Appendix F

Geology and Soils

PRELIMINARY GEOTECHNICAL REPORT
THE TRIANGLE SPECIFIC PLAN
MURRIETA, CALIFORNIA

Prepared For:

GOLDEN TRIANGLE DEVELOPMENT, LLC

One Better World Circle, Suite 300
Temecula, CA 92560

January 11, 2008

Project No. 601914-002

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

January 11, 2008

Project No. 601914-002

Golden Triangle Development, LLC
One Better World Circle, Suite 300
Temecula, California 92560

Attention: Mr. Micah Spano, Senior Project Manager

Subject: Preliminary Geotechnical Report, The Triangle Specific Plan, south of Murrieta Hot Springs Road and between I-15 and I-215, City of Murrieta, California

In accordance with your request, we are pleased to present this preliminary geotechnical report for the subject project. The purpose of this report is to summarize overall site geologic/geotechnical conditions and provide general design criteria for foundation design and earthwork construction. Based on available information, it is our opinion that the development of the site is feasible from a geotechnical viewpoint provided the findings and preliminary recommendations contained herein are implemented in the design and construction phases of development. However, additional building specific studies may be required to supplement the findings and recommendations included herein once final development/foundation plans become available.

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

Respectfully submitted,

LEIGHTON CONSULTING, INC.

REGISTERED PROFESSIONAL ENGINEER KANDEEPAN SARAVANAPAVAN NO. 71739 Exp. 12/31/08 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER SIMON I. SAIID No. 2641 Exp. GEOTECHNICAL STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST ROBERT F. RIHA No. 1921 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Kandeepan Saravanapavan
RCE 71739 (Exp 12/31/09)
Senior Staff Engineer

Simon I. Saiid,
GE 2641(Exp. 09/30/09)
Principal Engineer

Robert F. Riha
CEG 1921 (Exp. 02/28/08)
Sr. Principal Geologist

KS/SS/RFR/ew/dlm

Distribution: (5) Addressee

41715 Enterprise Circle N., Suite 103 ▪ Temecula, CA 92590-5661
951.296.0530 ▪ Fax 951.296.0534 ▪ www.leightonconsulting.com

TABLE OF CONTENTS

Section **Page**

Leighton

Accompanying Figures, Plates and Appendices

Figures

Plates

Appendices

Leighton

1.0 INTRODUCTION

This preliminary report is an updated report of the geotechnical conditions within the proposed Triangle Specific Plan site located south of Murrieta Hot Springs Road and between I-15 and I-215 in the City of Murrieta, California. Our scope of services for this geotechnical update included the following:

- Review of previously published geotechnical/geologic reports and maps prepared for this and adjacent sites, as well as other pertinent in-house and readily available documents regarding geotechnical/geological conditions at the subject site (Appendix A).
- Site reconnaissance to observe and document the current surface conditions.
- Provide seismic design parameters in accordance with the 2007 California Building Code.
- Preparation of this report, compiling our previous exploratory borings and laboratory test data pertinent to this area and providing our preliminary geotechnical recommendations for foundation design and earthwork construction.

2.0 PROJECT DESCRIPTION

2.1 Site Description

The proposed mixed use development, located south of Murrieta Hot Springs Road, between the I-15 and I-215 Freeways, encompasses approximately 64.3 acres, "Golden Triangle", within the City of Murrieta, California, (see Figure 1, Site Location Map). Site topography slopes gently downward and away from the east central highpoint elevation toward the low-lying drainage crossing the southerly area and toward the west and I-15. Total relief on the site is on the order of 50 feet.

The site was partially graded in 1998 for a previously planned entertainment center (RogersDale U.S.A.) under the observation and testing by Leighton and Associates, Inc. (Leighton, 1998c). The recent past grading resulted in the creation of several graded pads and a large (excavation depression) for a previously planned arena. Several large stockpiles associated with previous site grading are still present until this date.

A minor natural drainage channel was also filled and a storm drain constructed in the northwest corner of the site. This work was performed under the observation and testing by others and documentation of this grading was not available for our review. Remnants of past improvements such as a residential trailer park, some building foundations and slabs, well pumps, and several power poles for an active power line remain on the site as well as several areas of stockpiled debris associated with demolition of previous improvements.

Vegetation consists of a light to moderate stand of native grasses and weeds. Several aging palm trees and pepper trees exist on the site.

2.2 Proposed Development

Based on our review of the Preliminary Utility & Grading Exhibit, (RBF, 2007) Plate 1, it is our understanding that the proposed project will consist of a mixed-use commercial development that will include office buildings, retail/entertainment centers, hotel, parking structures, and associated underground utilities, driveways, parking lots, and off site improvements. It is anticipated that cuts and fills of up to 25 feet in height will be required to achieve finish grades. Remedial grading will be required to remove compressible alluvium, colluvium and areas of undocumented fill and highly weathered bedrock.

3.0 INVESTIGATION AND LABORATORY TESTING

3.1 Research

As part of our geotechnical investigation update, existing in-house preliminary and as-graded soil reports, published geologic literature (Appendix A) identifying geologic rock units, faulting and seismicity were reviewed. In addition, unpublished geotechnical and environmental survey reports (Appendix A) prepared for this site were reviewed and conditions re-evaluated where appropriate. Our relevant field and laboratory test data are included herein and remain valid for this site. Where appropriate, unpublished geotechnical reports prepared for adjacent sites and sites with similar geologic environments in the general vicinity were also reviewed and referenced in Appendix A.

3.2 Field Investigations

3.2.1 Site Reconnaissance

Based on the results of our recent site reconnaissance, the overall surface conditions are essentially the same as those observed during our previous site investigation (Leighton, 2006) and described above.

3.2.2 Previous Field Investigations

During previous site subsurface investigations, Leighton drilled thirty (30) 8-inch diameter hollow-stem auger borings throughout the site. The boring locations were determined based on the previous development plans. Geologists from our office conducted sampling and logging of the borings which ranged in depth from 16.5 to 51.5 feet below the existing ground surface. Additionally, thirty-one exploratory trenches were excavated, sampled, and logged throughout the site for the previously proposed RogersDale U.S.A. development. The exploratory backhoe trenches were excavated throughout the site to visually evaluate near surface soil characteristics and to determine limits of surficial and formational materials. Logs of previous borings and trenches are presented in Appendix B and their approximate locations are depicted on Plate 1. During the drilling and trenching operations, bulk and relatively undisturbed samples were obtained from the borings for laboratory testing and evaluation. The relatively undisturbed in-place samples were obtained utilizing a modified California drive sampler driven 12 inches with a 140 pound hammer dropping 30 inches, in general accordance with ASTM Test Method D3550.

In addition to the previous work by Leighton, exploratory boring logs from other previous investigations of the site (Moore and Taber, 1992) are included in Appendix B. The approximate locations of the exploratory borings are depicted on the Geotechnical Map (Plate 1).

3.3 Laboratory Testing

During the course of the previous field investigations and partial site grading, soil materials were visually classified in the field according to the Unified Soil Classification System. Laboratory tests were performed on the representative bulk and relatively undisturbed samples from the Leighton borings, test pits and during previous site grading to provide a basis for development of site-specific design parameters. Selected samples were tested for the following parameters: in-situ moisture content and density, expansion potential, shear strength, consolidation/collapse potential, maximum dry density, optimum moisture content, R-Value and soil corrosion (sulfate content, chloride content, minimum resistivity and pH). The results of our prior phases of laboratory testing along with summaries of the testing procedures are presented in Appendix C. In-situ moisture and density determination is presented on the boring logs (Appendix B).

The above field and laboratory testing information remain valid for the current site conditions and was the basis for our updated recommendations included in this report.

4.0 SUMMARY OF GEOTECHNICAL FINDINGS

4.1 Site Constraints and Opportunities

Review of the most recent County of Riverside Seismic Hazard Maps, Alquist-Priolo Earthquake Fault Hazard Maps, and relevant site specific reports indicates that the site is not constrained by identified geologic hazards such as liquefaction, subsidence or ground surface rupture. Compressible surficial soils present a moderate site constraint which has been addressed in this update investigation report and our recommendations for remediation have been included in Section 5.0 of this report.

Opportunities for the site include very low to low expansion potential of the majority of site soil material, favorable load-bearing characteristics, and site soils that are readily excavatable and compactable with conventional earth-moving equipment.

4.2 Regional Geology

The site is located in the Perris Block of the Peninsular Range Geomorphic Province of California. More specifically, the property is located less than a mile east of a fault controlled, down dropped graben, known as the Elsinore Trough (Kennedy, 1977). Portions of the graben are believed to contain as much as 3000 feet of alluvium which has accumulated since Miocene time (Mann, 1955). The Elsinore Trough is bounded on the northeast by Splays of the Wildomar Fault and on the southwest by the Willard Fault. The Murrieta Creek Fault is located between and generally parallels the Wildomar and Willard faults in its closest proximity to the site. The Murrieta Hot Springs Fault, a roughly east-west-trending transverse splay of the Elsinore Fault Zone, crosses to the north of the site. These faults are all part of the Elsinore Fault Zone, which extends from the San Gabriel River Valley southeasterly to the United States-Mexican border. The Wildomar, Murrieta Creek, and Murrieta Hot Springs faults are considered active and the Willard fault is considered potentially active (Hart, 1994; Jennings, 1994, Leighton, 1990).

The Santa Ana Mountains lie along the western side of the Elsinore Fault Zone and the Perris Block is located along the eastern side of the fault zone. The mountain ranges are underlain by pre-Cretaceous metasedimentary and metavolcanic rocks and Cretaceous plutonic rocks of the Southern California batholith. Tertiary sediments, volcanics and Quaternary sediments flank the mountain ranges. The Tertiary and Quaternary rocks are generally comprised of non-marine sediments consisting of sandstones, mudstones, conglomerates, and locally volcanic units.

4.3 Site Geologic Units

Our field explorations, observations, and a review of the pertinent literature (Appendix A) indicate that earth materials within the site consist of several surficial units including fill soils placed under our supervision, fill soil placed under the observation and testing by others, undocumented fill soils, topsoil/colluvium and alluvium, and one bedrock unit locally known as Pauba formation. Local areas of undocumented fills were found within the northwestern and central eastern portions of the site. The general site geology is depicted on the Geotechnical Map (Plate 1). Detailed descriptions of the earth materials encountered in each excavation are provided in Appendix B. A general description of each unit follows.

4.3.1 Undocumented Fill (map symbol - Afu)

The most significant area of undocumented fill soils is associated with the previous trailer park in the northeastern section of the site. These fill materials consist of brown to reddish brown, moist to wet, medium dense, clayey, fine to medium sands. Some concrete and asphalt debris was observed in the stockpiled soils near Murrieta Hot Springs Road. This area of undocumented fill as encountered may range in thickness from less than one foot thick to approximately five feet. Fill soils associated with the previously placed stockpiles adjacent to the "RogersDale Arena" may be more than 15 feet thick. In addition, all previous exploratory trenches were loosely backfilled and should be considered as undocumented fill. The undocumented fill soils are considered unsuitable for the support of additional fills and/or structural improvements in their present state. The clean undocumented fill is suitable for use as compacted fill. Please refer to Section 5.2.2 for removal recommendations.

4.3.2 Fill Placed under Leighton Observation and Testing (map symbol – Af)

Artificial fill soils were placed under the observation and testing of Leighton personnel during grading for portions of the previously proposed RogersDale USA Development (Leighton, 1998c). These materials are located in the central portion of the site and their approximate extent and thickness are shown on the Geotechnical Map (Plate 1). The documented fill materials are considered suitable for support of structural improvements and/or additional engineered fill placement within the proposed development areas. The As-Graded geotechnical report was prepared by Leighton for the previously proposed site and the geotechnical data necessary for the current proposed development has been included in this report. Please refer to Section 5.2.2 for moisture and scarification recommendations.

4.3.3 Fill Placed by Others (map symbol - Afo)

Fill soils were placed under the observation and testing by others in the northwestern corner of the site in conjunction with the grading for the widening of Murrieta Hot Springs Road. These fills and the underlying material were logged and sampled within two borings in this area. Our preliminary analysis indicates these materials should be suitable for support of the proposed structural improvements in this area. The as-graded geotechnical report prepared by others should also be provided to this office when available for review and consideration of recommendations for development in the northwest corner of the site. Additional evaluation may be performed during site grading to confirm the fill soils are placed on firm, noncompressable bedrock.

4.3.4 Topsoil (not a mapped unit)

A stratum of topsoil has developed over most of the undisturbed or ungraded surface of the site. This stratum consists of porous, brown to dark brown, dry to wet, loose to medium dense, silty to clayey, fine to medium sand and sandy clay. Because of its potentially compressible nature, this material is considered unsuitable for support of additional fills and/or structural improvements in its present state. The topsoil when cleared of organic matter is considered suitable for use as compacted fills. Please refer to Section 5.2.2 for removal recommendations.

4.3.5 Alluvium (map symbol Qal)

Alluvial materials were encountered within the natural drainages of the site. The alluvium consists of brown to gray-brown, moist to wet, loose to medium dense, silty, fine to medium coarse sand. The alluvial deposits were observed to be locally porous and may be unsuitable for the support of the proposed additional fills and/or structural improvements in its present state. Partial removal of the alluvium will be required depending on field conditions. The alluvial soils are considered suitable for use as compacted fill. Please refer to Section 5.2.2 of this report for removal recommendations.

4.3.6 Colluvium (map symbol Col/Qp)

Colluvial or highly weathered Pauba materials may be encountered over most of the ungraded portions of the site and may underlie other surficial soils. These materials, which grade from topsoil to unweathered Pauba, consist of brown to reddish-brown, moist to wet silty to clayey sand. Colluvial soils were observed to be very porous and, locally, to contain abundant roots. These materials are considered unsuitable for the support of fills and/or structural improvements in their present state. Colluvial soils

are considered suitable for use as compacted fill. Please refer to Section 5.2.2 of this report for removal recommendations.

