pale olive; moist, intensely weathered, very soft to moderately soft, with 5% cobble size hard concretions. siltsotnes have manganesedendrites which appear as disseminated black speckles. Jar Slake Index ≤ 3. Total Depth 28 ft. BGS. 11:40AM

PERCHED GROUND (GWS) WATER OBSERVED SEEPING FROM SANDSTONE BED AT ~26 FT. BGS. GROUNDWATER PONDED IN BOTTOM OF TRENCH TO ONE-QUARTER INCH (ESTIMATED) BETWEEN 11:40 AND 12:10.

Figure 3 Trench Log.

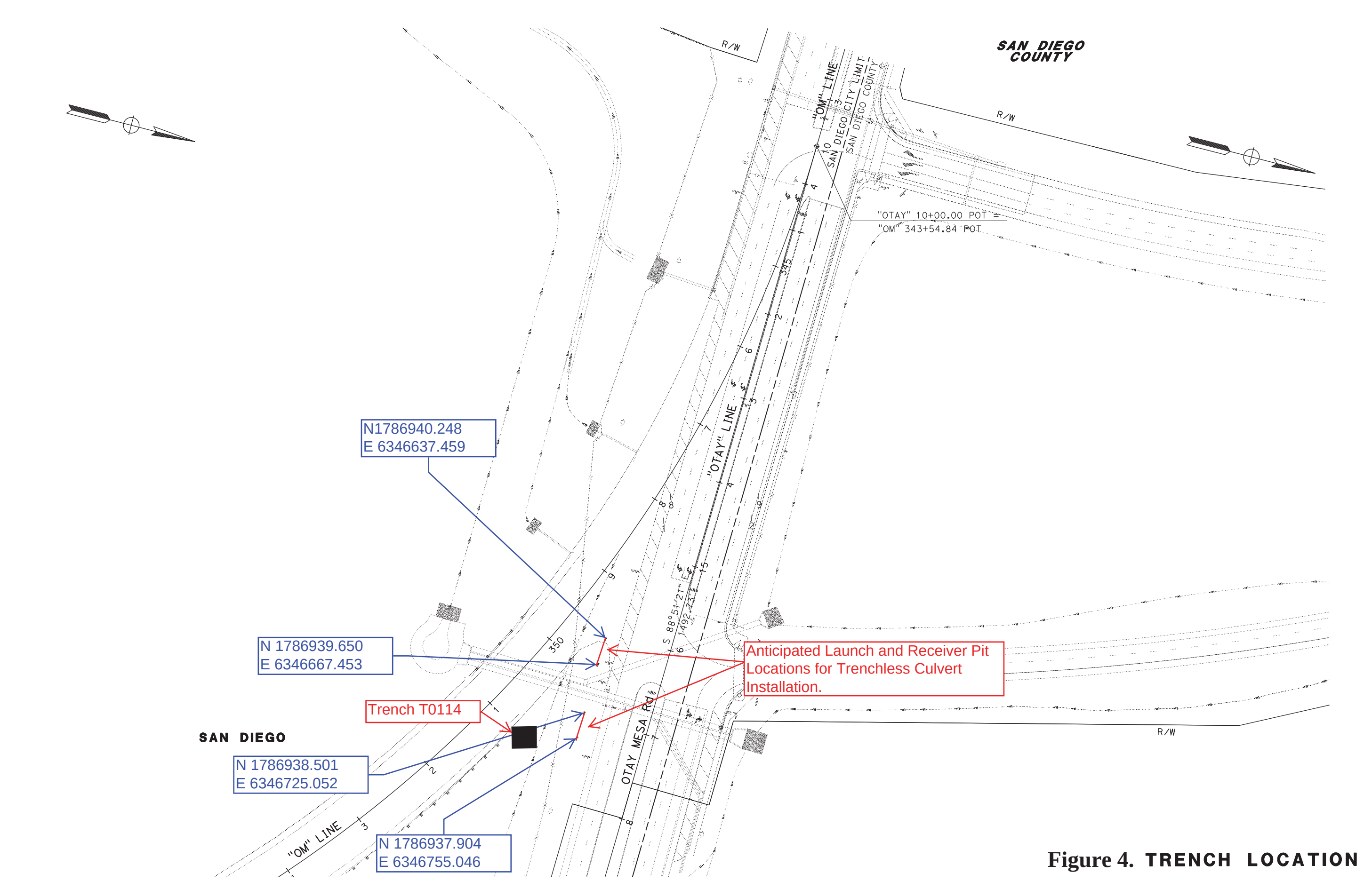


Figure 4. TRENCH LOCATION

SCALE: 1" = 50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans®
DESIGN
FUNCTIONAL SUPERVISOR: MICHAEL J. WEBSTER
CALCULATED-DESIGNED BY | CHECKED BY
REVISED BY | DATE REVISED

BORDER LAST REVISED 7/2/2010
USERNAME => s132966
DGN FILE => 1113000167_Trench_140701.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 2781
PROJECT NUMBER & PHASE 11130001671
LAST REVISION 07-01-14
DATE PLOTTED => 01-JUL-2014
TIME PLOTTED => 15:38

TUNNELMAN'S GROUND CLASSIFICATION SYSTEM

Classification	General Ground Behavior	Soil Types
Firm	Heading can be advanced without initial support	Hard clay, cemented sand
Slow Raveling	Chunks drop off the face after the ground has been exposed	Sands with fines, fine sands above water table
Rapid Raveling	Chunks drop off the face within a few minutes of exposure	Sands with fines, fine sands below water table
Squeezing	Soil slowly advances into tunnel without signs of fracturing	Soft to stiff clays
Swelling	Soil moves slowly into tunnel, associated with a considerable volume increase in the ground surrounding the tunnel	Highly over-consolidated high plasticity clays
Cohesive Running	Preceded by brief period of raveling, soil will then "run" like a granulated sugar until the slope angle becomes equal to ~34°	Clean, fine, moist sand
Running	Immediately upon exposure, the soil will "run" like a granulated sugar until the slope angle becomes equal to ~34°	Clean, coarse or medium sand above water table
Flowing	Material with sufficient cohesion to stand for a brief period of raveling before it breaks down and flows as a mixture of soil and water into the heading.	Silt, sand, and gravel beneath the water

After: D. Bennett; 2014 Caltrans Hydraulic Conference, Trenchless Pipe Replacement

Method	Outer Diameter	Length	Accuracy	Suitable Ground Conditions	Relative Cost	Limitations
Auger Boring	8 – 84”	< 400’	1 – 2% of length	Stable soils	$$	Little to no groundwater
Pilot tube	8 – 36”	< 350’	± 0.5”	Stable to marginally stable soils, < 10’ GW	$$	No rock/cobbles, short lengths
Guided Boring	4 – 48”	< 500’	± 1.0”	Stable to marginally stable soils, < 10’ GW	$$$	Little to no groundwater
Powered Cutter Head	20 – 44”	< 500’	± 1.0”	Very stiff/dense soils	$$$	
Guided Ramming	6 – 80”	<300’	± 0.5”	Stable to marginally stable soil	$$$	No rock
Vacuum	10 – 14 ”	<350’	±0.5”	Stable to marginally stable soil	$$$	No flowing sands

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 1 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** Dark brown sandy CLAY, damp, stiff to hard, abundant rootlets, trace fine gravel	
158.0	1								**OTAY FORMATION** @ 0.9m: Light brown, silty SANDSTONE (SM); fine-grained, slightly moist, dense	
157.0	2									
156.0	3			R-1	50/ 100mm	16.81	19.8		@ 3.1m: Light brown, silty SANDSTONE (SM), fine-grained, slightly moist, dense, moderately friable, slightly mottled with pinkish brown, massive	CN
155.0	4			B-1						
				S-1	58				@ 4.6m: Very dense	SA
154.0	5									
153.0	6			R-2	50/ 100mm	17.07	18.5		@ 6.1m: Slight increase in moisture and clay content	CN
152.0	7									
				S-2	50/ 75mm				@ 7.6m: Strongly cemented silty SANDSTONE (SM); layer approximately 0.46m thick	
151.0	8									
150.0	9			R-3	50/ 100mm	17.71	14.7		@ 9.1m: Moist	
149.0	10									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-3

Date 7-31-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 27+12/13m right of B-Line

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
148.0	11			S-3	31				@ 10.7m: Light brown to light olive-brown SILTSTONE (ML); wet, very stiff to hard, well indurated, slightly micaceous, massive	SA
147.0	12			R-4	50/ 130mm	15.98	23.5		@ 12.2m: Thin pinkish brown CLAYSTONE (CL) interbed @ 12.3m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
146.0	13									
145.0	14			S-4	50/ 100m				@ 13.7m: Light brown to light olive brown, SILTSTONE (ML), wet, hard, well indurated, massive	
144.0	15			R-5	50 130mm				@ 15.2m: Micaceous	
143.0	16								Total Depth = 15.4m Ground water measured at 10.7m below ground surface at completion of drilling Backfilled with bentonite cement slurry on 7/31/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07
Project SR125/905 Interchange
Drilling Co. Tri County Drilling
Hole Diameter 0.20m
Borehole Elevation(m) 159.0
Drive Weight 63.5 kg
Location Station 26+63.5/17 m right of B-Line
Sheet 1 of 2
Project No. 600158-905
Type of Rig CME-75
Drop 0.76m

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
159.0	0							CL	**TOPSOIL** Dark brown, silty CLAY, moist, stiff, abundant organics to fine rootlets, trace fine-grained gravel; approximately 1m thick, but discontinuous elsewhere across the site	
158.0	1								**OTAY FORMATION** @1.5m: Light reddish-brown, silty SANDSTONE (SM), moist, slightly compact, mottled with light brown, fine-grained	
				S-1	15					
157.0	2									
				B-1						SA
156.0	3									
				R-1	91	16.10	23.0		@ 3.1m': Light brown to light olive-brown, silty SANDSTONE (SM), fine-grained, mottled with reddish-brown, moist, dense	DS
[illegible]	4									
				S-2	54				@ 4.6m: Light gray silty SANDSTONE (SM), moist, dense; fine-grained; mottled with reddish brown	
154.0	5									
153.0	6									
				R-2	82	17.47	18.2		@ 6.1m: Light brownish-gray silty to clayey SANDSTONE (SC); moist dense; homogeneous and unstained; upper sampler includes orange-brown silty claystone bed, moist, stiff, and waxy, displays dip of 10 to 20 degrees Driller notes ground water encountered	DS
152.0	7									
				S-3	52				@ 7.6m: Light gray, silty to clayey SANDSTONE (SM), moist, dense; fine-grained as above	
151.0	8									
150.0	9									
				R-3	77	15.25	28.3		@ 9.1m: Generally light gray silty SANDSTONE (SM), similar to above; sampler tip is sandy SILTSTONE (ML)with clay; moist, stiff; some pinkish stain/hue locally	
149.0	10									

SAMPLE TYPES:
[S] SPLIT SPOON
[R] RING SAMPLE
[B] BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-5

Date 8-1-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig CME-75
Hole Diameter 0.20m | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 159.0 | Location Station 26+63.5/17 m right of B-Line