4.3.7 Pauba Formation (map symbol Qp)

The Pauba Formation encountered generally consists of olive, red-brown to brown, damp to moist, medium dense to very dense, silty to clean fine to coarse sands and sandy silts. Unweathered Pauba Formation is considered suitable for use as fill material and the support of additional fills and/or structural improvements.

4.4 Groundwater

Groundwater was not encountered in any borings during our previous investigations. Near surface (perched) groundwater seepage was encountered in past exploratory trenches within the low-lying alluvial deposits. This water is believed to have been a result of heavy rains prior to the time of the field investigation. Canyon subdrain system may be required in the southeastern portion of the site based on review of final site grading plans.

4.5 Rippability

All trenches and borings were excavated without difficulty utilizing a conventional rubber-tired backhoe and hollow stem auger drill rig respectively. Rippability of the on-site materials is expected to be readily accomplished with standard heavy earthmoving equipment in good condition. Some localized cemented sandstone may be encountered, but should be limited in extent and generally rippable.

4.6 Faulting and Seismicity

Murrieta, like the rest of Southern California, is located within a seismically active region 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 faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 55 millimeters per year of slip between the plates. The Elsinore fault zone is estimated to accommodate roughly 10 to 15 percent of the plate boundary slip (WGCEP, 1995). The location of the site in relationship to known major faults in the Temecula Valley Region, are depicted in Figure 2, Regional Fault Map.

The California Geologic Survey (CGS) defines an “active fault” as one that has had surface displacement within the Holocene Epoch (roughly the last 11,000 years), and a potentially active fault as any which has been active during the Quaternary Period (approximately the

last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1999 (Hart, 1999) as the Alquist-Priolo Earthquake Fault Zoning Act. The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain inhabited structures across the trace of active faults. The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act nor is it in any Riverside County delineated special studies fault zones. Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within the subject property. Evidence for active or potentially active faulting was not encountered during our field investigation or review of pertinent reports and aerial photographs. The nearest active faults are the Wildomar branch of the Elsinore Fault located approximately 2,800 feet southwest of the site and the Murrieta Hot Springs Fault which is located approximately 1,600 feet north of Murrieta Hot Springs Road. Portions of the Murrieta Hot Springs Fault are believed to be active (Leighton, 1991b) and the Fault is included as a Riverside County special study fault zone. However this fault has not been included in the State of California Earthquake Fault Hazard Maps.

4.6.1 Seismic Design Parameters

Our evaluation of the regional seismicity included a deterministic analysis using EQFAULT (Blake, 2000b). Based on our deterministic analysis, the maximum moment magnitude earthquake is currently estimated to be magnitude 6.8Mw (Blake, 2000b) and the maximum associated peak site acceleration is reported as 0.68g. The effect of seismic shaking may be mitigated by adhering to the current California Building Code and seismic design parameters suggested by the Structural Engineers Association of California. Seismic design parameters calculated in accordance with the 2007 California Building Code are outlined below:

Seismic Design Parameters (CBC 2007)

Design Parameters	Reference - CBC 2007	Design Value
Site Class	Table 1613.5.2	D
Mapped Spectral Acceleration at Short Period (S_S)	Figure 1613.5(3)	1.7 g
Mapped Spectral Acceleration at 1 Second (S_1)	Figure 1613.5(4)	0.6 g
Design Spectral Acceleration at Short Period (S_{DS})	Equation 16-39	1.1 g
Design Spectral Acceleration at 1 Second (S_{D1})	Equation 16-40	0.6 g

The design values were calculated utilizing a software program published by United States Geological Survey (USGS) which follows the procedures stated in American Society of Civil Engineers (ASCE) Publication ASCE 7-05 and CBC Chapter 16, Section 1613.

4.6.2 Ground Shaking

The seismic hazard most likely to impact the site is ground-shaking resulting from an earthquake on one of the major regional faults. The design earthquake is considered to be a 6.8 magnitude event on the nearby Wildomar (Elsinore) Fault, which is expected to produce peak ground acceleration at the site of 0.68g. Ground shaking originating from earthquakes along other active faults in the region (Murrieta Creek, Murrieta Hot Springs, etc.) is expected to be less due to smaller anticipated earthquake magnitudes and/or greater distances from the site.

The effects of seismic shaking can be reduced by adhering to the most recent edition of the Uniform Building Code and design parameters of the Structural Engineers Association of California.

4.6.3 Liquefaction

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils or soils of low plasticity below a near surface ground water table are most susceptible to liquefaction. Liquefaction is characterized by a loss of shear strength in the affected soil layers, thereby causing the soil to flow as a liquid. This effect may be manifested at the ground surface by settlement and/or sand boils. In order for the potential effects of liquefaction to be manifested at the ground surface, the soils generally have to be granular, loose to medium dense, saturated relatively near the ground surface and must be subjected to a sufficient magnitude and duration of ground shaking.

Based on the observation of our previous subsurface exploration and the findings of referenced geotechnical report (Appendix A), the site is underlain by shallow, medium dense to very dense bedrock unit (Pauba formation). In addition, near surface soft alluvial deposits (soils susceptible to liquefaction) on the site will be removed and recompacted during remedial grading. It is our opinion that (due to the depth to groundwater (>50ft) and proposed dense fill soils over Pauba formation) the potential

for liquefaction and associated settlement to surface structures due to the design earthquake event is considered low for this site.

4.7 Hydroconsolidation and Subsidence

Damage to structures and ground cracking due to hydroconsolidation of recent alluvial deposits has occurred in the “California Oaks” area of Murrieta to the north of the site (approximately 0.5 to 3 miles) and withdrawal of groundwater causing ground subsidence in Temecula has occurred to the south and southwest (approximately 1.0 to 2 miles). The County of Riverside has identified these areas as the "California Oaks" zone, "Silver Hawk" zone and Temecula "Subsidence" zone, respectively.

Considering the nature of the site, observations and results of the laboratory testing, it is concluded that this site does not exist in a collapsible soil environment. Also, alluvial soils and other earth materials, which are subject to hydroconsolidation, are to be removed and recompacted (see section 5.2.2). Therefore, the potential for damage to surface structures due to hydroconsolidation is considered to be negligible.

The "Temecula Subsidence" zone was established as a result of ground cracking due to groundwater withdrawal where the cracking occurred along a pre-existing fault trace. The subject site is not located within the Temecula subsidence zone and the lack of onsite faulting makes the probability of ground cracking onsite due to groundwater withdrawal very unlikely.

4.8 Evaluation of Photo Lineaments

A review of pertinent aerial photographs was previously performed to identify geomorphic features, vegetation, tonal lineaments that may have been produced by faulting (Leighton, 1998a).

A site specific subsurface fault investigation was previously performed by Moore & Taber Agra (M & T Agra, 1992) to evaluate several lineaments suggested by others (Geofon, 1988). This referenced investigation concluded that active or potentially active faulting has not occurred on this site. Additionally, no faulting or indications of potential faulting were observed during the previous site grading (Leighton, 1998c).

We observed no other geomorphic features or lineaments crossing the subject property or trending in the direction of the property from a distance of approximately one-half mile from the site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

Based on our geotechnical investigation, it is our opinion that the proposed development is feasible from a geotechnical standpoint and may be constructed provided the following recommendations are implemented during grading and incorporated into the design and construction. The following sections discuss the principal geotechnical concerns affecting site development and grading and provides preliminary foundation design recommendations. Additional building specific subsurface investigation may be recommended based on our review of final development plans.

5.2 Earthwork

Earthwork should be performed in accordance with the General Earthwork and Grading Specifications in Appendix D and the following recommendations. The recommendations contained in Appendix D are general grading specifications provided for typical grading projects and some of the recommendations may not be strictly applicable to this project. The specific recommendations contained in the text of this report supersede the general recommendations in Appendix D. The contract between the developer and earthwork contractor should be worded such that it is the responsibility of the contractor to place the fill properly in accordance with the recommendations of this report and the specifications in Appendix D, notwithstanding the testing and observation of the geotechnical consultant.

5.2.1 Site Preparation

Prior to grading, the proposed structural improvement areas (i.e. all pavements areas, structural buildings, etc.) of the site should be cleared of surface and subsurface obstructions. Heavy vegetation and any debris present should be disposed of off site. Clean concrete, asphalt and masonry block may be reduced to pieces generally less than 12-inches in maximum dimension and placed in deeper fill areas. These oversize materials should be placed in the parking areas and a minimum of 10 feet below finish grade or 2 feet below the deepest utility. All areas prepared to receive fill or improvements should be observed by a representative of Leighton prior to scarification.

5.2.2 Removal and Recompaction

Portions of the subject development site are mantled by potentially compressible undocumented fill soils, topsoil, colluvium, alluvium and/or highly weathered, porous Pauba Formation bedrock. In general, these materials should be subject to complete removal and recompaction if they are subjected to additional loads. The dense Pauba formation is generally suitable for support of additional fills and/or structural improvements provided field verified by our geotechnical engineer/ geologist. In addition, most areas of excavation (beyond areas of existing documented fill) where the planned excavation is generally less than 4 feet will require additional excavation to expose competent formational bedrock materials. Transition cut/fill building pads will require overexcavation to provide a uniform fill mat underlying footings and slabs. For planning purposes, a minimum of 2 feet of properly compacted fill should underlay the deepest footings. In the southeastern corner of the site, the encountered alluvium extends to a depth of 15 feet below existing grade (Boring LB-17). The depth of removal can be reduced (maximum 5 feet) or further evaluated based on additional studies since this area is to receive additional fill (~20 feet) in accordance with current site plan. In areas underlain by existing compacted fill (Map Symbol Af), the existing ground surface should be thoroughly cross ripped a minimum of 12-inches, moisture conditioned as necessary and compacted to a minimum 90 percent relative compaction (ASTM Test Method D1557).

After completion of the recommended removal of unsuitable soils, the approved surface should be scarified a minimum of 8-inches, moisture conditioned as necessary to near optimum and compacted prior to placing fill.

5.2.3 Structural Fills

The onsite soils are suitable for use as compacted fill, provided they are relatively free of organic materials and debris. Any highly expansive materials if encountered should not be placed within 10 feet beneath proposed structures or surface improvements. Mixing, blending and drying back of saturated alluvial soils should be anticipated by the earthwork contractor.

Areas to receive structural fill and/or other surface improvements should be prepared in accordance with Section 5.2.2 and scarified to minimum depth of 8 inches, brought to near optimum moisture content, and compacted. The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction

equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in thickness and compacted to a minimum 90 percent relative compaction (ASTM Test Method D1557). Fill soils should be placed at or above the minimum optimum moisture content. Fills placed on slopes steeper than 5 to 1 (horizontal to vertical) should be keyed and benched into approved formational soils (see Appendix D for benching detail). Placement and compaction of fill should be performed in accordance with local grading ordinances under the full-time observation and testing of the geotechnical consultant. Oversize materials (i.e. clean concrete, reduce masonry block, etc.) may be placed in structural fill areas in accordance with the recommendations of Appendix D.

5.2.4 Utility Trenches

The onsite soils may generally be suitable as trench backfill provided they are screened of rocks over 6 inches in diameter and organic matter. Trench backfill should be compacted in uniform lifts (not exceeding 8 inches in compacted thickness) by mechanical means to at least 90 percent relative compaction (ASTM Test Method D1557).

Excavation of utility trenches should be performed in accordance with the project plans, specifications and all applicable OSHA requirements. The contractor should be responsible for providing the "competent person" required by OSHA standards. Contractors should be advised that sandy soils (such as fills generated from the onsite alluvium) can make excavations particularly unsafe if all safety precautions are not taken. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles due to the excavation and construction equipment should be kept away from the sides of the trenches.

5.2.5 Shrinkage and Bulking

The volume change of excavated onsite materials upon recompaction is expected to vary with material type, density, insitu moisture content, location and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Therefore, we recommend site grading include, when possible, a balance area or ability to adjust import/export quantities to accommodate some variation. Based on results of

laboratory testing and our experience with similar materials, the following values are provided as guidelines:

Topsoil, Alluvium, Colluvium and Undocumented-reusable Fill	5 to 10 percent shrinkage
Pauba Formation	3 percent bulking to 5 percent shrinkage

5.3 Slope Stability

Our review of the project plan indicates that fill slopes at inclinations of 2:1 (horizontal to vertical) or flatter with an approximate maximum height of 30 feet are proposed on site. The slopes were analyzed for gross stability utilizing Janbu's analysis method for earth slopes. The results of our analyses indicate that the proposed cut and fill slopes are considered grossly stable. The strength parameters assumed in our analyses are based on our previous laboratory test results and our experience with similar units. The parameters utilized are summarized in the following table:

Material	Unit Weight (pcf)	Cohesion (pcf)	Angle of Internal Friction (degrees)
Compacted Fill	125	100	32
Pauba Formation	125	200	32

Properly compacted fill slopes to a maximum height of 30 feet should be surficially stable assuming adequate protection against erosion. In addition, the outer 2 to 3 feet of fill slopes generally become less dense with time and become increasingly susceptible to erosion. Accordingly, since the onsite soils have a high susceptibility to erosive rilling, vegetation selection and ongoing maintenance are imperative to properly performing slopes.

To reduce erosion potential drainage should be directed away from the tops of slopes. Inadvertent oversteepening of slopes should be avoided during fine grading and construction. Erosion and/or surficial failure potential of fill slopes may be further reduced by implementing the following measures during design and construction of slopes.

- Slope Face Compaction and Finishing

  In order for the recommended minimum of 90 percent relative compaction to be achieved out to the slope face, fill slopes should be overbuilt and trimmed back to expose the

properly compacted slope face core or periodically backrolled with increasing height of the fill slope with a weighted sheepsfoot compactor and track-walked with a tracked dozer or other equivalent proven methods.

- Slope Landscaping

  We recommend that all graded slopes be landscaped with drought-tolerant, slope stabilizing vegetation as soon as possible to minimize the potential for erosion and slumping. Moisture in the slope face should be maintained relatively constant (i.e., prolonged drying and wetting of the slope faces should be avoided). Burrowing activity by rodents and other vermin should be controlled at all times.

5.4 Surface Drainage and Erosion

We recommend that measures be taken to properly finish grade each building area, such that drainage water from the building area is directed away from building foundations (2 percent minimum grade on soil or sod for a distance of 5 feet). Ponding of water should not be permitted, and installation of roof gutters which outlet into a drainage system is considered prudent. Planting areas at grades should be provided with positive drainage directed away from buildings. Drainage and subdrainage design for these facilities should be provided by the design civil engineer and/or landscape architect.

5.5 Foundation Design

In the absence of any building specific foundation plans, we anticipate that the site structures will most likely be supported on a combination of conventional interior and exterior isolated-spread footings and continuous perimeter footings. The building foundations will be founded on either dense Pauba Formation or properly compacted fill. The proposed foundations and/or slabs should be designed in accordance with the structural consultants' design, the minimum geotechnical recommendations presented herein, and applicable provisions of the current California Building Code (CBC). In utilizing the minimum geotechnical foundation recommendations, the structural consultant should design the foundation system to acceptable deflection criteria for the specific structures. Foundation footings may be designed in accordance with the following parameters:

- A net allowable bearing capacity of 2,000 pounds per square foot (psf), or a modulus of subgrade reaction of 150 pci may be used for design of footings founded entirely into compacted fill or dense formational materials. This allowable bearing pressure may be increased by 500 psf for each additional foot of embedment and/or width, to a

maximum vertical bearing value of 3,000 psf if founded on compacted fill and 4,000 psf if founded on dense/approved Pauba. The footings should extend a minimum of 12 inches below lowest adjacent grade. A minimum base width of 18 inches for continuous footings and a minimum bearing area of 3 square feet (1.75 ft by 1.75 ft) for pad foundations should be used. Pad footing should have a minimum embedment depth of 24 inches. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind).

- The passive earth pressure may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3000 pounds per square foot. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

The footing width, depth, reinforcement, slab reinforcement, and the slab-on-grade thickness should be designed by the structural consultant based on and soil characteristics indicated herein and the most recently adopted edition of the CBC.

5.6 Floor Slab Design

Slab-on-grade floors utilized with conventional foundations should be designed with a minimum thickness as indicated by the project structural engineer consistent with a modulus of subgrade reaction of 300 pounds-per-square-inch per inch (pci). A slip-sheet or equivalent should be used if crack-sensitive floor coverings (such as ceramic tiles, etc.) are to be placed directly on the concrete slab-on-grade.

It has been a standard of care to install a moisture retarder (2 inches of sand over an impermeable membrane over an additional 2 inches of sand) underneath all slabs where moisture condensation is undesirable. Moisture vapor retarders may retard but not totally eliminate moisture vapor movement from the underlying soils up through the slabs. Moisture vapor transmission may be additionally reduced by use of concrete additives**.** It is our opinion that the proposed vapor retarder system should be reviewed and approved by the architect or entire design team including concrete subcontractors and manufactures of floor coverings.

Concrete sidewalks and other flatwork (including construction joints) should be designed by the project civil engineer and/or landscape engineer and should have a minimum thickness of 4 inches. Reinforcement of driveways, sidewalks, patios, or other concrete flatwork is

recommended and may consist of welded wire mesh reinforcement consisting of 6 x 6-10/10 or No. 3 rebars at 24 inches on center (each way). Reinforcement of these concrete areas is suggested as a minimum reinforcement measure, along with keeping pad grade soils at an elevated moisture content. Its installation, however, is referred to the owner.

5.7 Footing Setback

We recommend a minimum horizontal setback distance from the face of slopes for all structural footings and settlement-sensitive structures (i.e. fences, walls, signs, etc.). This distance is measured from the outside edge of the footing, horizontally to the slope face (or to the face of a retaining wall).

Slope Height	Recommended Footing Setback
<5 feet	5 feet minimum
5-15 feet	7 feet minimum
>15 feet	H/2, where H is the slope height, not to exceed 10 feet for 2:1 slopes

We should note that the soils within a slope setback area possess poor long term lateral stability, and improvements (such as retaining walls, sidewalks, fences, pavement, underground utilities, etc.) constructed within this setback area may be subject to lateral movement and/or differential settlement.

5.8 Anticipated Settlement

Settlement (elastic settlement) of properly compacted fill soils or Pauba materials is expected to be minor and may occur due to the application of structural or embankment loads, the majority of which typically occurs during and slightly after construction. Based on results of consolidation and collapse tests, hydroconsolidation of Pauba material is considered to be insignificant.

Consolidation characteristics of compacted fill and Pauba material have been considered in conjunction with the recommended allowable bearing capacities to evaluate settlement of structures. We also have assumed that isolated column loads will be less than 150 kips and wall loading will be less than 4 kips per linear foot for the proposed buildings. For preliminary planning, total settlement should not exceed 1 inch and differential settlement should not exceed ½ inch within 30 feet (Angular distortion, 1/720).

Additional settlement evaluation should be performed when building and actual foundation loads are determined.

5.9 Lateral Earth Pressures and Resistance

Embedded structural walls or cantilever retaining 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 enough (about 0.1 percent of wall height) 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.

For design purposes, the recommended equivalent fluid pressure for each case for walls founded above the static ground water table and backfilled with very low to low expansion potential soils is provided below. Determination of which condition, active or at-rest is appropriate for design will depend on the flexibility of the wall. The effect of any surcharge (dead of live load) should be added to the following lateral earth pressures. Based on our investigation, the onsite soils may provide low to very low expansive potential backfill material. All soils considered for wall backfill should be tested and have an expansion potential of less than 50 (per CBC 18-I-B). The passive pressures provided below assume that the setback recommendations in Section 5.7 are adhered to and no superimposed loads, such as traffic, seismic, etc. are applied. If applicable, these loads should be incorporated into the design.

Equivalent Fluid Weight (pcf)		
Condition	Level	2:1 Slope
Active	35	55
At-Rest	55	65
Passive	350 (Maximum of 3 ksf)	200

All retaining wall structures should be provided with appropriate drainage and waterproofing. Typical drainage design is illustrated in Figure 3. As an alternative, an approved drainage board system installed in accordance with the manufacturers' recommendations may be used.

Wall backfill should be compacted by mechanical methods to at least 90 percent relative compaction (based on ASTM Test Method D1557). Surcharges from adjacent structures, traffic, forklifts or other loads adjacent to retaining walls should be considered in the design.

Wall footing designs should be in accordance with the previously provided foundation design recommendations and reinforced in accordance with structural considerations. Soil resistance developed against lateral structural movement can be obtained from the passive pressure value provided above. Further, for sliding resistance, a friction coefficient of 0.35 may be used at the concrete and soil interface. When considering the friction resistance along with passive pressure, only 50 percent of the passive pressure should be considered in the design. 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 resistance provided that the passive portion does not exceed two-thirds of the total resistance. The retaining wall plans and design calculations should be reviewed by the geotechnical consultant, prior to construction.

5.10 Geochemical Issues

5.10.1 Concrete

Laboratory tests indicate a negligible concentration of soluble sulfates in onsite soils (less than 0.10 percent) for tested representative samples (Appendix C). Accordingly, concrete in contact with earth materials should be designed in accordance with Table 19-A-4 of the California Building Code (CBC, 2007) for a soil with a negligible sulfate concentration.

5.10.2 Metallic Corrosion

Minimum resistivity and pH tests were performed on representative soil samples (Moore and Taber, 1992). Preliminary test results indicate the onsite soils possess a low moderate corrosion potential for buried uncoated metal conduits. It is recommended that a qualified corrosion engineer be consulted if corrosion sensitive materials are to be used.

5.11 Preliminary Pavement Section Design

Because of the variability of materials on site, it is not possible to know which soils will be placed or exposed at pavement subgrade. In order to provide the following

recommendations, we have visually evaluated the onsite soils and utilized R-value test results performed on representative samples (Appendix C). R-Values of 20 and 30 (surface materials) and 45 (Pauba materials) have been selected as the basis for calculation of preliminary pavement sections for planning purposes. The following pavement sections are provided for the interior driveways and parking areas. Based on the selected R-values and assumed Traffic Indices, we provide the following preliminary sections for planning purposes. Pavement sections were determined using the Caltrans method for design of flexible pavements. It is recommended that representative samples of actual subgrade materials be obtained and tested as the basis for the final pavement design. In order to minimize pavement sections, selective grading may be considered to place the excavated materials from the Pauba formation within 18 inches of proposed subgrade for pavements and hardscape.

- Standard Duty Parking Areas (Traffic Index = 5.0)

  R-Value = 20: 3.0" AC / 7.0" AB
  R-Value = 30: 3.0" AC / 6.0" AB
  R-Value = 45: 3.0" AC / 6.0" AB

- Interior Traffic Lanes (Traffic Index = 6.0)

  R-Value = 20: 4.0" AC / 9.0” AB
  R-Value = 30: 4.0" AC / 7.0" AB
  R-Value = 45: 4.0" AC / 6.0" AB

Class 2 aggregate base should conform to Section 26 of the State of California, Department of Transportation, Standard Specifications. Concrete pavement should be reinforced at a minimum with 6x6-10/10 welded-wire mesh at slab midheight. Asphalt Concrete, Portland Cement Concrete, and base materials should conform to and be placed in accordance with the 2006 Edition of the "Greenbook", Standard Specifications for Public Works Construction.

The upper 12 inches of subgrade soils should be moisture conditioned and compacted to at least 90 percent relative compaction based on ASTM Test Method D1557 prior to placement of road base. The base layer should be compacted to at least 95 percent relative compaction as determined by ASTM Test Method D1557.

If pavement areas are adjacent to heavily watered landscape areas, some deterioration of the subgrade load bearing capacity may result. We recommend some measures of moisture control (such as deepened curbs or other moisture barrier materials) be provided to prevent the subgrade soils from becoming saturated.

6.0 GEOTECHNICAL REVIEW

Geotechnical review is of paramount importance in engineering practice. The poor performance of many foundation and earthwork projects have been attributed to inadequate construction review. We recommend that Leighton Consulting be provided the opportunity to review the following items.

6.1 Plans and Specifications

The geotechnical engineer should review the project plans and specifications prior to release for bidding and construction. Such review is necessary to determine whether the geotechnical recommendations have been effectively implemented. Review findings should be reported in writing by the geotechnical engineer.

6.2 Construction Review

Observation and testing should be performed by a Leighton Consulting representatives during construction. It should be anticipated that the substrata exposed during construction may vary from that encountered in the test borings or trenches. Reasonably continuous construction observation and review during site grading and foundation installation allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction.

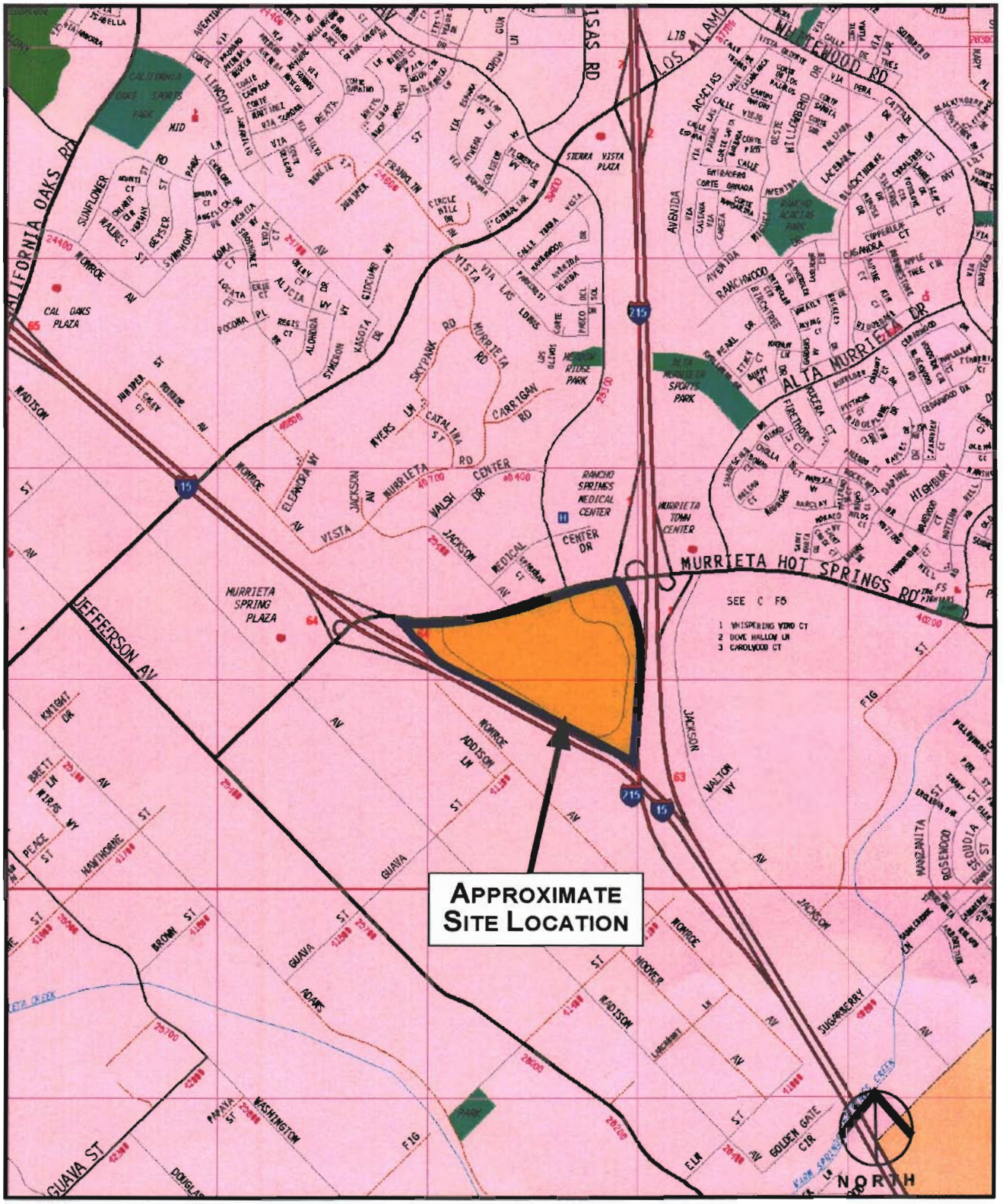
Site preparation, removal of unsuitable soils, approval of imported earth materials, fill placement, foundation installation and other site geotechnically-related operations should be observed and tested by representatives of Leighton Consulting.