Logged By RCS/BJO
Sampled By RCS/BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
148.0	11			S-4	30				@ 10.7m: Light brownish-gray, clayey SILTSTONE (ML), wet, medium stiff	
147.0	12			R-4	50/ 130mm	16.65	21.9		Ground water appears perched above @ 12.2m: Light gray-brown, silty to clayey SANDSTONE (SC), moist to wet, dense; Note, sands may have flowed, fine-grained	
146.0	13									
145.0	14			S-5	50/ 100mm				@ 13.7m: Light gray-brown SILTSTONE (ML), moist, very dense; sample tip is light brown claystone; moist, very stiff to hard	
144.0	15			R-5	50/ 130mm	16.88	21.2		@ 15.2m: Light gray-brown, very fine sandy SILTSTONE (ML), moist, very stiff to hard; localized medium	DS
143.0	16								Total Depth = 15.4m Ground water noted at 6.7m to 11.9m approximately Ground water measured at 5.2m prior to backfill Backfilled with bentonite cement slurry on 7/27/07	
142.0	17									
141.0	18									
140.0	19									
139.0	20									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 9-18-07
Project SR125/905 Interchange
Drilling Co. Tri County Drilling
Hole Diameter 200mm Drive Weight 63.5 kg
Borehole Elevation(m) 160.2 Location Otay Mesa Road Overcrossing

Sheet 1 of 2
Project No. 600158-905
Type of Rig D-120
Drop 0.76m

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Sample No.	Blows/300mm	Soil Class. (U.S.C.S.)
160.2	0			ML
159.2	1			
158.2	2	NR C-1		
157.2	3			
156.2	4	C-2		
155.2	5	C-3		
154.2	6			
153.2	7	C-4		
[illegible]2	8	NR		
151.2	9	C-5		
150.2	10	C-6		
149.2	11	NR		
148.2	12	C-7		
147.2	13			
146.2	14	S-1	64	
145.2	15	R-1	27/230mm	
144.2	16			
143.2	17	S-2	91/280mm	
142.2	18	R-2	86/250mm	
141.2	19			
140.2	20			

DESCRIPTION

ARTIFICIAL FILL (see adjacent Test Pits)
@ 0-1.7m: Spoils include light yellow-brown sandy SILT, and darker brown sandy to silty clay; moist, medium stiff

@ 1.8-1.9m: Mixed brown sandy CLAY and light gray-brown, very fine sandy SILT, damp to moist, medium stiff

OTAY FORMATION
@ 1.9-4.3m: Generally light gray-brown SILTSTONE (ML), moist, medium stiff; weathered; some near horizontal caliche pockets/layers to 1cm thickness
@ 2.6m: Grades slightly sandier
@ 4.3-5.0m: Light brownish-gray very fine sandy SILTSTONE to silty fine SANDSTONE (SM), very moist, medium dense; faint yellow-brown staining and slightly weathering
@ 5.0-5.1m: Grades finer grained; cohesive but still weathered and blocky texture; some diffuse, faint, near horizontal lamination
@ 5.1-6.6m: Light brownish-gray clayey SILTSTONE (ML), moist, medium stiff; some horizontal banding, no parting surfaces
@ 6.6-7.4m: Generally silty CLAYSTONE (CL), moist, stiff; otherwise similar to above
@ 7.4-9.1m: Light gray to brownish gray, very fine sandy SILTSTONE (ML), moist to very moist, medium stiff/dense; clayier sample tip
@ 7.6-7.8m: No sample recovery. Broken/disturbed core through 8.5m
@ 9.1-10.5m: Light gray to olive-gray SILTSTONE (ML) moist, stiff
@ 9.6-10.2m: Zones of reddish-brown silty CLAYSTONE, moist, stiff; indurated; no clear parting surfaces
@ 10.3-10.7m: Light gray, very fine sandy SILTSTONE (ML) to very fine-grained SANDSTONE (SM), damp, very dense; generally more homogeneous than above
@ 10.7-10.8m: No recovery
@ 10.8-11.2m: Light gray-brown clayey SILTSTONE (ML) damp to moist, very stiff
@ 11.2-11.8m: Includes laminated light olive to very light brown CLAYSTONE (CH), moist, stiff; bentonitic; pinkish hue near bottom; wavy laminations, with 5-8° dip to waxy, whitish layers
@ 11.8-12.2m: Light brown clayey SILTSTONE (ML) moist, stiff to very stiff; generally similar to upper hole @ 12.2m: end core sampling
@ 13.7m: Brownish-gray silty very fine SANDSTONE (SM) very moist to wet, dense; friable; micaceous. Red-brown coloration to upper sample
@ 15.2m: Light brownish-gray, very fine sandy SILTSTONE (ML) to silty SANDSTONE (SM), minor clay; very moist to wet, dense to very dense; soft and wet in upper sample; generally similar to 13.7m; water appears perched/confined in this interval
@ 16.7m: Light brown to pinkish-brown silty CLAYSTONE (CL) moist, very stiff
@ 18.2m: Light olive-brown clayey SILTSTONE (ML-CL) moist, very stiff; some bright adobe-red staining to lower sample; minor very fine sand locally in upper sample

SAMPLE TYPES:
SPLIT SPOON
RING SAMPLE
BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-6

Date 9-18-07 | Sheet 2 of 2
Project SR125/905 Interchange | Project No. 600158-905
Drilling Co. Tri County Drilling | Type of Rig D-120
Hole Diameter 200mm | Drive Weight 63.5 kg | Drop 0.76m
Borehole Elevation(m) 160.2 | Location Otay Mesa Road Overcrossing

Logged By BJO
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
				S-3	62				@ 19.8m: Light gray very fine sandy SILTSTONE (ML) moist, very stiff; homogeneous	
139.2	21			R-3	70/ 280mm					
138.2	22								@ 21.3m: Less sandy than above, minor clay; local weak cementation/induration in lower sampler	
137.2	23			S-4	88/ 280mm				@ 22.8m: Light gray-brown silty CLAYSTONE (CL) moist, very stiff; faint pinkish coloration locally	
136.2	24			R-4	50/ 75mm				@ 24.4m: No recovery, sampler tip includes orange-brown to adobe-red colored very fine sandy SILTSTONE (ML) damp, hard; some weak cementation (breaks with some finger-effort)	
135.2	25								Total Depth = 24.5m Ground water appears confined at 13-15m± Measured at 9.2m prior to backfill Backfilled with bentonite cement slurry on 9/18/07	
134.2	26									
133.2	27									
[illegible].2	28									
131.2	29									
130.2	30									
129.2	31									
128.2	32									
127.2	33									
126.2	34									
125.2	35									
124.2	36									
123.2	37									
122.2	38									
121.2	39									
120.2	40									

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

TYPE OF TESTS:
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
H HYDROMETER
HC HYDRO COLLAPSE
TR TRIAXIAL
SA SIEVE ANLAYSIS
AT ATTERBURG LIMITS
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON

GEOTECHNICAL BORING LOG B-7

Date 8-20-07 | Sheet 1 of 1

Project SR125/905 Interchange | Project No. 600158-905

Drilling Co. Tri-County Drilling | Type of Rig CME-75

Hole Diameter 0.02m | Drive Weight 63.5 kg | Drop 0.76m

Borehole Elevation(m) 156.8 | Location North Box Culvert

Logged By BJO

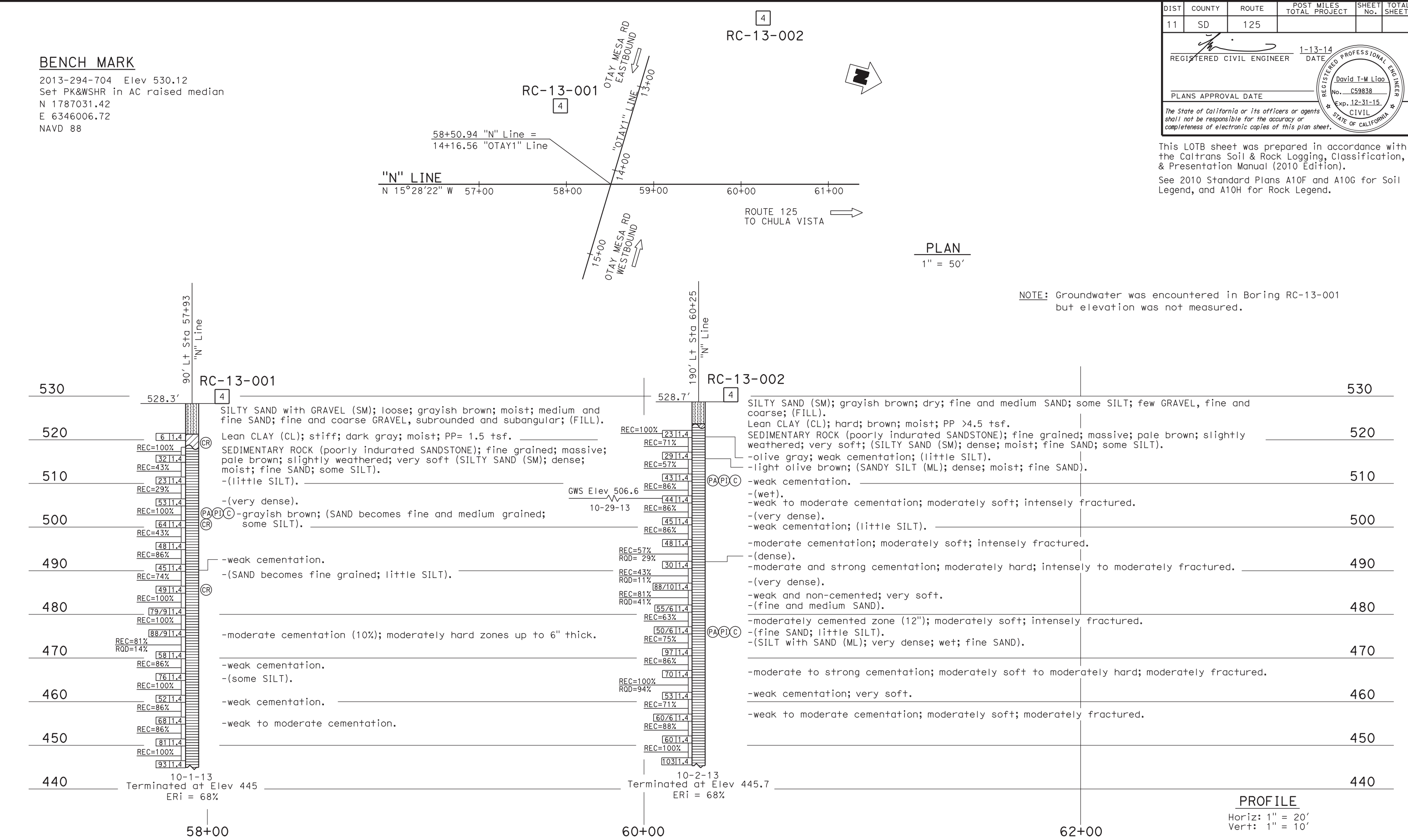
Sampled By BJO

Elevation Meter	Depth Meter	Graphic Log	Attitudes	Sample No.	Blows/300mm	Dry Density (kN/m³)	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
156.8	0								ARTIFICIAL FILL Light brownish-gray clayey to very fine sandy SILT; damp, medium stiff; dry and crumbly 0-0.2m from surface	
155.8	1			B-1				ML		
				R-1					OTAY FORMATION @ 1.5m: Light brown silty CLAYSTONE (CL-ML), moist, very stiff; slightly weathered with chalky/punky texture in upper sample @ 3.0m: Homogeneous light brown color, stuff to very stiff in sampler tip	AT,SA, H, CN
154.8	2									
153.8	3			S-1						
[illegible]8	4									
				R-2		16.05	24.9		@ 4.6m: Upper sample similar to above, with pinkish coloration locally; lower sample is light brownish gray clayey SILTSTONE, moist, very stiff	
151.8	5									
150.8	6			S-2					@ 6.1m: Olive-gray silty very fine SANDSTONE (SM), moist, dense; very fine grained; friable; somewhat micaceous	
149.8	7									
				R-3		13.84	24.2		@ 7.6m: Light brown clayey SILTSTONE (ML-CL) to silty CLAYSTONE, moist, very stiff; lower sample is clayier with slight pinkish coloration	
148.8	8								Total Depth 8.0m No ground water encountered at time of drilling Backfilled with bentonite cement slurry on 8/20/07	
147.8	9									
146.8	10									

SAMPLE TYPES:
- PLIT SPOON
- ING SAMPLE
- BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- H HYDROMETER
- HC HYDRO COLLAPSE
- TR TRIAXIAL
- SA SIEVE ANLAYSIS
- AT ATTERBURG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	125			

1-13-14
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
David T-M Liao
No. C59838
Exp. 12-31-15
CIVIL
STATE OF CALIFORNIA

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This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, & Presentation Manual (2010 Edition).