7.0 Limitations

This report was prepared for Golden Triangle Development, LLC, based on Golden Triangle Development, LLC's needs, directions and requirements at the time.

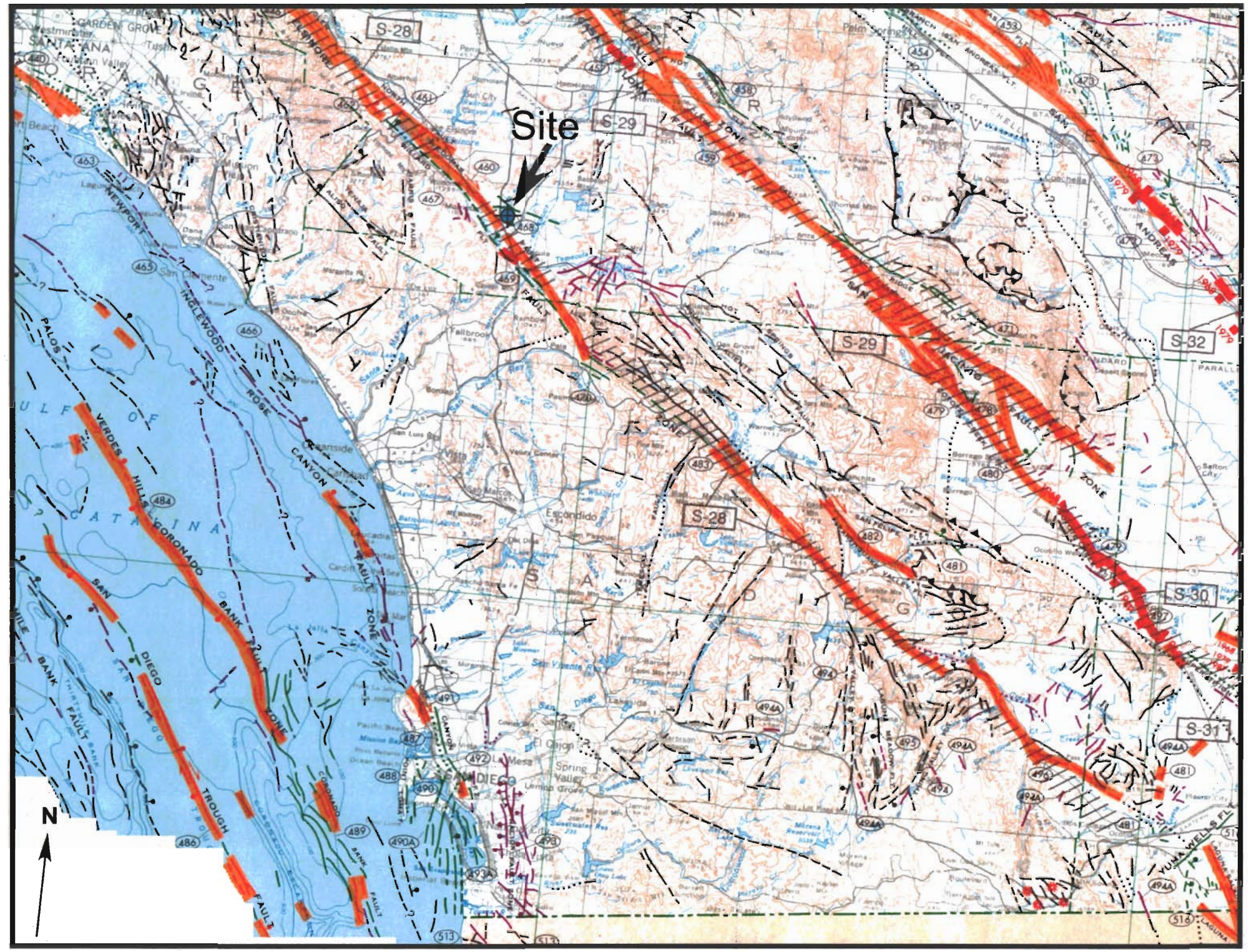
This report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil and/or samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is necessarily incomplete. The nature of many sites is such that differing characteristics can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time. This investigation was performed with the understanding that the subject site is proposed for commercial development. The client is referred to the attached information provided by the Associated Soil and Foundation Engineers (ASFE) on geotechnical engineering studies and reports and their applicability.

This report is not authorized for use by, and is not to be relied upon by any party except, Golden Triangle Development, LLC, its successors and assigns as owner of the property, with whom Leighton Consulting has contracted for the work. Use of or reliance on this report by any other party is at that party's risk. Unauthorized use of or reliance on this Report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.



Base Map: The Thomas Guide Digital Edition San Bernardino and Riverside, 2004, Not To Scale

Preliminary Geotechnical Report **The Triangle Specific Plan Development** Murrieta, California	**SITE LOCATION MAP**	Project No. **601914-002** Date **January 2008** Figure No. 1



EXPLANATION

Fault traces are indicated by solid lines where well located, by dashed lines where approximate or inferred, by dotted lines where concealed and queried where uncertain. Coloring and highlighting indicate the age or recency of displacement:

Pink	Faults that show displacement during historic time (i.e. last 200 years)
Orange	Faults that show displacement during Holocene (i.e. last 100,000 years)
Green	Faults that show displacement during late Quaternary (i.e. last 700,000 years)
Purple	Faults that show displacement during Quaternary (i.e. last 1.6 million years)
Black	Faults without recognized Quaternary displacement (considered inactive faults)

Site Location (⊕)

Adapted from Jennings, 1994, Fault Activity Map of California and Adjacent Areas: CDMG, California Geologic Data Map Series, Map No. 6

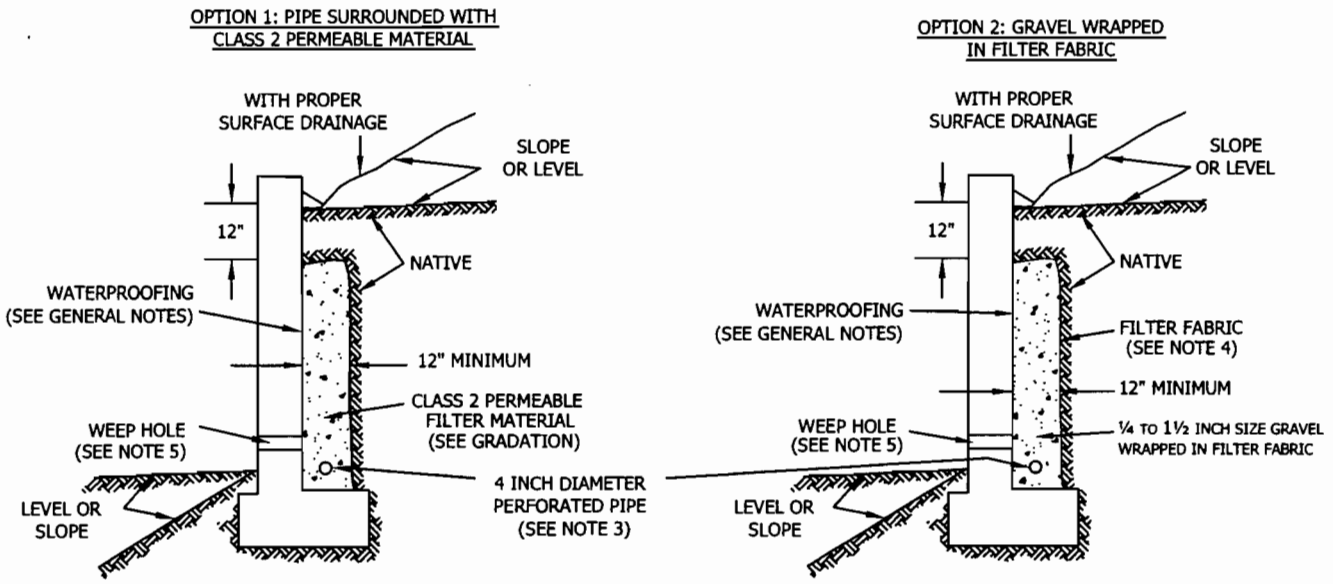
Regional Fault Location Map

The Triangle Specific Plan
Murrieta, California

Project No.	601914-002
Scale	1:750,000
Engr./Geol.	SIS/RFR
Drafted By	KXS
Date	January 2008

Figure No. 2

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

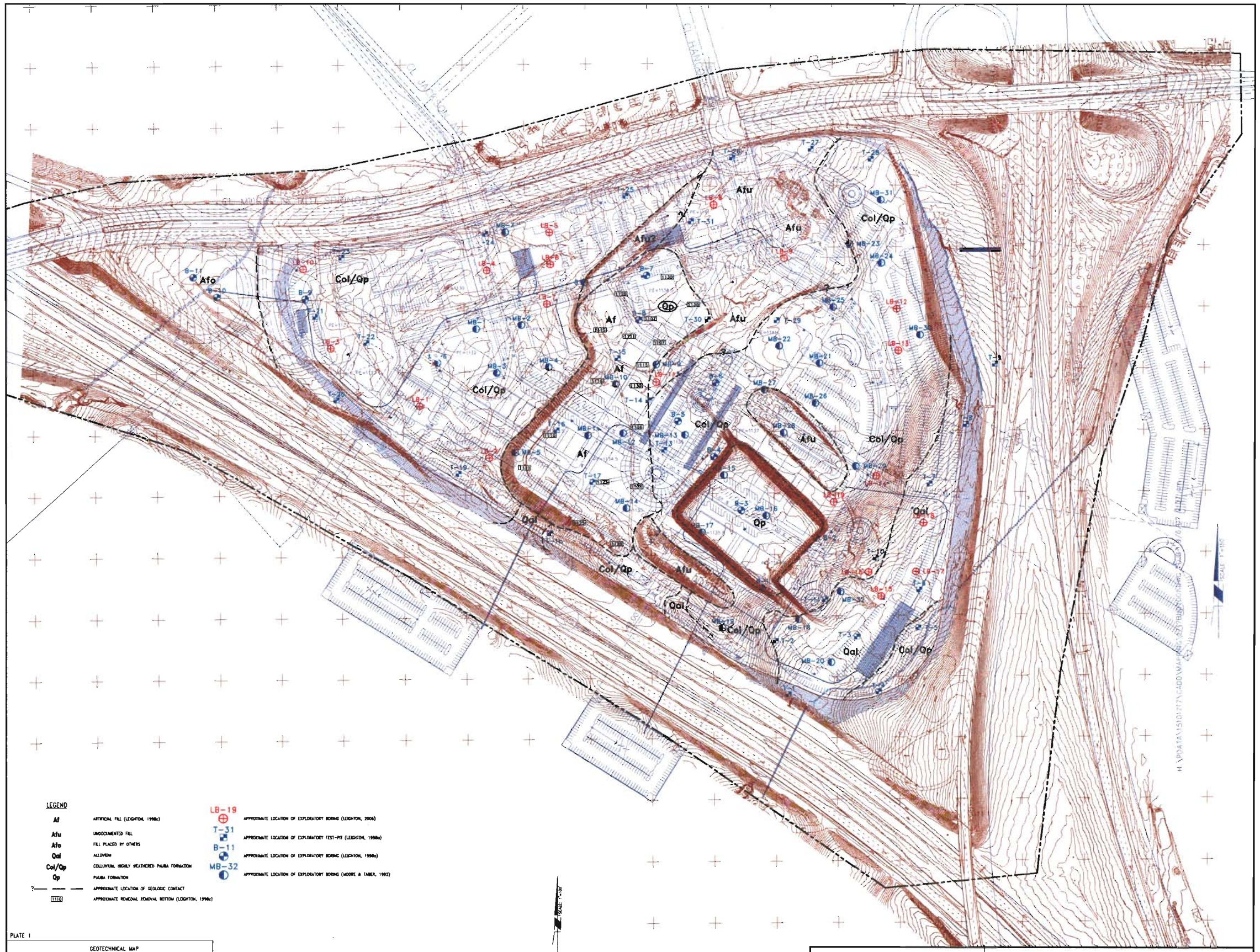
* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton


Afo
Col/Qp
Af
Afu
Afu?
Qp
Qal
LEGEND
Af ARTIFICIAL FILL (LEIGHTON, 1998b)
Afu UNDOCUMENTED FILL
Afo FILL PLACED BY OTHERS
Qal ALLUVIUM
Col/Qp COLLUVIUM, HIGHLY WEATHERED PAUBA FORMATION
Qp PAUBA FORMATION
APPROXIMATE LOCATION OF GEOLOGIC CONTACT
APPROXIMATE REMEDIAL REMOVAL BOTTOM (LEIGHTON, 1998c)
LB-19 APPROXIMATE LOCATION OF EXPLORATORY BORING (LEIGHTON, 2006)
T-31 APPROXIMATE LOCATION OF EXPLORATORY TEST-PIT (LEIGHTON, 1998a)
B-11 APPROXIMATE LOCATION OF EXPLORATORY BORING (LEIGHTON, 1998a)
MB-32 APPROXIMATE LOCATION OF EXPLORATORY BORING (MOORE & TAIBER, 1992)
SCALE: 1"=100'
SCALE: 1"=100'
PLATE 1
GEOTECHNICAL MAP
THE TRIANGLE SPECIFIC PLAN
MURRIETA, CALIFORNIA
Proj: 601914-002
Scale: 1"=100'
Date: 4/08
Eng/Geol: SS/RFR
Drafted By: BOT
CP By: BOT
RBF CONSULTING
PLANNING • DESIGN • CONSTRUCTION
THE GOLDEN TRIANGLE
PRELIMINARY UTILITY & GRADING EXHIBIT
SITE PLAN M.2
NOVEMBER 27, 2007

APPENDIX A

References

Albee, A.L., and Smith, J.L., 1996, Earthquake Characteristics and Fault Activity in Southern California, in Lung, R., and Proctor, R., ed., Engineering Geology in Southern California, Association of Engineering Geologists, Special Publication, dated October 1966.

Blake, T.F., 2000a, EQSEARCH, Version 4.0, A Computer Program for the Estimation of Peak Horizontal Acceleration from Southern California Historical Earthquake Catalogs, Users Manual, 94pp., 2000.

Blake, T.F., 2000b, EQFAULT, Version 3.00b, A Computer Program, for the Deterministic Prediction of Peak Horizontal Acceleration from Digitized California Faults, User's Manual, 77pp.

Blake, T.F., 2000c, FRISKSP, Version 4.00 Computer Program, for Determining the Probabilistic Horizontal Acceleration, User's Manual, 99pp.

Blake, T.F., 2000d, UBCSEIS, Version 1.0, User's Manual for Evaluating the Seismic Parameters in accordance with the 1997 UBC, 53 pp.

Bolt, B.A., 1973, Duration of Strong Ground Motion, proc. Fifth World Conference on Earthquake Engineering, Rome, Paper No. 292, pp. 1394-1313, dated June, 1973.

Bonilla, M.J., 1970, Surface Faulting and Related Effects, in Wiegel, R., ed., Earthquake Engineering, New Jersey, Prentice-Hall, Inc., p. 47-74.

California Building Code, 2007, Volumes 1 & 2.

California, State of, Department of Conservation, Division of Mines and Geology, 1996, Draft Guidelines for Evaluation and Mitigating Seismic Hazards, dated October 1, 1996.

California, State of, Department of Conservation, Division of Mines and Geology, 1990, Special Study Zones, Murrieta Quadrangle, 7.5 Minute Series.

California, State of, Department of Transportation, 1987, Peak Acceleration from Maximum Credible Earthquakes in California, Modified from Maulchin and Jones, CDMG Map Sheet 45.

California, State of, Department of Transportation, 1988a, Standard Specifications, dated January 1988.

California, State of, Department of Transportation, 1988b, Highway Design Manual, 4th Ed., dated August 5, 1988.

Campbell, Kenneth, W., 1996, Strong Motion Attenuation Relationships, in Seismic Hazards Analysis, AEG Short Course, Thomas F. Blake Program Coordinator, January 20, 1996.

County of Riverside, 1988, Resolution No. 88-61, Establishing Subsidence Report Zone within the Area Generally Known as Wolf Valley and Temecula Valley in the County of Riverside, dated February 9, 1988.

County of Riverside, 1991, Resolution No. 91-285, Establishing Special Geologic Study Report Zone within the Area Generally Known as California Oaks, Murrieta Area in the County of Riverside, dated May 16, 1991.

County of Riverside, 1994, Resolution No. 94-125, Establishing A Special Geologic Report Zone within the Area Generally Known as Silverhawk and Adjacent Areas, Near the City of Temecula, County of Riverside, dated April 6, 1994.

Department of Water Resources, 1971, Water Wells and Springs in the Western Part of the Upper Santa Margarita River Watershed, Bulletin 91-20, August 1971.

Engineering Ventures, Inc., 1998, Rough Grading and Erosion Control Plan, Revised Permit 98-007, Plot Plan 11992, Amend. N-4, W.O. 275-2, 7 sheets, 40 scale, dated February 23, 1998.

Geofon, 1987, Preliminary Environmental Survey, Murrieta Hot Springs Property, Murrieta Hot Springs, California, 87-209, dated December 4, 1987.

Geofon, 1988, Preliminary Geologic Hazards Evaluation for Site Bounded by Corona Freeway, Escondido Freeway and Murrieta Hot Springs Road, Project No. 88-302, dated January 28, 1988.

GeoSoils, Inc., 1992a, Faulting and Seismic Concerns, Proposed Murrieta Springs Mall, City of Murrieta, Riverside County, California, W.O. 558-A-RC, dated August 20, 1992.

GeoSoils, Inc., 1992b, Second Party Review, Geologic and Geotechnical Studies, for the Proposed Murrieta Springs Mall, Murrieta, Riverside County, W.O. 558-A-RC, dated October 30, 1992.

GeoSoils, Inc., 1993, Response to “Comments and Response to Second Party Review Geological and Geotechnical Studies for the Proposed Murrieta Springs Mall, Murrieta, Riverside County, dated December 31, 1997, Job No. 692-123 by M & T Agra, Inc., W.O. 558-A-RC, dated January 26, 1993.

Glasser, Steven, D. and Chung, Riley M., 1995, Estimation of Liquefaction Potential by Insuti Methods, in Earthquake Spectra, Vol. II No. 3, August 1995, pp 431-454.

Hart, E.W., Bryant, W. A., 1999, Fault-Rupture Hazard Zones in California: California Geological Survey Special Publication 42, 38p.

Ishihara, K., 1985, "Stability of Natural Deposits During Earthquake", Proceedings of the Eleventh International Conference on Soil Mechanics and Foundation Engineering, A.A. Belkema Publishers, Rotterdam, Netherlands.

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

Kennedy, M.P., 1977, "Recency and Character of Faulting Along the Elsinore Fault Zone in Southern Riverside County, California", Special Report 131.

Kleinfelder, 1990, Geologic Input for Environmental Impact Report, Regional Mall at Murrieta, Riverside County, California, Project No. 56-1043-01, dated May 3, 1990.

Leighton and Associates, Inc., 1990, Geotechnical Investigation of Faulting and General Geotechnical Investigation for a Portion of Parcel 4, Proposed Acute Care Facility, Temecula Medical Hospital Complex, Parcel Map 21564, Northeast of Hancock Avenue and Murrieta Hot Springs Road, Murrieta, Riverside County, California, Project No. 1190054-03, dated November 19, 1990.

Leighton and Associates, Inc., 1991a, Geotechnical Investigation of Faulting and General Geotechnical Investigation for Parcel 4 and the Southern Half of the Remainder Parcel, Proposed Sharp Temecula Medical Center, Parcel Map 21564, Northeast of Hancock Avenue and Murrieta Hot Springs Road, Murrieta, Riverside County, California, Project No. 11900542-03, dated January 17, 1991.

Leighton and Associates, Inc., 1991b, Geotechnical Investigation of Faulting for Parcel 1, 2, 3 Proposed Temecula Valley Medical Plaza, Buildings and Associated parking Facility, Parcel Map 21564, Northeast of Hancock Avenue and Murrieta Hot Springs Road, Murrieta, Riverside County, California, Project No. 11900542-04, January 25, 1991.

Leighton and Associates, Inc., 1998a, Supplemental Geotechnical Investigation, RogersDale U.S.A., Murrieta, California, Project No. 11980052-001, dated March 26, 1998.

Leighton and Associates, Inc., 1998b, Preliminary Remedial Earthwork Recommendations, RogersDale U.S.A., Murrieta, California, Project No. 11980052-001, dated March 10, 1998.

Leighton and Associates, Inc., 1998c, As-Graded Report of Rough Grading Celebrity Theater, Arena, and Buildings C, F and H, RogersDale U.S.A., Murrieta, California, Project No. 11980052-003, dated December 3, 1998.

Leighton and Associate, Inc., 1999, Geotechnical Investigation, Proposed Sewer Line, Interstate 15, Station 26+00 to 31+00, Murrieta, California, Project No. 11980052-004, dated June 21, 1999.

Leighton and Associates, Inc., 2006, Preliminary Geotechnical Investigation Update Report and Supplemental Investigation, Proposed Murrieta Triangle Commercial Development, Murrieta, California, Project No. 601178-002, dated March 14, 2006.

Mann, John F., 1955, Geology of a Portion of the Elsinore Fault Zone, California Division of Mines and Geology, Special Report 43, dated October, 1955.

Moore and Taber, 1992, Report Geotechnical Investigation, Murrieta Springs Mall, Job No. 692-123, dated August 28, 1992.

Moore & Taber Agra, Inc., 1992a, Additional Geologic Studies, Murrieta Springs Mall, Job No. 692-123, dated October 5, 1992.

Moore & Taber Agra, Inc.,, 1992b, Comments and Response to Second Party Review Geological and Geotechnical Studies for the Proposed Murrieta Springs Mall, Murrieta, Riverside County, Job No. 692-123, dated December 31, 1992.

Pacific Soils Engineering, Inc., 1992, Murrieta Special Geologic Study Zone Report, Murrieta, California, dated April 17, 1992.

RBF Consulting, Inc., 2007, Preliminary Utility & Grading Exhibit Site Plan M.2, dated November 27, 2007.

Riverside, County of, 2003, General Plan Safety Element and Appendix H - Geotechnical Report (Technical Background Document), Adopted October 7, 2003

Schnabel, P.B., and Seed, H.B., 1973, "Accelerations in Rock for Earthquakes in the Western United States", Bull. of the Seismol. Soc. of Am., Vol. 63, No. 2, pp 501-516.

Seed, H.B., 1979, Soil Liquefaction and Cyclic Mobility Evaluation for Level Ground During Earthquakes, ASCE, GT2, p. 201, dated February 1979.

Seed, H.B., and Idriss, I.M., 1982, Ground Motion and Soil Liquefaction During Earthquakes, Earthquake Engineering Research Institute.

Seed, H.B., and Idriss, I.M., 1983, Ground Motions and Soil Liquefaction During Earthquakes Monograph Series, Earthquakes Engineering Research Institute, Berkeley, California.

Seed, H.B., Idriss, I.M., and Arango, I., 1983, Evaluation of Liquefaction Potential Using Field Performance Data, ASCE JGE, Vol. 109, No. 3, P. 458, dated March 1983.

Seed, H.B., Idriss, I.M., and Kiefer, F.W., 1969, Characteristics of Rock Motions During Earthquakes, Journal of Soil Mechanics and Foundation Division, ASCE, V. 95, No. SM5, Proc. Paper 6783, pp. 1199-1218.

Tokimatsu, K., and Seed, H.B. 1987, Evaluation of Settlements in Sands Due to Earthquake Shaking, ASCE Journal of Geotechnical Engineering, Vol. 113, No. 8, dated August 1987.

U.S. Navy, 1986, Naval Facilities (NAVFAC) Engineering Command, Foundations and Earth Structures, Design Manual 7.02 (DM 7.02), Revalidated by Change 1, September, 1986.

WGCEP - Working Group on California Earthquake Probabilities, 1995, Seismic Hazards in Southern California: Probable Earthquake Probabilities, Bull. Seismol. Soc. Amer., Vol. 85, No. 2, pp 379-439.

APPENDIX B

GEOTECHNICAL BORING AND TEST PIT LOGS

GEOTECHNICAL BORING LOG LB-1

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1119.5 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0	N S						SM	QUATERNARY PAUBA FORMATION (Qp) @Surface: brown, moist, silty SAND	
				R2	76/11.5	118	7		@2.5': Brown, moist, dense, silty SAND; iron oxide staining	
1115	5			R3	76				@5': Brown, moist, dense, silty SAND	-200
				R4	69	121	7		@7.5': Brown, moist, dense, silty SAND	
1110	10			R5	56	117	5	SP-SM	@10': Brown, damp, dense, SAND with silt; coarse grained, traces of mica	
1105	15			S6	36		6	SM	@15': Brown, moist, dense, silty SAND	
1100	20			R7	65			SP-SM	@20': Brown, moist, dense, SAND with silt; coarse grained, traces of mica	
1095	25			S8	48				@25': Brown, moist, dense, SAND with silt and gravel; coarse grained	
1090	30								Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-2

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1118.4 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @ Surface: Brown, moist, silty SAND	
				R1	48					
1115				B4		116	8	SC	@2.5': Brown, moist, dense, clayey SAND	
	5			R2	42				@5': Brown, moist, dense, clayey SAND	HCO
				B6						
1110				R3	10 95/10"	105	17	SM	QUATERNARY PAUBA FORMATION (Qp) @7.5': Brown, moist, dense, silty SAND	
	10			R5	82/11"	111	4		@10': Brown, damp, dense, silty SAND	
1105										
	15			R7	106			SP-SM	@15': Brown, moist, dense, SAND with silt and gravel; traces of mica	
1100										
	20			S8	50		9	SM	@20-21': Brown, moist, dense, silty SAND	
				S9						-200
1095										
	25			R10	72			ML	@25': Brown, moist, hard, sandy SILT	
1090									Total dept 26.5 feet No groundwater encountered Backfilled with spoils	
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-3

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1114.4 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1				SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @0-5': Brown, moist, silty SAND	EI
				R2	44				@2.5': Brown, moist, dense, silty SAND; porous	HCO
1110	5			R3 B5	79	111	16	ML	QUATERNARY PAUBA FORMATION (Qp) @5': Brown, moist, hard, sandy SILT with trace mica	
				R4	80					
						121	9	SM	@7.5': Brown, moist, dense, silty SAND with mica	
1105	10			R6	66	122	8		@10': Brown, moist, dense, silty SAND; coarse grained, gravel, trace clay	
1100	15			R7	74				@15': Brown, very moist, dense, silty sand with gravel; coarse grained	
1095	20			S8	32		9		@20': Brown, moist, dense, silty sand with gravel; coarse grained	
1090	25			R9	83				@25': Brown, very moist, dense, silty sand with gravel; coarse grained	
1085	30								Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-4