See 2010 Standard Plans A10F and A10G for Soil Legend, and A10H for Rock Legend.

ENGINEERING SERVICES | **MATERIALS AND GEOTECHNICAL SERVICES**

FUNCTIONAL SUPERVISOR
NAME: M. Desalvatore
DRAWN BY: I. G-Remmen
CHECKED BY: E. Neupert
FIELD INVESTIGATION BY: TM Liao

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN
DESIGN BRANCH X

BRIDGE NO. 57-1202R
POST MILE 0.74

OTAY MESA ROAD UC
LOG OF TEST BORINGS

OGS CIVIL LOG OF TEST BORINGS SHEET
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3
UNIT: 3643
PROJECT NUMBER & PHASE: 11130001671
CONTRACT NO.: 11-288811
DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES 01-13-14
SHEET X OF X
FILE => otay.dgn
USERNAME => s116982 DATE PLOTTED => 14-JAN-2014 TIME PLOTTED => 06:53

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

PROFESSIONAL GEOLOGIST 10-30-12

PLANS APPROVAL DATE

Erich Neupert No. 8137 Exp. 2-28-14 — PROFESSIONAL GEOLOGIST — STATE OF CALIFORNIA

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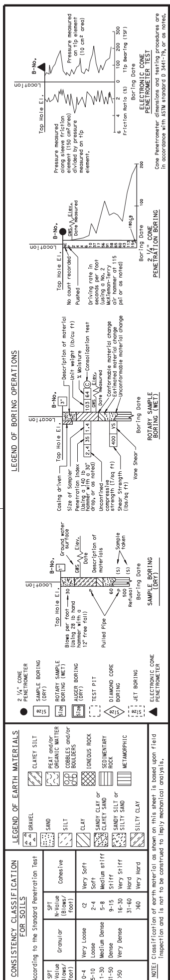
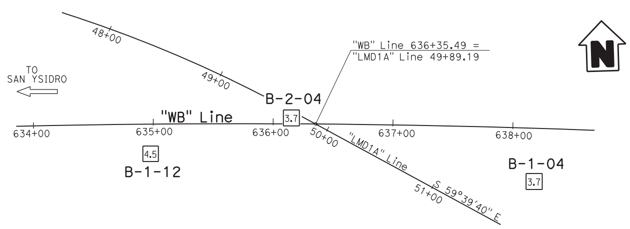


BENCH MARK

BM 905-K17.8 Elev 525.75'

Caltrans Benchmark 905-K17.8, brass cap set in concrete on the southwest corner of the top of a 2-cell box culvert on the west side of existing Route 905.

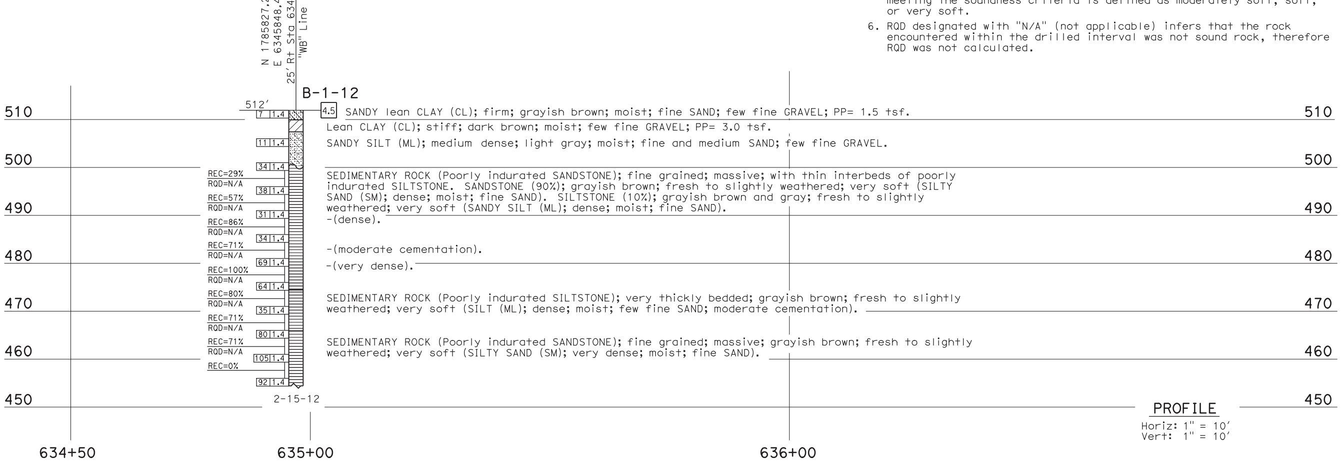


PLAN

1" = 40'

NOTES:

1. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)," Engineering Service Center, Office of Structure Foundations, August 1996.
2. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using Geological Society of America rock color charts (1995, 8th Printing).
3. Ground water was measured in Boring B-2-04. No attempt was made to measure ground water in Borings B-1-04 and B-1-12. Those Borings were backfilled immediately after completion of drilling.
4. E= Blow count for 1' penetration extrapolated from blow count for less than 1' (due to change in material or hard driving).
5. RQD with asterisk designation (i.e. RQD=53%*) indicates that the rock within the drilled interval is soft and that the soundness criteria has not been met (as described by Deere and Deere, 1989). Rock not meeting the soundness criteria is defined as moderately soft, soft, or very soft.
6. RQD designated with "N/A" (not applicable) infers that the rock encountered within the drilled interval was not sound rock, therefore RQD was not calculated.



PROFILE

Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH X	BRIDGE NO. 57-1228F	W11 - W905 CONNECTOR
DRAWN BY	I.G-Remmen	H. Valencia, D.T-M Liao			POST MILE 0.26	LOG OF TEST BORINGS 1 OF 4
CHECKED BY	E. Neupert					

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES — 09-26-12 10-26-12

SHEET X OF X

FILE => 11-w905-1of4.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:33

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST Erich Neupert No. 8137 Exp. 2-28-14 STATE OF CALIFORNIA

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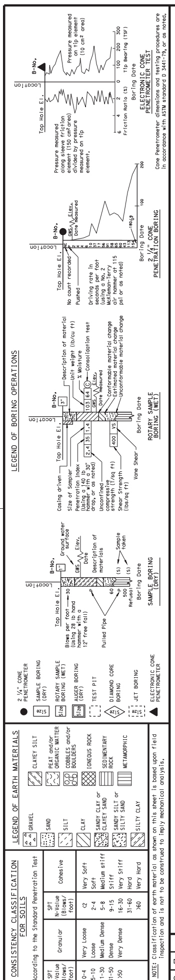

FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS 1 OF 4"

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	W11 - W905 CONNECTOR
DRAWN BY	I.G-Remmen			DESIGN BRANCH X	57-1228F	
CHECKED BY	E. Neupert	H. Valencia			POST MILE 0.26	LOG OF TEST BORINGS 2 OF 4

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000001591

CONTRACT NO.: 11-235801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 09-26-12 10-26-12

SHEET X OF X

FILE => 11-w905-2of4.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:33

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
ENGINEERING GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST
Erich Neupert
No. 8137
Exp. 2-28-14
STATE OF CALIFORNIA

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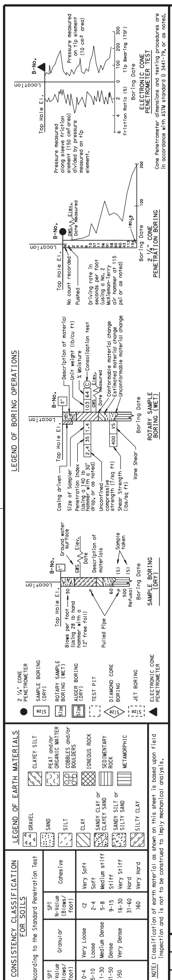
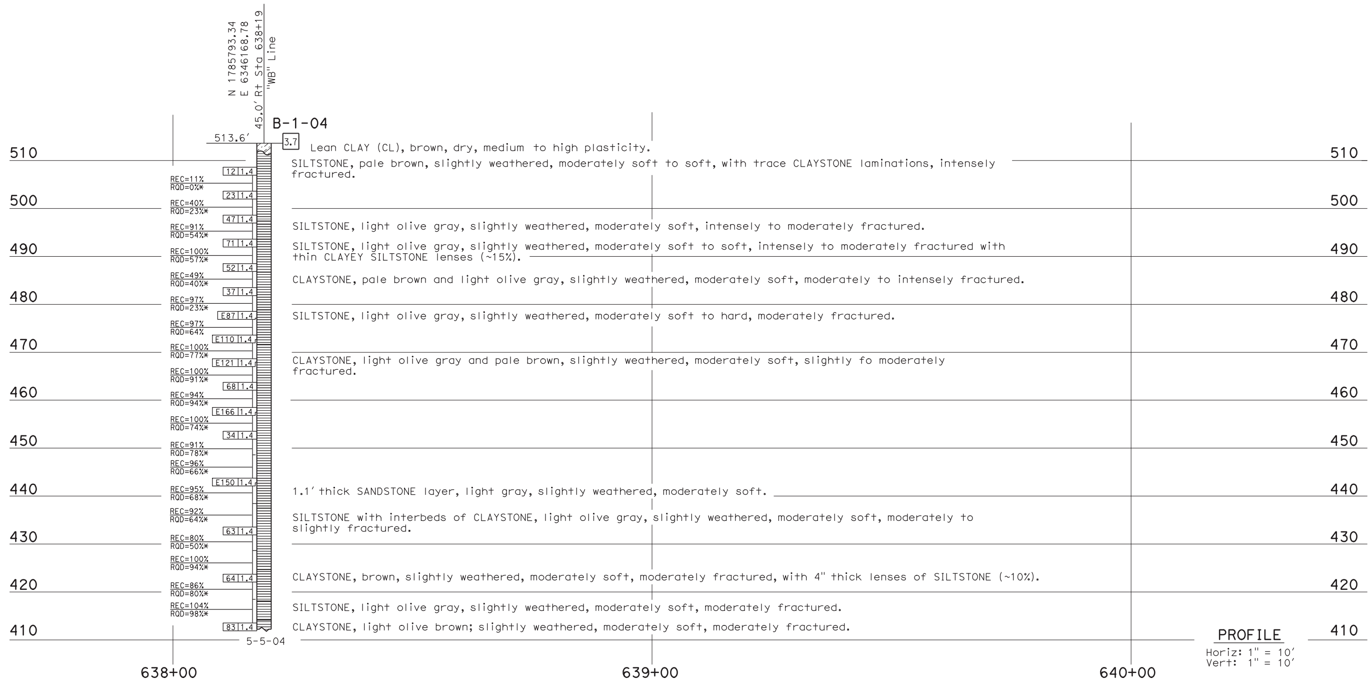
FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS 1 OF 4"





ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 57-1228F	W11 - W905 CONNECTOR
DRAWN BY: I.G-Remmen				DESIGN BRANCH X	POST MILE 0.26	LOG OF TEST BORINGS 3 OF 4
CHECKED BY: E. Neupert		H. Valencia				

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000001591

CONTRACT NO.: 11-235801

DISREGARD PRINTS BEARING EARLIER REVISION DATES 09-20-12 10-26-12

SHEET X OF X

FILE => 11-w905-3of4.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:33

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

PROFESSIONAL GEOLOGIST 10-30-12

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — Hector Valencia — No. 7776 — Exp. 2-28-14 — STATE OF CALIFORNIA

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B-1-03

40' Rt Sta 38+77 "A" Line

553.2'

Elev	Blows / ft (length)	REC / RQD	Description
550	3.7		SANDY CLAY (CL) with scattered fine to coarse GRAVEL (10-20%), pale brown, moist.
	14 / 1.4		CLAY (CL) and CLAYEY SILT (ML) with scattered SAND lenses (up to 3" thick), pale brown, stiff/medium dense, moist.
540	14 / 1.4		CLAYEY SAND (SC), with CLAY lenses (20%), medium dense, pale brown, moist, with trace cemented gravel sized sedimentary rock fragments.
	10 / 1.4	REC=100% RQD=0%*	CLAY with trace organic fragments (5%), stiff, dark grayish brown, moist.
530	30 / 1.4	REC=57% RQD=57%*	SILTSTONE, yellowish brown, moderately weathered, soft to moderately soft, weakly to moderately cemented, with scattered gravel sized rock fragments.
	37 / 1.4	REC=80% RQD=51%*	SILTY fine SANDSTONE, yellowish brown to light yellowish brown, soft to moderately soft with local very soft zones (30%), up to 1.5' thick.
520	32 / 1.4	REC=94% RQD=68%*	CLAYSTONE, light yellowish brown, slightly weathered, soft to moderately soft, massive, moderately cemented.
	63 / 1.4	REC=100% RQD=43%*	From Elev 518.7' to 518.2' and Elev 515.7' to 514.7', interbeds of CLAYEY fine SANDSTONE, soft to very soft (up to 1' thick).
510	52 / 1.4	REC=100% RQD=14%*	Fine SANDY and CLAYEY SILTSTONE, light yellowish brown, slightly weathered, very soft to soft, easily friable.
			SILTY fine SANDSTONE, light yellowish brown and light olive brown, slightly weathered, soft, weakly cemented.
	68 / 1.4	REC=100% RQD=0%*	SILTY CLAYSTONE, light olive brown, slightly weathered, soft to moderately soft, moderately to well cemented.
			CLAYEY SILTSTONE and fine SANDY SILTSTONE (30%), light olive brown, slightly weathered, soft, weakly cemented.
500	74 / 1.4	REC=100% RQD=0%*	
	68 / 1.4	REC=100% RQD=0%*	From Elev 498.3' to Elev 496.7', SILTY fine SANDSTONE, very soft, weakly to non-cemented.
490	E87 / 1.4	REC=100% RQD=91%*	From Elev 491.7' to Elev 488.2', CLAYEY SILTSTONE, moderately soft, slightly fractured.
	89 / 1.4	REC=100% RQD=29%*	SILTY CLAYEY fine SANDSTONE, light olive brown, slightly weathered, very soft, easily friable, weakly to non-cemented.
480	56 / 1.4	REC=100% RQD=100%*	CLAYEY SILTSTONE, light olive brown, soft to moderately soft, slightly weathered, well cemented, unfractured with light reddish brown SILTSTONE interbeds up to 4" thick.
		REC=100% RQD=80%*	
470	E167 / 1.4	REC=100% RQD=83%*	SILTY fine SANDSTONE, light olive brown, very soft to soft, weakly to non-cemented.
		REC=100% RQD=58%*	SILTSTONE, light olive brown, slightly weathered, soft to moderately soft, slightly to moderately fractured, moderately cemented.
460	98 / 1.4	REC=100% RQD=0%*	SILTY and CLAYEY fine SANDSTONE, light olive brown, slightly weathered, soft, weakly cemented, with localized interbeds (up to 1' thick) of CLAYEY SILTSTONE, moderately soft to soft
		REC=100% RQD=57%*	SILTY CLAYSTONE, light olive brown, slightly weathered, moderately soft to soft, moderately fractured with scattered thin interbeds of SILTY fine SANDSTONE (10%).
450	E100 / 1.4	REC=90% RQD=70%*	CLAYEY SILTSTONE, light olive brown, and light reddish brown, slightly weathered, moderately soft, slightly fractured.
		REC=90% RQD=58%*	
440	92 / 1.4	REC=37% RQD=14%*	
		REC=100% RQD=94%*	SILTY CLAYSTONE, light olive brown, with local light reddish brown zones, slightly weathered, moderately soft to soft, slightly fractured.
430	62 / 1.4	REC=100% RQD=100%*	
		REC=100% RQD=100%*	
420	90 / 1.4	REC=100% RQD=100%*	
		REC=100% RQD=90%*	
410	E92 / 1.4	REC=100% RQD=96%*	From Elev 407.7' to 406.7', SILTY fine SANDSTONE, soft.
		REC=98% RQD=90%*	Fine SANDY and CLAYEY SILTSTONE, light olive brown, slightly weathered, moderately soft, slightly weathered.
400	90 / 1.4		

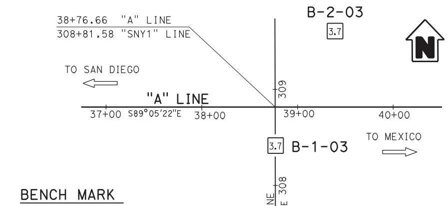
GWS Elev 529.9'
1-13-04

11-20-03
ERi = 97%

38+50 39+00 40+00

PROFILE

Horiz: 1" = 10'
Vert: 1" = 10'



PLAN

1" = 50'

BENCH MARK

Caltrans Benchmark: Sanyo 2003
Brass disk set in concrete in the sidewalk on east side of Sanyo Rd.
Elev 553.97'
NAVD 88 (Vertical Datum)

Notes:

1. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structure Foundations, August 1996.
2. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using Geological Society of America rock color charts (1995, 8th Printing).
3. Ground water was measured in boring B-1-03. Please refer to that boring for ground water measurement. No attempt was made to measure ground water in borings B-2-03 . That boring was backfilled immediately after completion of drilling.
4. ERi = The estimated hammer energy ratio.
5. Test borings B-1-03 and B-2-03 utilized a Dietrich automatic hammer to advance the sampler using a 140 lb hammer with a 30" drop. Penetration index values shown are the actual blow counts recorded in the field. Soil descriptions shown on the LOTB sheets are based on these index values.
6. E= Estimated Blow count for 1' penetration extrapolated from blow count for less than 1' of penetration (due to change in material or hard drilling).
7. RQD with asterisk designation (i.e. RQD=53%*) indicates that the rock within the drilled interval is soft and that the soundness criteria has not been met (as described by Deere and Deere, 1989). Rock not meeting the soundness criteria is defined as moderately soft, soft, or very soft.

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH X	BRIDGE NO. 57-1226 / POST MILE 0.80	SANYO AVENUE UNDERCROSSING — LOG OF TEST BORINGS 1 OF 3
DRAWN BY: I.G-Remmen		H. Valencia				
CHECKED BY: H. Valencia						

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191
CONTRACT NO.: 11-056311

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 10-30-12 | X | X

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

FILE => sanyo1of3.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:35

FOR PLAN VIEW, SEE "LOG OF TEST BORINGS" 1 OF 3

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

PROFESSIONAL GEOLOGIST — 10-30-12

PLANS APPROVAL DATE

Professional Geologist seal: Hector Valencia, No. 7776, Exp. 2-28-14, State of California

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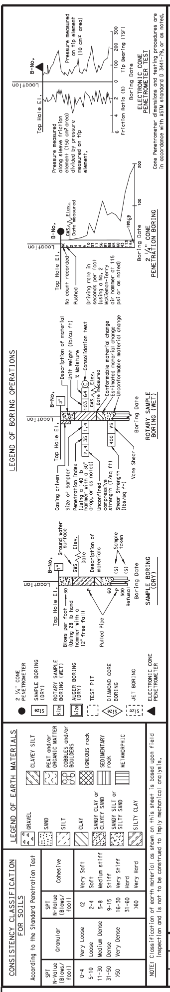
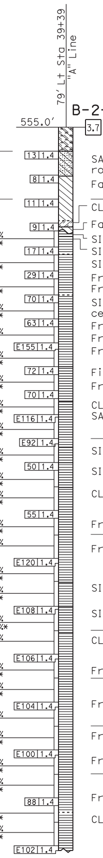




B-2-03 — 79' Lt Sta 39+39 "A" Line — 555.0'

Elev	REC / RQD	Sample	Description
550		3.7	4" A/C and 2' SILTY and CLAYEY fine to medium SAND (SM) with fine coarse GRAVEL (Roadbase) over SANDY CLAY (CL) with scattered fine GRAVEL (10-20%), pale brown, moist, (Fill).
		13 1.4	SANDY CLAY (CL) with scattered fine GRAVEL (5-15%), medium dense, pale brown and grayish brown, moist, GRAVEL consists of sedimentary rock fragments.
540		8 1.4	Fat CLAY (CH), black, stiff, moist, with scattered wood fragments (<5%) and coarse SAND.
		11 1.4	CLAYEY SILT (ML) with scattered GRAVEL, medium dense, light brown, moist.
		9 1.4	Fat CLAY (CH), black, firm, moist, with scattered coarse SAND.
530	REC=100% RQD=29%*		SILTSTONE, yellowish brown, slightly weathered, soft, with scattered gravel sized rock fragments.
		17 1.4	SILTY fine SANDSTONE, grayish brown and light yellowish brown, soft, friable, weakly cemented.
	REC=83% RQD=83%*		SILTSTONE and CLAYEY SILTSTONE, light gray, slightly weathered, moderately soft to soft.
520	REC=86% RQD=57%*	29 1.4	From Elev 527' to 525', interbed of SILTY fine SANDSTONE, light yellowish brown. From Elev 523.5' to 520', scattered thin interbeds of fine SANDY SILTSTONE (20%) and a 1' thick interbed of soft, pale brown CLAYSTONE.
	REC=100% RQD=86%*	70 1.4	SILTY fine SANDSTONE, light yellowish brown, slightly weathered, moderately soft, moderately to weakly cemented zones, with a soft, weakly cemented zone from Elev 515' to 513.5'.
510	REC=100% RQD=0%*	63 1.4	From Elev 513' to 509.7', soft, weakly cemented, with trace CLAYEY fine SANDSTONE interbeds (5-10%) up to 1" thick. From Elev 509.7' to 508.8', SILTSTONE, light yellowish brown, soft, weakly to moderately cemented. From Elev 508.8' to 505', with interbeds (up to 4" thick) of CLAYSTONE, soft, friable.
	REC=100% RQD=11%*	E155 1.4	Fine SANDY SILTSTONE, light olive brown with reddish brown, slightly weathered, soft to very soft, massive, weakly cemented.
500	REC=100% RQD=14%*	72 1.4	From Elev 503.5' to 500', with interbeds of SILTY fine SANDSTONE, soft to moderately soft, moderately cemented.
	REC=100% RQD=80%*	70 1.4	CLAYSTONE, olive gray, slightly weathered, moderately soft, massive, moderately to well cemented with scattered fine SANDY SILTSTONE and SILTY SANDSTONE interbeds (10%) up to 9" thick.
490	REC=100% RQD=47%*	E116 1.4	
	REC=100% RQD=93%*	E92 1.4	SILTY fine SANDSTONE, olive brown, slightly weathered, moderately soft to soft, moderately cemented.
480	REC=100% RQD=71%*	50 1.4	SILTSTONE, olive gray, slightly weathered, soft to moderately soft, weakly to well cemented.
	REC=100% RQD=60%*		CLAYSTONE, pale brown and olive gray with pink, slightly weathered, moderately soft to soft, moderately to well cemented, massive.
470	REC=100% RQD=57%*	55 1.4	From Elev 472'to 470.5', fine SANDY SILTSTONE, moderately soft.
	REC=100% RQD=0%*		From Elev 467' to 464', fine SANDY SILTSTONE, soft to medium soft, moderately to weakly cemented.
460	REC=100% RQD=45%*	E120 1.4	SILTY fine SANDSTONE, olive gray, slightly weathered, moderately soft, moderately to well cemented.
	REC=100% RQD=50%*		SILTSTONE, olive gray, slightly weathered, moderately soft, slightly fractured, well cemented.
450	REC=100% RQD=100%*	E108 1.4	CLAYSTONE, reddish brown and olive gray, slightly weathered, moderately soft, intensely fractured, moderately to well cemented.
	REC=100% RQD=8%*		
440	REC=100% RQD=28%*	E106 1.4	From Elev 448' to 447', SILTSTONE, moderately soft.
	REC=100% RQD=34%*		From Elev 438' to 425', moderately soft to soft.
430	REC=100% RQD=0%*	E104 1.4	From Elev 430' to 425', moderately fractured to intensely fractured.
	REC=100% RQD=68%*		From Elev 422' to 417.5', moderately soft with local soft zones (30%) up to 1.5' thick.
420	REC=100% RQD=28%*	E100 1.4	
	REC=104% RQD=22%*		From Elev 416.5' to 413.5', moderately fractured.
410	REC=94% RQD=40%*	88 1.4	CLAYSTONE, reddish brown and olive gray, slightly weathered, moderately soft to soft, moderately to intensely fractured.
	REC=102% RQD=36%*	E102 1.4	
400			12-3-03, ERi = 90%