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1125.5 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1125	0	N S		B1				SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @Surface: Reddish brown, moist, silty SAND	RV
				R2	39	132	7		@2.5': Reddish brown, damp, medium dense, silty SAND	
1120	5			R3	27	123	10		@5': Reddish brown, moist, medium dense, silty SAND	
				R4	31					
								ML	@7.5': Brown, moist, stiff, sandy SILT with clay	AL, CN
1115	10			R5	43	123	13		@10': Brown, moist, very stiff, sandy SILT	
1110	15			S6	37		11	SM-ML	QUATERNARY PAUBA FORMATION (Qp) @15': Olive brown, moist, dense/very stiff, silty SAND/sandy SILT	
1105	20			R7	50/6"				@20': Olive brown, moist, very stiff, sandy SILT	
								SM	@21': Brown, moist, dense, silty SAND	
1100	25			S8	33				@25': Brown, moist, dense, silty SAND	
	30								Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-5

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1128.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B2				ML	QUATERNARY PAUBA FORMATION (Qp) @Surface: Olive brown, damp, sandy SILT	
				R1	70					
1125						117	8	SM	@2.5': Olive brown, moist, dense, silty SAND	
	5			R3	67	115	9		@5': Brown, moist, dense silty SAND	
				R4	48					
1120									@7.5': Brown, moist, dense, silty SAND	
	10			R5	61	119	8		@10': Brown, moist, dense, silty SAND; coarse grained	
1115										
	15			R6	53				@15': Brown, moist, dense, silty SAND	
1110										
	20			S7	41		5		@20': Brown, moist, dense, silty SAND	
1105										
	25			R8	46				@25': Brown, moist, dense, silty SAND; coarse grained, micaceous	
1100									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-6

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1127.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY PAUBA FORMATION (Qp) @Surface: Brown, moist, silty SAND	
1125				R1	51	117	4		@2.5': Brown, moist, dense, silty SAND; coarse grained	
	5			R2	41	114	4	SP-SM	@5': Brown, moist, medium dense, SAND with silt; Coarse grained	
1120				R3	56	121	8	SM	@7.5': Brown, very moist, dense silty SAND with trace clay; coarse grained	
	10			R4	63				@10': Brown, very moist, dense silty SAND with trace clay; coarse grained	
1115										
	15			S5	27		11		@15': Brown, very moist, dense silty SAND; coarse grained	
1110										
	20			R6	86				@20': Brown, very moist, dense silty SAND; coarse grained	
1105										
	25			S7	28		9		@25': Brown, moist, medium dense, silty SAND with gravel; coarse grained	
1100									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-7

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1127.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @Surface: Brown, moist, silty SAND with trace clay	
1125				R1	24	112	5		@2.5': Brown, damp, silty SAND with trace gravel; coarse grained	
	5			R2 B3	20	113	4		@5': Brown, damp, silty SAND with trace gravel; coarse grained	
1120				R4	84	106	8	SM	QUATERNARY PAUBA FORMATION (Qp) @7.5': Brown, moist, dense, silty SAND with gravel; coarse grained	
	10			R5	72	125	8		@10': Brown, moist, dense, silty SAND with gravel; coarse grained	
1115										
	15			R6	76				@15': Brown, very moist, dense, silty SAND with gravel; coarse grained	
1110										
	20			S7	29		9		@20': Brown, very moist, dense, silty SAND with gravel; coarse grained	
1105										
	25			R8	73				@25': Brown, very moist, dense, silty SAND with gravel; coarse grained	
1100									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-8

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1141.5 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	ARTIFICIAL FILL (Afu) @Surface: Brown, moist, silty SAND	
1140				R1	61				@2.5': Brown, dry, dense, silty SAND	
	5			R2	84				@5': Brown, dry, dense, silty SAND	
1135				R3	40					
									QUATERNARY PAUBA FORMATION (Qp) @7.5': Brown, damp, medium dense, silty SAND with gravel	
	10			R4	28				@10': Brown, damp, medium dense, silty SAND with gravel	
1130										
	15			R5	81	124	10		@15': Brown, moist, medium dense, silty SAND with gravel and trace clay	
1125										
									Total depth 16.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
	20									
1120										
	25									
1115										
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-9

Date 1-23-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1145.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1145	0			B1				SM	ARTIFICIAL FILL (Afu) @Surface: Light brown, damp, silty SAND	CS
				R2	80				QUATERNARY PAUBA FORMATION (Qp) @2.5': Reddish brown, damp, dense, silty SAND with gravel; coarse grained	
1140	5			R3	56				@5': Reddish brown, dry, dense, silty SAND with gravel; coarse grained	
				R4	52				@7.5': Reddish brown, moist, medium dense, silty SAND with gravel; coarse grained	
1135	10			R5	35				@10': Reddish brown, moist, medium dense, silty SAND with gravel; coarse grained	
1130	15			R6	59				@15': Brown, damp, silty SAND with gravel; coarse grained	
									Total depth 16.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
1125	20									
1120	25									
1115	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-10

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1115.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1115	0							ML	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @Surface: Olive brown, damp, SILT with sand	
				R1	80/11"					
						111	8	SM	QUATERNARY PAUBA FORMATION (Qp) @2.5': Light brown, damp, dense, silty SAND	
1110	5			R2 B3	55	114	14		@5': Brown, moist, dense, silty SAND	
				R4	62	118	9		@7.5': Brown, moist, dense, silty SAND	
1105	10			R5	59				@10': Brown, moist, dense, silty SAND with trace gravel	
1100	15			S6	31		10		@15': Brown, moist, dense, silty SAND	
1095	20			R7	21				@20': Brown, moist, medium dense, silty SAND	
1090	25			S8	44		12		@25': Brown, moist, dense, silty SAND with trace gravel	
									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
1085	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-11

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1139.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1				SM	ARTIFICIAL FILL (Af) @ Surface: Brown, damp, silty SAND @2.5': Brown, moist, dense, silty SAND with trace clay	
1135				R2	43					
	5			R3	44			SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @5': Brown, damp, dense, silty SAND with trace gravel	
				R4	37				@7.5': Brown, moist dense, silty SAND; coarse grained	
1130										
	10			R5	22			SM	QUATERNARY PAUBA FORMATION(Qp) @10': Brown, moist, dense, silty SAND with trace gravel; coarse grained, micaceous	
1125										
	15			S6	19			SP-SM	@15': Brown, moist, medium dense, silty SAND/poorly graded SAND with trace mica	
1120										
	20			R7	53	102	11		@20': Brown, moist, dense, silty SAND/poorly graded SAND	
1115										
	25			S8	29		9	SM	@25': brown, moist, dense, silty SAND with trace gravel	
1110									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/23/06	
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-12

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1154.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B1				SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @Surface: Reddish brown, damp, silty SAND	
				R2	50/6"				@2.5': Brown, moist, dense, silty SAND	
1150										
	5			R3	52			SC	@5': Brown, damp, dense, clayey SAND	
				R4	60			SC/SM	@7.5': Brown, damp, dense, clayey SAND	
1145									QUATERNARY PAUBA FORMATION (Qp)	
	10			R5	38	124	7	SM	@ 9': Brown, moist, dense, silty SAND with trace clay	
1140										
	15			S6	19		8		@15': Brown, moist, medium dense, silty SAND	
1135										
	20			R7	46	127	4		@20': Brown, moist, dense, silty SAND; coarse grained	
1130										
	25			S8	22		8		@25': Brown, moist, medium dense, silty SAND	
									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
1125										
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-13

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1154.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY COLLUVIUM(Qcol)/Highly Weathered PAUBA @Surface: Reddish brown, damp, silty SAND	
				R1	61			SC	@2.5': Reddish brown, damp, dense, clayey SAND; porous	
1150										
	5			R2 B4	43	127	8		@5': Reddish brown, damp, dense, clayey SAND; porous	
									QUATERNARY PAUBA FORMATION (Qp) @7.5': Reddish brown, moist, medium dense, silty SAND with gravel	
				R3	27	113	8	SM		
1145										
	10			R5	25	115	7		@10': Reddish brown, moist, medium dense, silty SAND with gravel	
1140										
	15			R6	49				@15': Brown, moist, dense, silty SAND with gravel	
1135										
	20			R7	48				@20': Brown, moist, dense, silty SAND with gravel	
1130										
	25			R8	55				@25': Brown, moist, dense, silty SAND with gravel	
1125									Total depth 26.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-14

Date 1-24-06 **Sheet** 1 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1145.0 ' **Location** See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CTM; Sampled By CTM)	Type of Tests
1145	0							SM	QUATERNARY PAUBA FORMATION(Qp) @Surface: Reddish brown, damp. silty SAND	
				R1	74					
								SC	@3.5': Reddish brown, dry, dense, clayey SAND with gravel	
1140	5			R2 B3	60			SM	@5': Reddish brown, dry, dense, silty SAND with gravel	EI, CS, SU
				R4	86				@7.5': Brown, moist, dense, silty SAND	
1135	10			R5	59				@10': Brown, moist, dense, silty SAND	
1130	15			R6	46	107	12		@15': Brown, moist, dense, silty SAND	
1125	20			S7	20		12		@20': Brown, moist, dense, silty SAND	
1120	25			R8	75/11"	120	4		@25': Brown, moist, dense, silty SAND	
1115	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-14

Date 1-24-06 **Sheet** 2 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1145.0 ' **Location** See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CTM; Sampled By CTM)	Type of Tests
1115	30			S9	15		12	SM	@30': Brown, moist, medium dense, silty SAND	
									Total depth 31.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
1110	35									
1105	40									
1100	45									
1095	50									
1090	55									
1085	60									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-15

Date 1-24-06 **Sheet** 1 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1111.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0			B2				SM	QUATERNARY ALLUVIUM (Qal) @Surface: Brown, moist, silty SAND	
1110				R1	4	110	13		@2.5': Brown, moist. very loose, silty SAND	
	5			R3	10				@5': Brown, wet, loose, silty SAND	
1105				R4	25					
								SC	@7.5': Brown, very moist, medium dense, clayey SAND	
	10			R5	25			SM	@10': Brown, very moist, medium dense, silty SAND with trace clay	
1100										
	15			R6	90			SM	QUATERNARY PAUBA FORMATION (Qp) @15': Brown, moist, dense, silty SAND	
1095										
	20			R7	85			SM-ML	@20': Brown, moist, dense, silty SAND-SILT with sand	
1090										
	25			R8	81			SM	@25': Brown, moist, dense, silty SAND	
1085										
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-15

Date 1-24-06 **Sheet** 2 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1111.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1080	30			R9	61			SM	@30': Brown, moist, dense, silty SAND	
1075	35			R10	32			ML	@35': Brown, moist, dense, SILT with sand	
1070	40			R11	62			SM	@40': Brown, moist, dense, silty SAND	
1065	45			R12	32			SC	@45': Brown, moist, medium dense, clayey SAND	
1060	50			R13	44			SM	@50': Brown, moist, dense, silty SAND	
1055	55								Total is 51.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
	60									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-16

Date 1-24-06 **Sheet** 1 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1116.0 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY PAUBA FORMATION (Qp) @Surface: brown, damp, silty SAND	
1115				R1	91/11"	131	6		@2.5': Brown, damp, dense, silty SAND	
	5			R2	67	108	13		@5': Brown, damp, dense, silty SAND	HCO
1110				R3	71/11"	120	12	ML	@7.5': Brown, damp, very stiff, SILT with sand	
	10			R4	70/12"			SM	@10': Brown, damp, dense, silty SAND	
1105										
	15			S5	30		11	ML	@15': Brown, moist, very stiff, SILT with sand	
1100										
	20			R6	58			SM	@20': Brown, moist, dense, silty SAND	
1095										
	25			S7	22		10		@25': Brown, moist, medium dense, silty SAND	
1090										
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-16

Date 1-24-06 **Sheet** 2 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1116.0 ' **Location** See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By CTM; Sampled By CTM)	Type of Tests
1085	30			R8	66			SM-ML	@30': Brown, moist, dense, silty SAND-SILT with sand	
									Total depth 31.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
1080	35									
1075	40									
1070	45									
1065	50									
1060	55									
	60									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-17

Date 1-24-06 **Sheet** 1 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1112.5 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY ALLUVIUM (Qal) @Surface: Reddish brown, damp, silty SAND	
1110				R1	37	117	2		@2.5': Brown, dry, medium dense, silty SAND	
	5			R2 B4	36	120	3		@5': Brown, damp, medium dense, silty SAND	
1105				R3	28			SC	@7.5': Dark brown, moist, medium dense, clayey SAND	CN
	10			R5	28			SM	@10': Dark brown, moist, medium dense, silty SAND	
1100										
	15			S6	35			SM	QUATERNARY PAUBA FORMATION(Qp) @15': Brown, moist, medium dense, silty SAND; coarse grained	
1095										
	20			R7	54				@20': Brown, moist, dense, silty SAND with trace clay	
1090										
	25			S8	18				@25': Brown, moist, dense, silty SAND	
1085										
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-17

Date 1-24-06 **Sheet** 2 **of** 2
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1112.5 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R9	32			ML	@30': Brown, moist, hard, SILT with sand	
1080									Total depth 31.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
	35									
1075										
	40									
1070										
	45									
1065										
	50									
1060										
	55									
1055										
	60									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-18

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1116.3 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY ALLUVIUM (Qal) @Surface: Brown, damp, silty SAND	
1115				R1	54	120	3		@2.5': Brown, dry, dense, silty SAND	
	5			R2 B3	83	102	5	SM	QUATERNARY PAUBA FORMATION (Qp) @5': Brown, dry, dense, silty SAND	
1110				R4	70	115	9		@7.5': Brown, moist, dense, silty SAND	
	10			R5	60	116	11	SC	@10': Brown, moist, dense, clayey SAND	
1105										
	15			S6	26		8	SM	@15': Brown, moist, dense, silty SAND; coarse grained	
1100										
	20			R7	80				@20': Brown, moist, dense, silty SAND; coarse grained, gravel	
1095										
									Total depth 21.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
	25									
1090										
	30									

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

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG LB-19

Date 1-24-06 **Sheet** 1 **of** 1
Project Murrieta Triangle **Project No.** 111990-002
Drilling Co. Martini **Type of Rig** CME-75
Hole Diameter 8 inches **Drive Weight** 140 **Drop** 30 inches
Elevation Top of Hole +/- 1116.6 ' **Location** See Geotechnical Map

Logged By CTM
Sampled By CTM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	QUATERNARY PAUBA FORMATION(Qp) @Surface: Reddish brown, damp, silty SAND	
1115				R1	83				@2.5': Brown, dry, dense, silty SAND; trace gravel and organics	
	5			R2	71/11"				@5': Brown, dry, dense, silty SAND; coarse grained	
1110				R3	90/10"				@7.5': Brown, moist, dense, silty SAND	
	10			R4	72				@10': Brown, moist, dense, silty SAND	
1105										
	15			S5	25		9		@15': Brown, moist, medium dense, silty SAND	
1100										
	20			R6	79	112	7		@20': Brown, moist, dense, silty SAND with trace clay	
1095									Total depth 21.5 feet No groundwater encountered Backfilled with spoils 1/24/06	
	25									
1090										
	30									

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

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS REMOLDED DS

Leighton

GEOTECHNICAL BORING LOG B-1

Date 3-3-98 | Sheet 1 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1140' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
1140	0								TOPSOIL/COLLUVIUM	
				1	12	116.8	11.2	SM	@ 2': Brown, moist, loose, silty, fine to coarse SAND; medium to large pores common, few rootlets	
1135	5			2	85	100.3	6.9	SM	QUATERNARY PAUBA FORMATION @ 5': Light brown to light orange brown, damp, very dense, silty, fine to coarse SAND	
1130	10			3	70/6"			SM	@ 10': Pale brown, dry, very dense, silty, fine SAND	
1125	15			4	50/5"	89.0	5.7	SM	@ 15': Light gray-brown, dry, very dense, silty, fine SAND	
1120	20									
1115	25			5	50/5"	94.4	3.4	SM	@ 25': Light gray-brown, dry, very dense, silty, fine SAND; scattered coarser grains	
1110	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-1

Date 3-3-98 | Sheet 2 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1140' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
1110	30			6	50/6"	95.5	9.0	SM	@ 30': Gray-brown, damp, very dense, silty, fine to medium SAND; few coarser grains, fine to medium pores common	
1105	35			7	50/4"			SM	@ 35': Light gray-brown, dry, very dense, silty, fine to coarse SAND; few manganese stains	
1100	40									
1095	45			8	50			ML	@ 45': Light gray-brown, damp, very dense, fine, sandy SILT	
1090	50								Total Depth 50' No Groundwater Encountered Backfilled 3/3/98	
1085	55									
1080	60									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-2

Date 3-3-98 | Sheet 1 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1141' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KBC Sampled By KBC	Type of Tests
	0								QUATERNARY PAUBA FORMATION (Qp)	
1140				1	50/3"			SC	@ 2': Red brown, dry, very dense, clayey, fine to coarse SAND; medium to large pores common	
	5			2	85/11"	101.8	6.2	SM	@ 5': Brown to reddish brown, damp, very dense, silty, fine to medium SAND; fine pores common	
1135										
	10			3	50/6"	87.5	3.5	SM	@ 10': Brown to reddish brown, damp, very dense, silty, fine to medium SAND; fine pores common	
1130										
	15			4	50/5"			SM	@ 15': Orange brown, dry, very dense, silty, fine to medium SAND	
1125										
	20			5	50/5"	98.2	7.3	SM	@ 20': Light gray, brown, dry, very dense, silty, very fine SAND	
1120										
	25			6	50/3"			SM	@ 25': Yellow-brown, damp, very dense, silty, fine SAND; coarse grains common	
1115										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-2

Date 3-3-98 | Sheet 2 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1141' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KBC Sampled By KBC	Type of Tests
1110	30			7	50/5"			SM/ML	@ 30': Light gray and orange-brown, damp, very dense, silty, very fine SAND to fine sandy SILT	
1105	35			8	50/5"			SM	@ 35': Light gray-brown, dry, very dense, silty, fine to medium SAND	
1100	40								Total Depth No Groundwater Encountered Backfilled 3/3/98	
1095	45									
1090	50									
1085	55									
	60									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

505A(11/77)

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-3

Date 3-3-98 | Sheet 1 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1144' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0								TOPSOIL/COLLUVIUM	
			Bag 1 @ 1-4'	2	21	121.2	10.9	SC	@ 1': Brown, moist, medium dense, clayey, fine to medium SAND; few medium pores, few rootlets	
1140										
	5			3	29			SM	QUATERNARY PAUBA FORMATION (Qp) @ 5': Reddish-brown, moist, medium dense, slightly clayey, silty, fine to coarse SAND	
1135										
	10			4	53	108.7	9.0	SW	@ 10': Orange-brown, damp, dense, fine to coarse SAND	
1130										
	15			5	65			SP	@ 15': Orange-brown, damp, dense, medium to coarse SAND	
1125										
	20									
1120										
	25			6	50/5"	104.8	6.5	SP	@ 25': Orange-brown, damp, very dense, medium to coarse SAND	
1115										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-3

Date 3-3-98 | Sheet 2 of 2
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1144' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KBC Sampled By KBC	Type of Tests
	30			7	90/8"			SP	@ 30': Red-brown to brown, moist, very dense, medium to coarse SAND; few large pores	
1110										
	35			8	50/6"			SM	@ 35': Light red-brown to light gray, damp, very dense, silty, fine to medium SAND	
									Total Depth 35.5' No Groundwater Encountered Backfilled 3/3/98	
1105										
	40									
1100										
	45									
1095										
	50									
1090										
	55									
1085										
	60									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-4

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1145' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
1145	0								TOPSOIL/COLLUVIUM	
				1	22	123.8	10.4	SM	@ 2': Brown, moist, medium dense, silty, fine to medium SAND; medium pores common, few rootlets	
1140	5			2	33	119.0	12.0	SC	@ 5': Red-brown, wet, medium dense, clayey, fine to coarse SAND; highly weathered Qp	
								SM	QUATERNARY PAUBA FORMATION (Qp)	
1135	10			3	45			SP	@ 10': Light orange-brown, moist, medium dense, medium to coarse SAND	
1130	15			4	74			SP	@ 15': Orange-brown, damp, dense, interbedded medium and coarse SAND	
1125	20			5	66			SP	@ 20': Orange-brown, damp, dense, medium to coarse SAND	
									Total Depth 21' No Groundwater Encountered Backfilled 3/3/98	
1120	25									
1115	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-5

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1143' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (Logged By KBC; Sampled By KBC)	Type of Tests
	0								TOPSOIL/COLLUVIUM	
			Bag 1 @ 1-4'	2	26	123.2	10.3	SC	@ 1': Reddish-brown, wet, medium dense, clayey, fine to medium SAND; few medium pores, few rootlets	
1140										
	5			3	27	114.5	12.4	SM	QUATERNARY PAUBA FORMATION (Qp) @ 5': Orange-brown, moist, medium dense, slightly clayey, silty, fine to medium SAND; medium pores common	
1135										
	10			4	44		9.2	SP	@ 10': Orange-brown, damp, medium dense, medium to coarse SAND (sample disturbed)	
									Total Depth 11' No Groundwater Encountered Backfilled 3/3/98	
1130										
	15									
1125										
	20									
1120										
	25									
1115										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

505A(11/77)

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-6

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1145' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KBC Sampled By KBC	Type of Tests
1145	0								TOPSOIL/COLLUVIUM	
				1	26	125.4	10.1	SM	@ 2': Brown, moist to wet, medium dense, slightly clayey, silty, fine to medium SAND; few medium pores, few rootlets	
1140	5			2	31	119.8	11.4	SC	@ 5': Brown, moist to wet, medium dense, clayey, fine to medium SAND; highly weathered Qp	
									QUATERNARY PAUBA FORMATION (Qp)	
1135	10			3	31	108.2	8.9	SM	@ 10': Gray-brown, moist, medium dense, silty, fine to coarse SAND	
1130	15			4	68			SM	@ 15': Orange-brown, damp, dense, silty, fine to medium SANDSTONE	
1125	20			5	79			SP	@ 20': Reddish-brown, damp, dense, medium to coarse SANDSTONE; few large pores	
									Total Depth 21' No Groundwater Encountered Backfilled 3/3/98	
1120	25									
1115	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-7

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1138' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0								ARTIFICIAL FILL - undocumented (Afu)	
			Bag 1 @ 1-4'	2	35	105.8	6.3	SM	@ 1': Red-brown, moist, medium dense, silty, fine to coarse SAND; abundant fine pores, few medium pores	
1135										
									QUATERNARY PAUBA FORMATION (Qp)	
	5			3	92			SM	@ 5': Brown, moist, very dense, silty, fine to medium SAND; scattered fine gravel	
1130										
	10			4	70			SP	@ 10': Red-brown, damp, dense, medium to coarse SAND; scattered fine gravel	
1125										
	15			5	80			SW	@ 15': Red-brown, dry, very dense, fine to coarse SAND	
1120										
	20			6	64			SW	@ 20': Red-brown, dry, dense, fine to coarse SAND	
									Total Depth 21' No Groundwater Encountered Backfilled 3/3/98	
1115										
	25									
1110										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-8

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1134' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (Logged By KBC; Sampled By KBC)	Type of Tests
	0								ARTIFICIAL FILL - undocumented (Afu)	
				1	20	103.3	5.6	SC	@ 2': Reddish-brown, moist to wet, medium dense, gravelly, clayey, fine to medium SAND; few rootlets	
1130										
	5			2	26	116.7	11.4	SM	QUATERNARY ALLUVIUM (Qal) @ 5': Brown, moist to wet, medium dense, silty, fine SAND; fine pores common	
1125										
	10			3	40	121.6	11.7	SM	@ 10': Brown, moist, medium dense, silty, fine to medium SAND; fine pores common	
1120										
	15			4	39			SM	QUATERNARY PAUBA FORMATION (Qp) @ 15': Reddish-brown, moist, medium dense, silty, fine to medium SAND; few fine to medium pores	
1115										
	20			5	50/6"			SC	@ 20': Reddish-brown, moist, very dense, clayey, fine to coarse SAND	
									Total Depth 20.5' No Groundwater Encountered Backfilled 3/3/98	
1110										
	25									
1105										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-9

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1114' ft. | Ref. or Datum See Geotechnical Map

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KBC Sampled By KBC	Type of Tests
	0								FILL - undocumented (Afu)	
				1	78/11"	113.7	9.1	SM	@ 2': Dark gray-brown, moist, very dense, silty, fine SAND; coarse sand to fine gravel common	
1110	5			2	25	94.7	18.5	ML	QUATERNARY ALLUVIUM (Qal) @ 4': Yellow-brown, moist, medium dense, fine sandy SILT; few medium pores	
				3	78/11"	89.0	31.0	ML	QUATERNARY PAUBA FORMATION (Qp) @ 6': Gray-brown, very moist, very dense, fine sandy SILT	
1105	10			4	50/6"			SM	@ 10': Gray-brown, damp, very dense, silty, fine to medium SAND	
									Total Depth 10.5' No Groundwater Encountered Backfilled 3/3/98	
1100	15									
1095	20									
1090	25									
1085	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

505A(11/77)

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-10

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1113' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0								ARTIFICIAL FILL - undocumented (Afu)	
1110				1	42	120.0	7.4	SM	@ 2': Brown, moist, medium dense, silty, fine to medium SAND; few rootlets	
	5			2	44	109.9	10.3	SM	@ 5': Gray-brown, moist, medium dense, silty, fine to medium SAND; few rootlets	
1105				3	40	113.9	12.2	SM	@ 7.5': Dark gray, moist, medium dense, silty, fine to medium SAND; few rootlets	
	10			4	58	123.0	8.7	SM	ALLUVIUM ? (Qal) @ 10': Gray-brown, moist, dense, silty, fine to medium SAND; fine gravel common; few medium pores	
1100										
	15			5	71			SM	QUATERNARY PAUBA FORMATION (Qp) @ 15': Light gray-green, damp, dense, silty, fine SAND	
1095										
	20			6	70/11"			SM	@ 20': Light gray, moist, very dense, silty, fine SAND	
									Total Depth 21' No Groundwater Encountered Backfilled 3/3/98	
1090										
	25									
1085										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-11

Date 3-3-98 | Sheet 1 of 1
Project RogersDale - Murrieta | Project No. 11980052-001
Drilling Co. CAL PAC | Type of Rig HSA
Hole Diameter 8 in | Drive Weight 140 lbs | Drop 30 in.
Elevation Top of Hole +/-1116' ft. | Ref. or Datum See Geotechnical Map

Logged By KBC
Sampled By KBC

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
1115	0							SM	ARTIFICIAL FILL (Afu) @ 0': Red-brown, moist, medium dense, silty, fine to medium SAND	
1110	5			1	29	120.0	10.3	SM	@ 5': Dark brown, moist to wet, medium dense, silty, fine SAND; weak decayed organic odor	
1105	10			2	59	125.8	7.2	SM	@ 10': Red-brown, moist, medium dense, silty, fine to medium SAND	
1100	15			3	36			SM	QUATERNARY PAUBA FORMATION (Qp) @ 15': Dark red-brown, damp, dense, silty, fine to medium SAND; coarser grains and fine gravel common	
									Total Depth 16.5' No Groundwater Encountered Backfilled 3/3/98	
1095	20									
1090	25									
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- D RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- RV R VALUE
- EI EXPANSION INDEX

LEIGHTON & ASSOCIATES

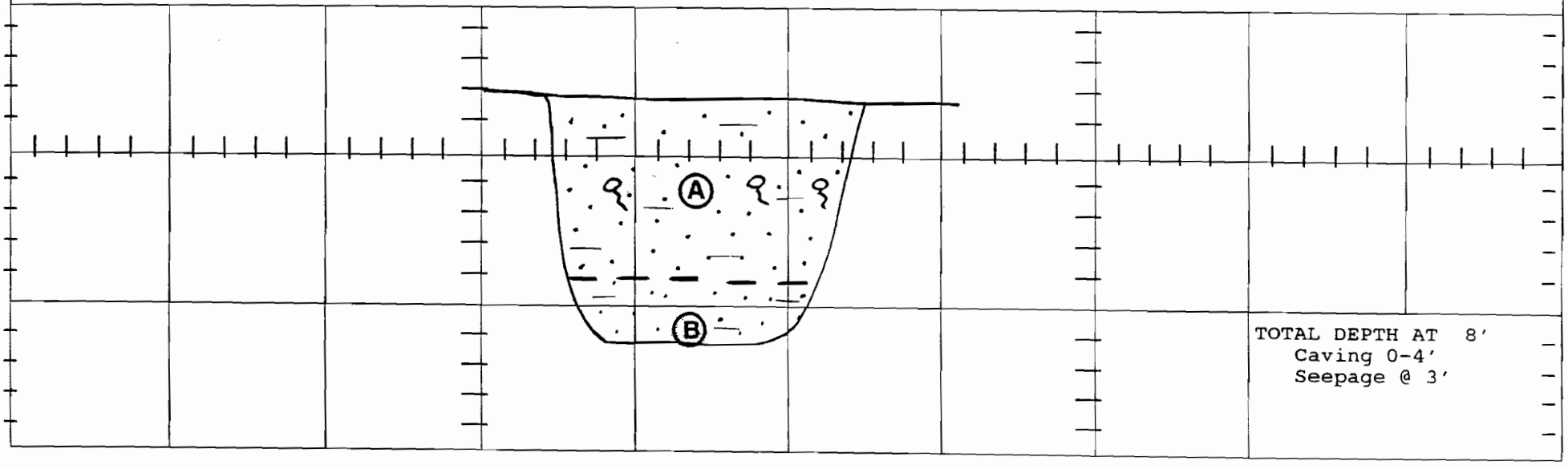
LOG OF TRENCH NO.: T-1

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1108±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Medium brown to gray-brown, saturated-wet, loose, silty SAND; seepage @ 3'		SM/SP			
	Pauba Formation	Qp				
	B: @ 6': Olive-brown, damp to moist, dense, silty fine SAND; mottled, few root hairs		SM			

GRAPHIC REPRESENTATION Eastwall SCALE: 1" = 5' SURFACE SLOPE: 10S TREND: N60°W



501-A - (10/90)

Leighton & Associates

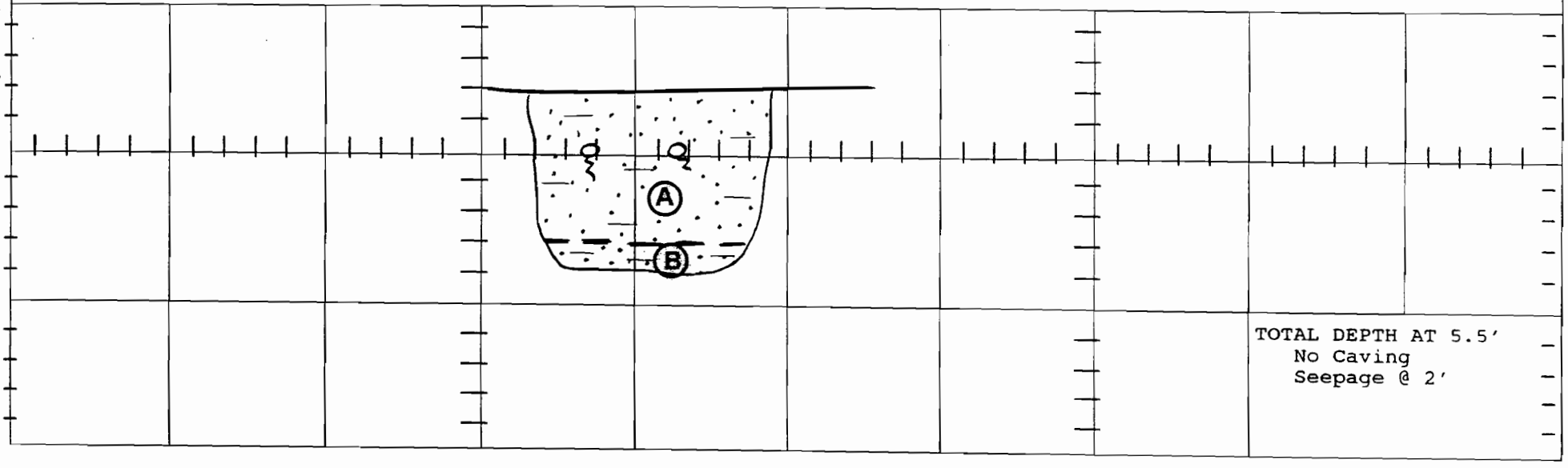
LOG OF TRENCH NO.: T-2

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1115±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium/Colluvium	Qal				
	A: @ 0': Dark to medium brown, very moist to wet, loose, silty SAND to medium sand; roots to 2'; seepage @ 2'					
	Pauba Formation	Qp				
	B: @ 5': Olive-brown to dark brown, damp, dense to very dense, silty fine to medium SAND; locally clayey sand; mottled, few fine root hairs					

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 12S TREND: N35°E



501-A - (10/90)

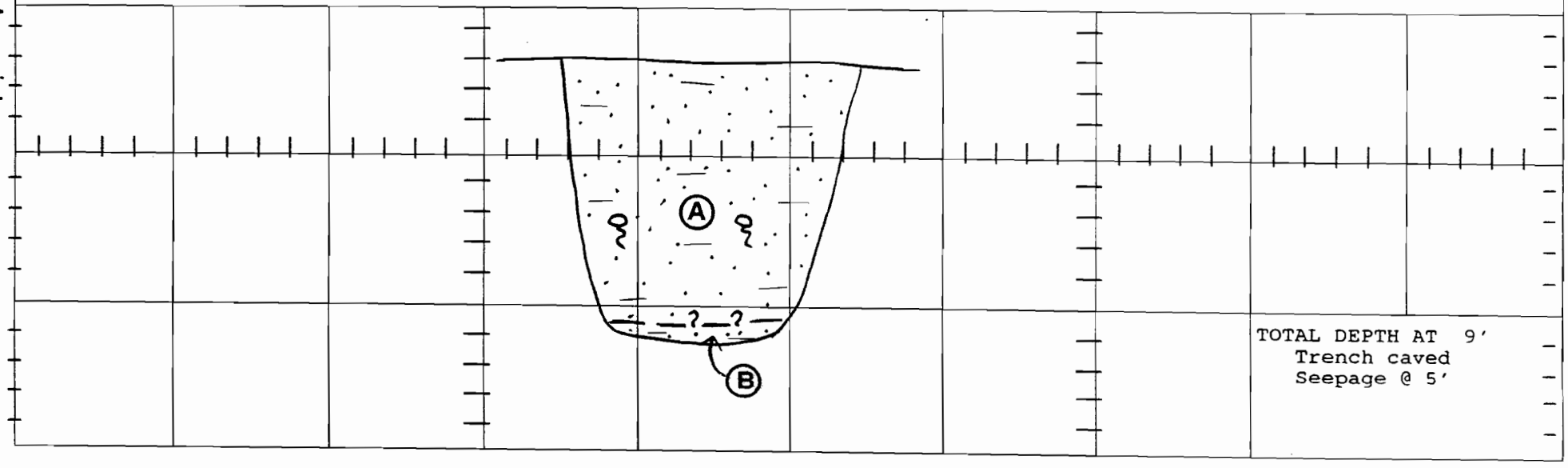
Leighton & Associates

LOG OF TRENCH NO.: T-3

Project Name: RogersDale	Logged by: RFR	ENGINEERING PROPERTIES	
Project Number: 11980052-001	Elevation: 1110±		
Equipment: Case 580 Backhoe	Location: See Geotechnical Map		

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Medium brown to gray-brown, saturated-wet, loose, silty SAND; seepage @ 5'					
	Pauba Formation	Qp				
	B: @ 8.5': Olive-brown, very moist to wet, loose to medium dense, silty fine SAND; possible very weathered Pauba, Trench caved					

GRAPHIC REPRESENTATION Eastwall SCALE: 1" = 5' SURFACE SLOPE: 2W TREND: N45°E



TOTAL DEPTH AT 9'
Trench caved
Seepage @ 5'

501-A - (10/90)

Leighton & Associates

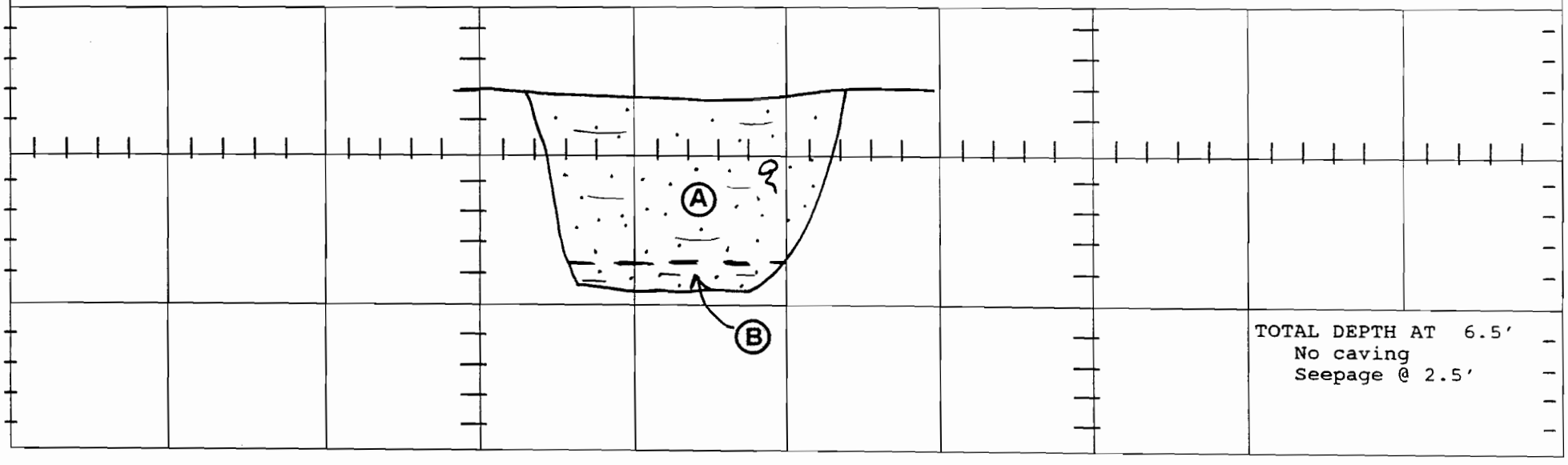
LOG OF TRENCH NO.: T-4

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1113±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Alluvium	Col				
	A: @ 0': Medium brown to dark-brown, moist to wet, loose, silty SAND; seepage @ 2.5'					
	Pauba Formation	Qp				
	B: @ 5.5': Light olive to olive-brown, damp, dense to very dense, silty fine SAND; slightly mottled; some dark olive-brown clay stringers					

GRAPHIC REPRESENTATION Southwall SCALE: 1" = 5' SURFACE SLOPE: 15N TREND: N60°W



TOTAL DEPTH AT 6.5'
No caving
Seepage @ 2.5'

501-A - (10/90)

Leighton & Associates

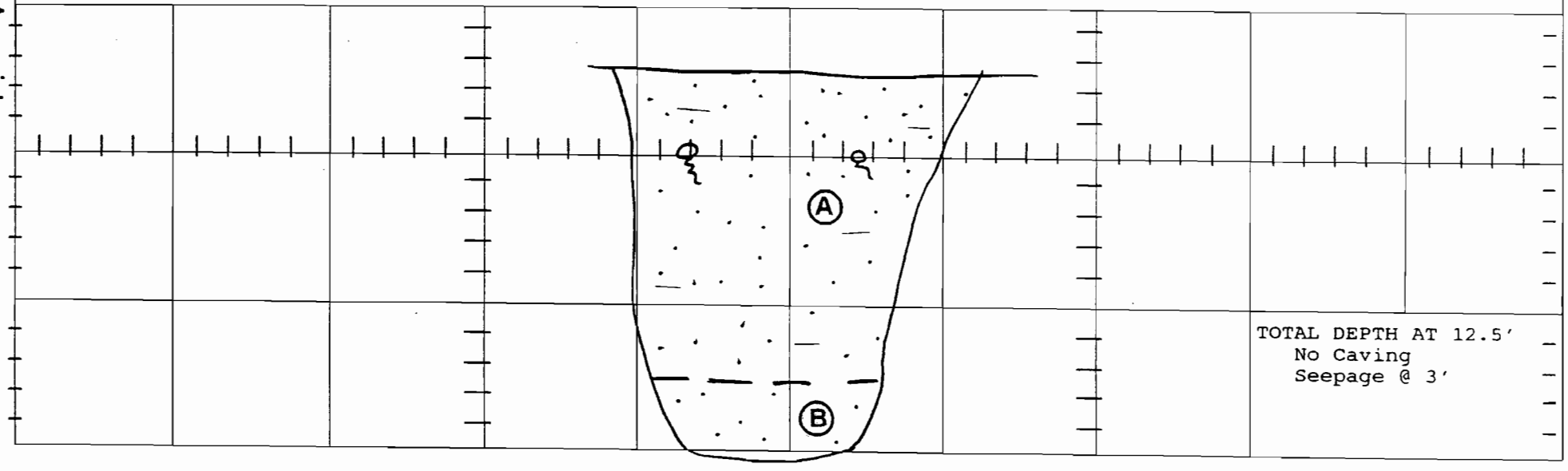
LOG OF TRENCH NO.: T-5

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1114±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Light gray-brown, wet, loose, medium SAND to gray-brown, very moist to wet, silty SAND; seepage @ 3'		SM			
	Pauba Formation	Qp				
	B: @ 10.5': Medium red-brown, moist, dense to very dense, medium grained SAND; iron stained; few local pores, locally silty sand, friable		SP/SM			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: 4W TREND: N15°E



TOTAL DEPTH AT 12.5'
No Caving
Seepage @ 3'

501-A - (10/90)

Leighton & Associates