PROFILE

Horiz: 1" = 10'
Vert: 1" = 10'

39+00 — 40+00 — 41+00

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH X	BRIDGE NO. 57-1226 / POST MILE 0.80	SANYO AVENUE UNDERCROSSING — LOG OF TEST BORINGS 2 OF 3
DRAWN BY: I.G-Remmen		H. Valencia				
CHECKED BY: H. Valencia						

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056311

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 10-30-12 | SHEET X OF X

FILE => sanyo2of3.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:35

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

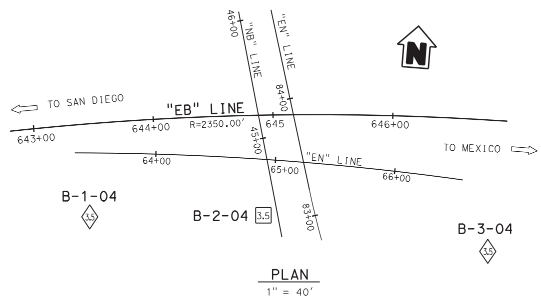
PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST
Erich Neupert
No. 8137
Exp. 2-28-14
STATE OF CALIFORNIA

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

BENCH MARK

BM Elev 538.88'
Caltrans Benchmark 905-K18.3, brass cap set in concrete on the northwest corner of Airway Road and existing Route 905.

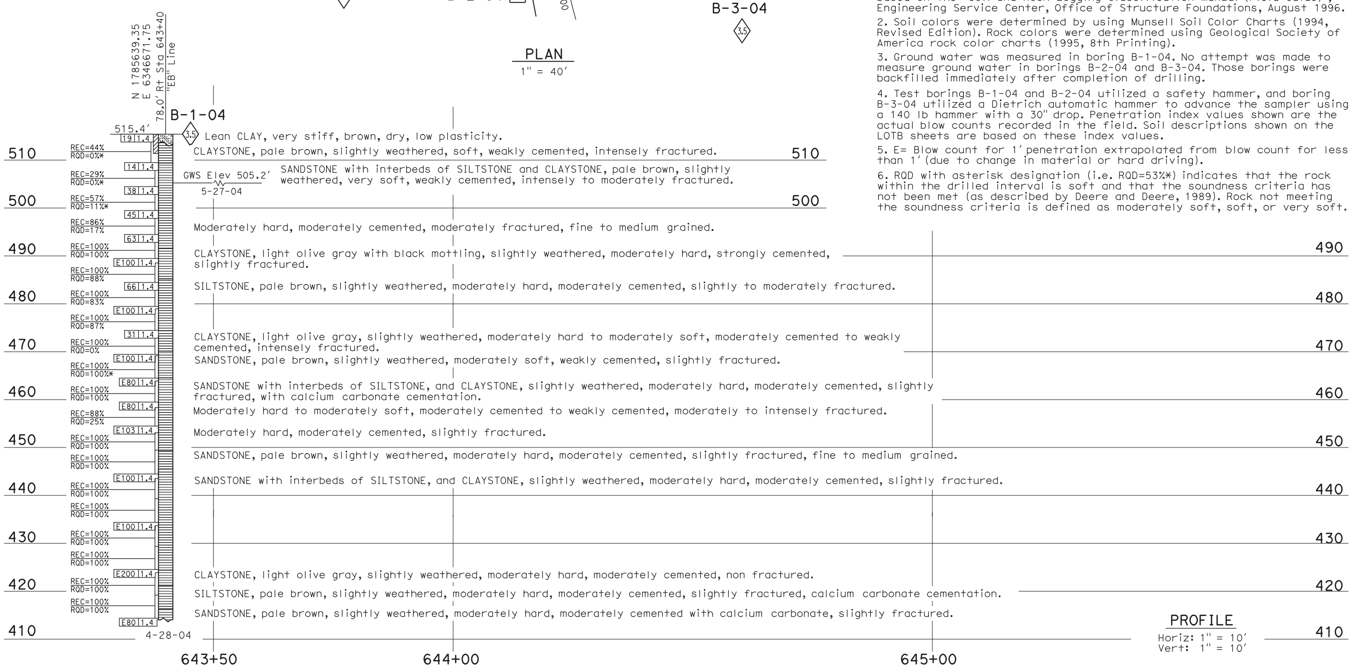


PLAN

1" = 40'

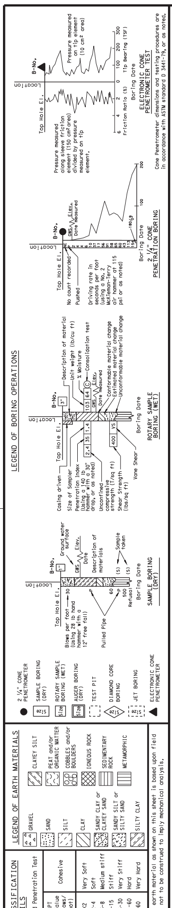
Notes:

1. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structure Foundations, August 1996.
2. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using Geological Society of America rock color charts (1995, 8th Printing).
3. Ground water was measured in boring B-1-04. No attempt was made to measure ground water in borings B-2-04 and B-3-04. Those borings were backfilled immediately after completion of drilling.
4. Test borings B-1-04 and B-2-04 utilized a safety hammer, and boring B-3-04 utilized a Dietrich automatic hammer to advance the sampler using a 140 lb hammer with a 30" drop. Penetration index values shown are the actual blow counts recorded in the field. Soil descriptions shown on the LOTB sheets are based on these index values.
5. E= Blow count for 1' penetration extrapolated from blow count for less than 1' (due to change in material or hard driving).
6. RQD with asterisk designation (i.e. RQD=53%*) indicates that the rock within the drilled interval is soft and that the soundness criteria has not been met (as described by Deere and Deere, 1989). Rock not meeting the soundness criteria is defined as moderately soft, soft, or very soft.



PROFILE

Horiz: 1" = 10'
Vert: 1" = 10'



ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:
DRAWN BY	I.G-Remmen	
CHECKED BY	E. Neupert	E. Neupert

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH X

BRIDGE NO. 57-1227R/L
POST MILE 0.43

ROUTE 11/125 SEPARATION

LOG OF TEST BORINGS 1 OF 7

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

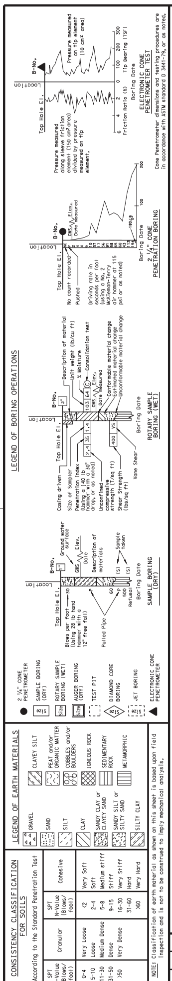
CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
10-25-12	10-26-12			X	X

FILE => rte11-125sep1of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — Erich Neupert — No. 8137 — Exp. 2-28-14 — STATE OF CALIFORNIA

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FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS 1 OF 7"

B-2-04

N 1785652.60
E 6346818.96
84' Rt Sta 644+90
"EB" Line

515.9'

Elev.	Sample	REC / RQD	Description
	12 / 1.4		(3.5) Lean CLAY, stiff, dark brown, dry, with scattered plant roots and trace calcium carbonate veins, low plasticity.
510		REC=29% RQD=0%*	SILTSTONE, pale brown, slightly weathered, very soft, weakly cemented, intensely fractured.
	12 / 1.4	REC=23% RQD=0%*	
500	40 / 1.4	REC=71% RQD=11%*	SANDSTONE, pale brown, slightly weathered, moderately to intensely fractured, fine grained.
	60 / 1.4	REC=57% RQD=0%	
490	E85 / 1.4	REC=100% RQD=56%	CLAYSTONE, light olive gray, slightly weathered, moderately hard, moderately cemented, moderately fractured.
	E81 / 1.4	REC=100% RQD=100%	SILTSTONE, pale brown, slightly weathered, moderately hard, moderately cemented, slightly fractured.
			CLAYSTONE, light olive gray, slightly weathered, moderately hard, moderately cemented, slightly fractured.
480	E100 / 1.4	REC=100% RQD=61%	SANDSTONE, pale brown, slightly weathered, moderately hard to moderately soft, moderately cemented to weakly cemented, moderately fractured.
	E80 / 1.4	REC=100% RQD=100%	SANDSTONE, pale brown, slightly weathered, moderately hard, moderately cemented with calcium carbonate, slightly fractured.
470	51 / 1.4	REC=100% RQD=86%	CLAYSTONE, light olive gray, slightly weathered, moderately hard, moderately cemented, slightly fractured.
	84 / 1.4	REC=86% RQD=71%	SANDSTONE with interbeds of SILTSTONE and CLAYSTONE, pale brown, slightly weathered, moderately hard, moderately well cemented with calcium carbonate, slightly to moderately fractured, fine to medium grained.
460	E100 / 1.4	REC=100% RQD=29%	
	E100 / 1.4	REC=85% RQD=100%	
450	E100 / 1.4	REC=100% RQD=100%	CLAYSTONE, light olive gray, slightly weathered, moderately hard, moderately cemented, slightly fractured.
		REC=100% RQD=100%	SILTSTONE, pale brown, slightly weathered, moderately hard, moderately cemented with calcium carbonate, slightly fractured.
440	E100 / 1.4	REC=100% RQD=100%	SANDSTONE, pale brown, slightly weathered, moderately hard to hard, cemented with calcium carbonate, slightly fractured.
		REC=100% RQD=100%	SANDSTONE, slightly weathered, moderately hard to hard, cemented with calcium carbonate, slightly fractured.
430	E100 / 1.4	REC=100% RQD=100%	CLAYSTONE, light olive gray, slightly weathered, moderately hard to hard, strongly cemented with calcium carbonate, slightly fractured.
		REC=100% RQD=100%	SILTSTONE, pale brown, slightly weathered, moderately hard to hard, strongly cemented, slightly fractured.
420	E133 / 1.4	REC=100% RQD=100%	CLAYSTONE, light olive gray, slightly weathered, moderately hard to hard, strongly cemented, slightly fractured.
			SILTSTONE, pale brown, slightly weathered, moderately hard to hard, strongly cemented with calcium carbonate, slightly fractured.
		REC=100% RQD=100%	SANDSTONE, pale brown, slightly weathered, moderately hard to hard, strongly cemented with calcium carbonate, slightly fractured.
410	E100 / 1.4	REC=100% RQD=100%	
		REC=100% RQD=60%	SANDSTONE, pale brown, slightly weathered, moderately hard to moderately soft, moderately to weakly cemented with calcium carbonate, moderately to intensely fractured.
400		REC=100% RQD=0%*	SANDSTONE, pale brown, slightly weathered, soft to very soft, weakly cemented to non-cemented, medium grained, intensely fractured.
		REC=100% RQD=80%	Moderately hard, moderately cemented with calcium carbonate, slightly to moderately fractured.
390			

4-29-04

644+50 | 645+00 | 646+00 | 647+00

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN — DESIGN BRANCH X	BRIDGE NO. 57-1227R/L; POST MILE 0.43	ROUTE 11/125 SEPARATION — LOG OF TEST BORINGS 2 OF 7
DRAWN BY: I.G-Remmen						
CHECKED BY: E. Neupert		E. Neupert				

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES 10-29-12 10-26-12 — SHEET X OF X

FILE => rte11-125sep2of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

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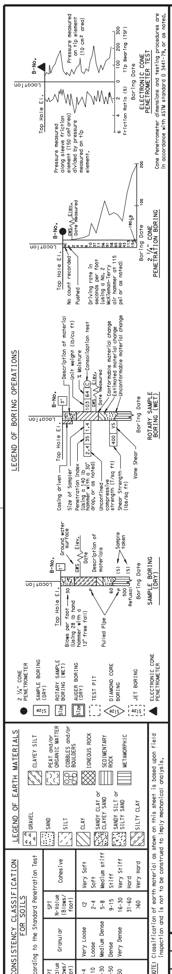
PROFESSIONAL GEOLOGIST Erich Neupert No. 8137 Exp. 2-28-14 STATE OF CALIFORNIA

FOR PLAN VIEW, SEE "LOG OF TEST BORINGS 1 OF 7"



N 1785637.71
E 6347004.73
110' Rt Sta 646+87 "EB" Line

B-3-04

517.4'

Elev.	REC / RQD	Sample	Description
		10 1.4	(3.5) Lean CLAY, stiff, brown, dry, nonplastic, with scattered calcium carbonate lenses, scattered plant roots.
510	REC=51% RQD=0%*	19 1.4	SANDSTONE with interbeds of SILTSTONE, pale brown, slightly weathered, soft, weakly cemented, medium to fine grained, scattered calcium carbonate veins, intensely fractured.
500	REC=14% RQD=0%*; REC=57% RQD=0%	28 1.4; 27 1.4	Moderately hard, moderately cemented with calcium carbonate, intensely to moderately fractured.
490	REC=43% RQD=14%; REC=71% RQD=57%; REC=100% RQD=54%	36 1.4; E100 1.4	SANDSTONE with interbeds of SILTSTONE and CLAYSTONE, pale brown, slightly weathered, moderately hard, moderately cemented, moderately fractured.
	REC=57% RQD=0%*	66 1.4	Soft, intensely fractured.
480		43 1.4	SILTSTONE, pale brown, slightly weathered, moderately hard, moderately cemented, moderately fractured.
	REC=100% RQD=43%		SANDSTONE, pale brown, slightly weathered, soft, weakly cemented, moderately fractured.
		51 1.4	CLAYSTONE, light olive gray, slightly weathered, moderately hard, moderately cemented, moderately fractured.
470	REC=100% RQD=71%	33 1.4	SANDSTONE with interbeds of SILTSTONE and CLAYSTONE, pale brown, slightly weathered, moderately hard to hard, moderately to strongly cemented with calcium carbonate, slightly fractured.
	REC=100% RQD=86%	51 1.4	SANDSTONE, pale brown, slightly weathered, soft, weakly cemented, moderately to intensely fractured.
460	REC=100% RQD=29%	E100 1.4	SILTSTONE, pale brown, slightly weathered, moderately hard, moderately cemented with calcium carbonate, moderately fractured.
	REC=100% RQD=0%*	E100 1.4	SANDSTONE with interbeds of SILTSTONE and CLAYSTONE, pale brown, slightly weathered, moderately soft to soft, moderately to weakly cemented with calcium carbonate, intensely fractured.
	REC=85% RQD=49%		Moderately hard, moderately cemented, moderately fractured.
450	REC=100% RQD=50%	69 1.4	Scattered moderately hard, strongly cemented zones and moderately soft, weakly cemented zones, moderately to intensely fractured.
440	REC=100% RQD=74%; REC=100% RQD=94%		Slightly fractured.
		E125 1.4	CLAYSTONE, light olive gray, slightly weathered, moderately hard to hard, strongly cemented, slightly fractured.
430	REC=100% RQD=100%; REC=100% RQD=90%		SANDSTONE with interbeds of SILTSTONE and CLAYSTONE, pale brown, slightly weathered, moderately hard to hard, strongly cemented, slightly fractured.
420	REC=100% RQD=20%	E100 1.4	SANDSTONE, pale brown, slightly weathered, moderately hard to soft, strongly to weakly cemented, moderately to intensely fractured.

5-4-04

646+50 647+00 648+00 649+00

PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH X	BRIDGE NO. 57-1227R/L	ROUTE 11/125 SEPARATION
DRAWN BY I.G-Remmen		E. Neupert			POST MILE 0.43	LOG OF TEST BORINGS 3 OF 7
CHECKED BY E. Neupert						

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

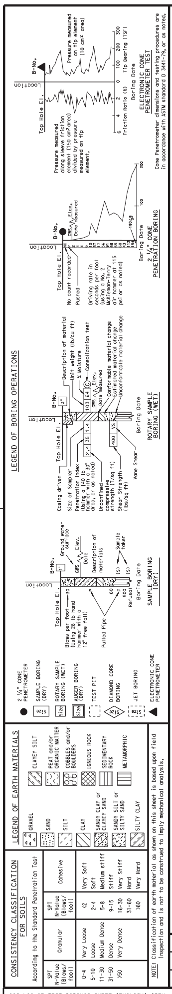
CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 10-25-12 10-26-12 SHEET X OF X

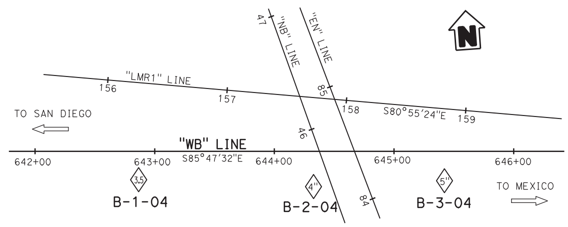
FILE => rte11-125sep3of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32



BENCH MARK

BM Elev 538.88'
Caltrans Benchmark 905-K18.3, brass cap set in concrete on the northwest corner of Airway Road and existing Route 905.



PLAN
1" = 40'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST Erich Neupert No. 8137 Exp. 2-28-14 STATE OF CALIFORNIA

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Notes:

1. The descriptions and classifications of rock and/or soil, including consistency and relative density descriptors, used by the field and/or office personnel for the exploration boreholes shown on this sheet are based on the "Soil and Rock Logging Classification Manual (Field Guide)", Engineering Service Center, Office of Structure Foundations, August 1996.
2. Soil colors were determined by using Munsell Soil Color Charts (1994, Revised Edition). Rock colors were determined using Geological Society of America rock color charts (1995, 8th Printing).
3. Ground water was measured in boring B-2-04. No attempt was made to measure ground water in borings B-1-04 and B-3-04. Those borings were backfilled immediately after completion of drilling.
4. Test boring B-1-04 utilized a safety hammer, test boring B-2-04 utilized a safety and Dietrich automatic hammer, and test boring B-3-04 utilized a Dietrich automatic hammer to advance the sampler using a 140 lb hammer with a 30" drop. Penetration index values shown are the actual blow counts recorded in the field. Soil descriptions shown on the LOTB sheets are based on these index values.
5. E= Blow count for 1' penetration extrapolated from blow count for less than 1' (due to change in material or hard driving).
6. RQD with asterisk designation (i.e. RQD=53%*) indicates that the rock within the drilled interval is soft and that the soundness criteria has not been met (as described by Deere and Deere, 1989). Rock not meeting the soundness criteria is defined as moderately soft, soft, or very soft.

N 1785777.61
E 6346634.85
24' Rt Sta 642+87
"WB" Line

B-1-04

514.3'

Elev	Core	Blows	Description
510		33 1.4	Lean CLAY (CL), hard, brown, dry, roots.
	REC=100% RQD=75%*		SANDSTONE, brown, slightly weathered, moderately soft to very soft, slightly to moderately fractured.
	REC=68% RQD=0%*	27 1.4	CLAYSTONE, yellowish gray, slightly weathered, moderately soft to very soft, intensely fractured, poorly cemented.
500	REC=81% RQD=39%	E81 1.4	SANDSTONE, light olive gray, black mottling, slightly weathered, moderately soft to moderately hard, moderately cemented, moderately fractured
	REC=66% RQD=40%	54 1.4	
490	REC=100% RQD=74%	E100 1.4	CLAYSTONE, pale brown with black mottling, slightly weathered, moderately soft to moderately hard, moderately fractured.
	REC=95% RQD=75%	E40 1.4	SANDSTONE, light olive gray, slightly weathered, moderately hard, well cemented, moderately fractured.
480	REC=100% RQD=86%	E100 1.4	SILTSTONE, pale brown with orange and black mottling, slightly weathered, moderately hard, well cemented, slightly fractured.
	REC=100% RQD=40%	E80 1.4	CLAYSTONE, pale brown with black mottling, slightly weathered, moderately hard, moderately fractured, moderately cemented.
470	REC=100% RQD=91%*	E40 1.4	SANDSTONE, light olive gray, slightly weathered, moderately soft, slightly to moderately fractured.
	REC=91% RQD=71%	E80 1.4	Moderately hard.
460	REC=100% RQD=69%	E133 1.4 E200 1.4	
	REC=93% RQD=100%	E200 1.4	SANDSTONE with interbeds of CLAYSTONE and SILTSTONE, light olive gray, slightly weathered, moderately hard, well cemented, non-fractured.
450	REC=96% RQD=100%	E100 1.4	
	REC=100% RQD=100%		
440	REC=100% RQD=93%	E80 1.4	Slightly fractured.
	REC=98% RQD=70%		SANDSTONE, light olive gray to yellowish gray, slightly weathered, moderately hard, well cemented, moderately fractured.
430	REC=98% RQD=98%	E133 1.4	CLAYSTONE, pale brown with black mottling, slightly weathered, moderately hard to hard, well cemented, slightly fractured.
	REC=100% RQD=70%		SANDSTONE, light olive gray, slightly weathered, moderately soft, fine grained, moderately to slightly fractured.
420	REC=98% RQD=89%*	E100 1.4	
	REC=94% RQD=100%*		
410		E100 1.4	4-28-04

643+00 644+00 645+00

PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'

ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH X	BRIDGE NO. 57-1227R/L	ROUTE 11/125 SEPARATION
DRAWN BY	I.G-Remmen	B. Harwell			POST MILE 0.43	LOG OF TEST BORINGS 4 OF 7
CHECKED BY	E. Neupert					

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191
CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES 10-29-12 10-26-12
SHEET X OF X

FILE => rte11-125sep4of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST Erich Neupert No. 8137 Exp. 2-28-14 STATE OF CALIFORNIA

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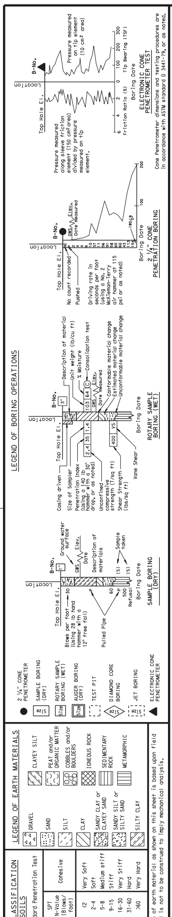
FOR PLAN VIEW, SEE "LOG OF TEST BORINGS 4 OF 7"



ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH X	BRIDGE NO. 57-1227R/L POST MILE 0.43	ROUTE 11/125 SEPARATION LOG OF TEST BORINGS 5 OF 7
DRAWN BY	I.G-Remmen	B. Harwell				
CHECKED BY	E. Neupert					

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 10-25-12 10-26-12 SHEET X OF X

FILE => rte11-125sep5of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST — Erich Neupert — No. 8137 — Exp. 2-28-14 — STATE OF CALIFORNIA

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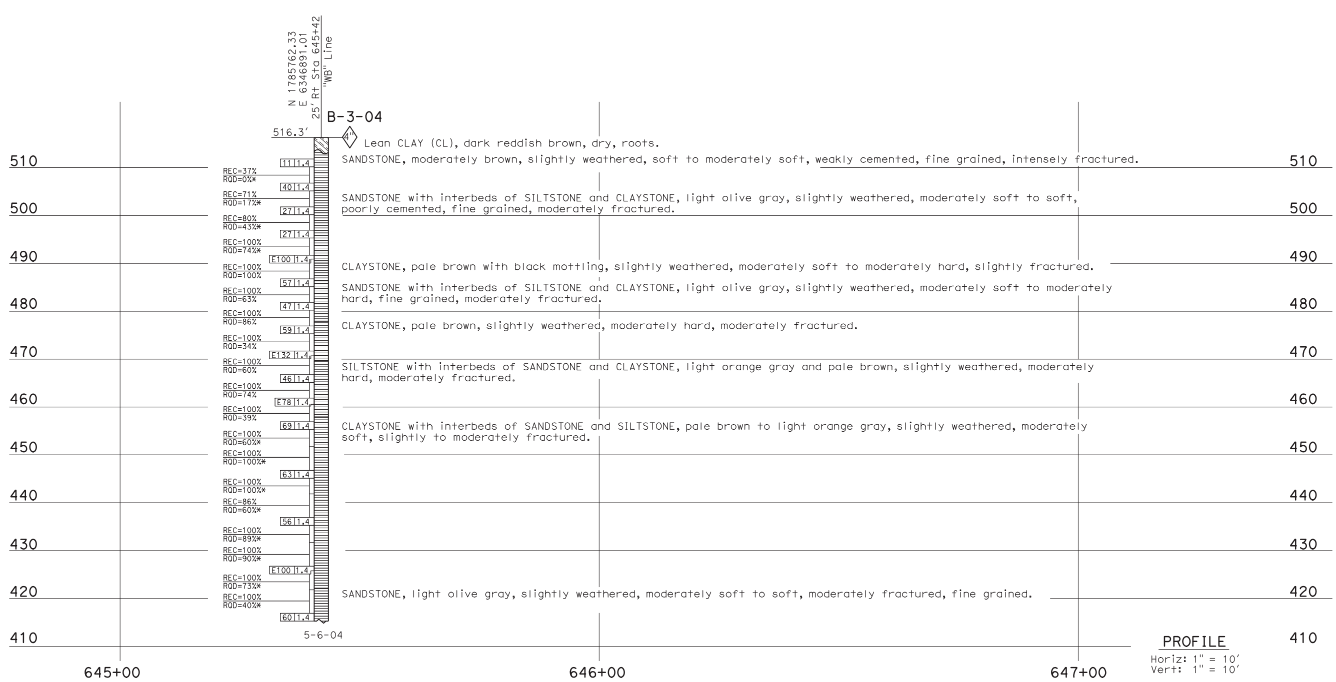
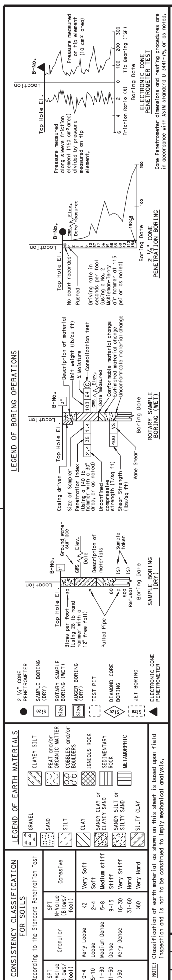
FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS 4 OF 7"



PROFILE
Horiz: 1" = 10'
Vert: 1" = 10'



ENGINEERING SERVICES	MATERIALS & GEOTECHNICAL SVCS	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	ROUTE 11/125 SEPARATION
DRAWN BY	I.G-Remmen	B. Harwell		DESIGN BRANCH X	57-1227R/L	LOG OF TEST BORINGS 6 OF 7
CHECKED BY	E. Neupert				POST MILE 0.43	

OGS LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 5/25/07)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 10-25-12 10-26-12

SHEET X OF X

FILE => rte11-125sep6of7.dgn

USERNAME => s116982 DATE PLOTTED => 30-OCT-2012 TIME PLOTTED => 14:32

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	905			

REGISTERED CIVIL ENGINEER — DATE 9-11-12

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — David T-M Liao — No. C59838 — Exp. 12-31-13 — CIVIL — STATE OF CALIFORNIA

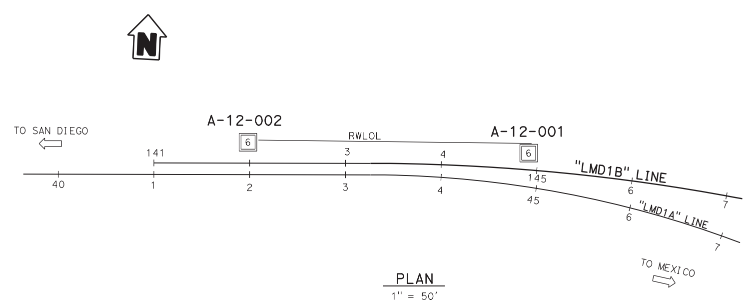
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock Logging, Classification, & Presentation Manual (2010 Edition).

See 2010 Standard Plans A10F and A10G for Soil Legend, and A10H for Rock Legend.

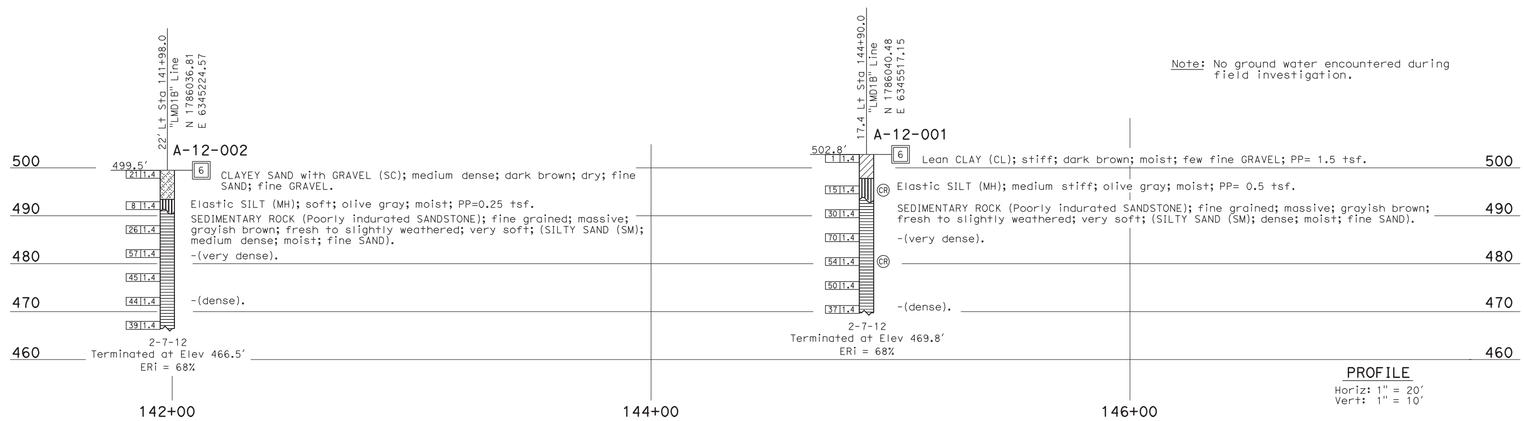
BENCH MARK

BM 905-10.6 Elev 525.96'
Brass disk on south side of Route 905
N 1785344.09
E 6346287.24
Vertical Datum: NAVD88



PLAN
1" = 50'

Note: No ground water encountered during field investigation.



PROFILE
Horiz: 1" = 20'
Vert: 1" = 10'

ENGINEERING SERVICES		MATERIALS AND GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	RETAINING WALL NO. 1
FUNCTIONAL SUPERVISOR NAME: M. DeSalvatore	DRAWN BY: I.G-Remmen CHECKED BY: E. Neupert	FIELD INVESTIGATION BY: D. Liao		DESIGN BRANCH X	POST MILE	LOG OF TEST BORINGS

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191
CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES 09-06-12 — SHEET X OF X

FILE => rw1.dgn

USERNAME => s116982 DATE PLOTTED => 19-SEP-2012 TIME PLOTTED => 10:54

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	11			

Erich Neupert 10-30-12
PROFESSIONAL GEOLOGIST

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST
Erich Neupert
No. 8137
Exp. 2-28-14
STATE OF CALIFORNIA

WEATHERING DESCRIPTORS

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

Descriptors		Diagnostic features					General characteristics § (strength, excavation, etc.)
		Chemical weathering-Discoloration and/or oxidation		Mechanical weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and solutioning		
Alphanumeric descriptor	Descriptive term	Body of rock	Fracture † surfaces		Texture	Solutioning	
W1	Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck. Almost always rock excavation except for naturally weak or weakly cemented rocks such as siltstones or shales.
W2	Slightly weathered to fresh °						
W3	Slightly weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened. With few exceptions, such as siltstones or shales, classified as rock excavation.
W4	Moderately to slightly weathered °						
W5	Moderately weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened. Depending on fracturing, usually is rock excavation except in naturally weak rocks such as siltstones or shales.
W6	Intensely to moderately weathered °						
W7	Intensely weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened. Usually common excavation.
W8	Very intensely weathered						
W9	Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Always common excavation. Resistant minerals such as quartz may be present as "stringers" or "dikes."

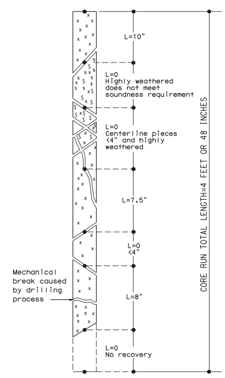
Note: This chart and its horizontal categories are more readily applied to rocks with feldspars and mafic minerals. Weathering in various sedimentary rocks, particularly limestones and poorly indurated sediments, will not always fit the categories established. This chart and weathering categories may have to be modified for particular site conditions or alteration such as hydrothermal effects; however, the basic framework and similar descriptors are to be used.

° Combination descriptors are permissible where equal distribution of both weathering characteristics are present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, dual descriptors should not be used where significant, identifiable zones can be delineated. When given as a range, only two adjacent terms may be combined. "Decomposed to slightly weathered," or "moderately weathered to fresh" are not acceptable.

† Does not include directional weathering along shears or faults and their associated features. For example, a shear zone that carried weathering to great depths into a fresh rock mass would not require the rock mass to be classified as weathered.

§ These are generalizations and should not be used as diagnostic features for weathering or excavation classification. These characteristics vary to a large extent based on naturally weak materials or cementation and type of excavation.

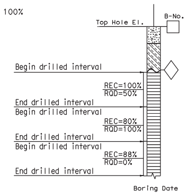
ROCK QUALITY DESIGNATION (RQD) & PERCENT RECOVERY (REC) LOGGING



$$RQD = \frac{\sum \text{Length of sound core} \geq 4 \text{ inches pieces}}{\text{Total core run length}}$$

$$RQD = \frac{10 + 7.5 + 8}{48} \times 100\%$$

RQD = 53% (fair)



RQD (ROCK QUALITY DESIGNATION)	DESCRIPTION OF ROCK QUALITY
0 - 25%	VERY POOR
25 - 50%	POOR
50 - 75%	FAIR
75 - 90%	GOOD
90 - 100%	EXCELLENT

After Deere & Deere, 1989

FRACTURE DENSITY

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

FRACTURE DENSITY- Based on the spacing of all natural fractures in an exposure or core recovery lengths in boreholes; excludes mechanical breaks, shears, and shear zones; however, shear-disturbed zones (fracturing outside the shear) are included. Descriptors for fracture density apply to all rock exposures such as tunnel walls, dozer trenches, outcrops, or foundation cut slopes and inverts, as well as boreholes. Descriptive criteria presented below are based on borehole cores where lengths are measured along the core axis, for other exposures the criteria is distance measured between fractures (size of blocks).

UNFRACTURED (FDØ): No fractures.

VERY SLIGHTLY FRACTURED (FD1): Core recovered mostly in lengths greater than 3 ft.

SLIGHTLY TO VERY SLIGHTLY FRACTURED (FD2)*

SLIGHTLY FRACTURED (FD3): Core recovered mostly in lengths from 1 to 3 ft. with few scattered lengths less than 1 ft or greater than 3 ft.

MODERATELY TO SLIGHTLY FRACTURED (FD4)*

MODERATELY FRACTURED (FD5): Core recovered mostly in 0.3 to 1.0 ft lengths with most lengths about 0.6 ft.

INTENSELY TO MODERATELY FRACTURED (FD6)*

INTENSELY FRACTURED (FD7): Lengths average from 0.1 to 0.3 ft with scattered fragmented intervals. Core recovered mostly in lengths less than 0.3 ft.

VERY INTENSELY TO INTENSELY FRACTURED (FD8)*

VERY INTENSELY FRACTURED (FD9): Core recovered mostly as chips and fragments with a few scattered short core lengths.

* Combinations of fracture densities (e.g. very intensely to intensely fractured, or moderately to slightly fractured) are used where equal distribution of both fracture density characteristics are present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions.

ROCK HARDNESS DESCRIPTORS

Alphanumeric Descriptor	Descriptor	Criteria
H1	Extremely hard	Core, fragment, or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows.
H2	Very hard	Cannot be scratched with knife on sharp pick. Core or fragment breaks with repeated heavy hammer blows.
H3	Hard	Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.
H4	Moderately hard	Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.
H5	Moderately soft	Can be grooved 1/16 inch deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.
H6	Soft	Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
H7	Very soft	Can be readily indented, grooved or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Any bedrock unit softer than H7, very soft, is to be described using ASTM D-2488 consistency descriptors.

Note: Although "sharp pick" is included in these definitions, descriptions of ability to be scratched, grooved or gouged by a knife is the preferred criteria.

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

BEDDING, FOLIATION, OR FLOW TEXTURE DESCRIPTORS

Descriptors	Thickness / Spacing
Massive	Greater than 10 ft
Very thickly (bedded, foliated, or banded)	3 to 10 ft
Thickly	1 to 3 ft
Moderately	0.3 to 1 ft
Thinly	0.1 to 0.3 ft
Very thinly	0.03 (3/8 in) to 0.1 ft
Laminated (intensely foliated or banded)	Less than 0.03 ft (3/8 in)

Modified from United States Bureau of Reclamation, Engineering Geology Field Manual.

ENGINEERING SERVICES

MATERIALS & GEOTECHNICAL SERVICES

PREPARED BY: I. G-Remmen

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH X

BRIDGE NO. 57-1227R/L
POST MILE 0.43

ROUTE 11/125 SEPARATION
LOG OF TEST BORINGS 7 OF 7

GS LOTB ROCK LEGEND

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 3643
PROJECT NUMBER & PHASE: 11000205191

CONTRACT NO.: 11-056321

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
10-26-12				X	X

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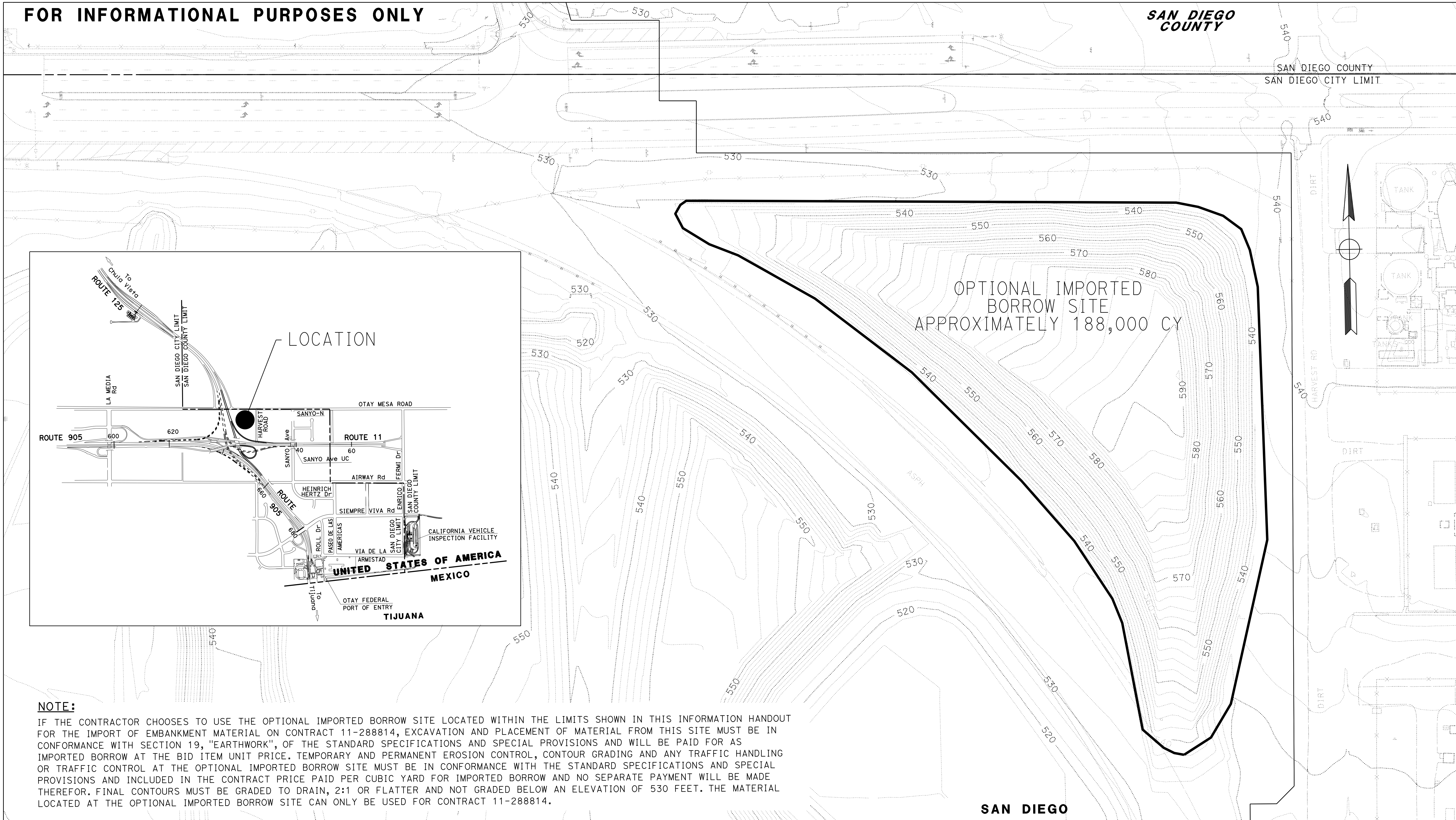
FOR INFORMATIONAL PURPOSES ONLY



NOTE:

IF THE CONTRACTOR CHOOSES TO USE THE OPTIONAL IMPORTED BORROW SITE LOCATED WITHIN THE LIMITS SHOWN IN THIS INFORMATION HANDOUT FOR THE IMPORT OF EMBANKMENT MATERIAL ON CONTRACT 11-288814, EXCAVATION AND PLACEMENT OF MATERIAL FROM THIS SITE MUST BE IN CONFORMANCE WITH SECTION 19, "EARTHWORK", OF THE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS AND WILL BE PAID FOR AS IMPORTED BORROW AT THE BID ITEM UNIT PRICE. TEMPORARY AND PERMANENT EROSION CONTROL, CONTOUR GRADING AND ANY TRAFFIC HANDLING OR TRAFFIC CONTROL AT THE OPTIONAL IMPORTED BORROW SITE MUST BE IN CONFORMANCE WITH THE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS AND INCLUDED IN THE CONTRACT PRICE PAID PER CUBIC YARD FOR IMPORTED BORROW AND NO SEPARATE PAYMENT WILL BE MADE THEREFOR. FINAL CONTOURS MUST BE GRADED TO DRAIN, 2:1 OR FLATTER AND NOT GRADED BELOW AN ELEVATION OF 530 FEET. THE MATERIAL LOCATED AT THE OPTIONAL IMPORTED BORROW SITE CAN ONLY BE USED FOR CONTRACT 11-288814.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DISTRICT 11

11-SD-11, 125, 905
11-288814

SR-905/125 NORTHBOUND CONNECTOR PROJECT
OPTIONAL BORROW SITE

SCALE: 1" = 50'

CALCULATED-DESIGNED BY: B. EMERY

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s132966
DGN FILE => Stockpile Exhibit.dgn
DATE PLOTTED => 22:34 12-FEB-2015

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN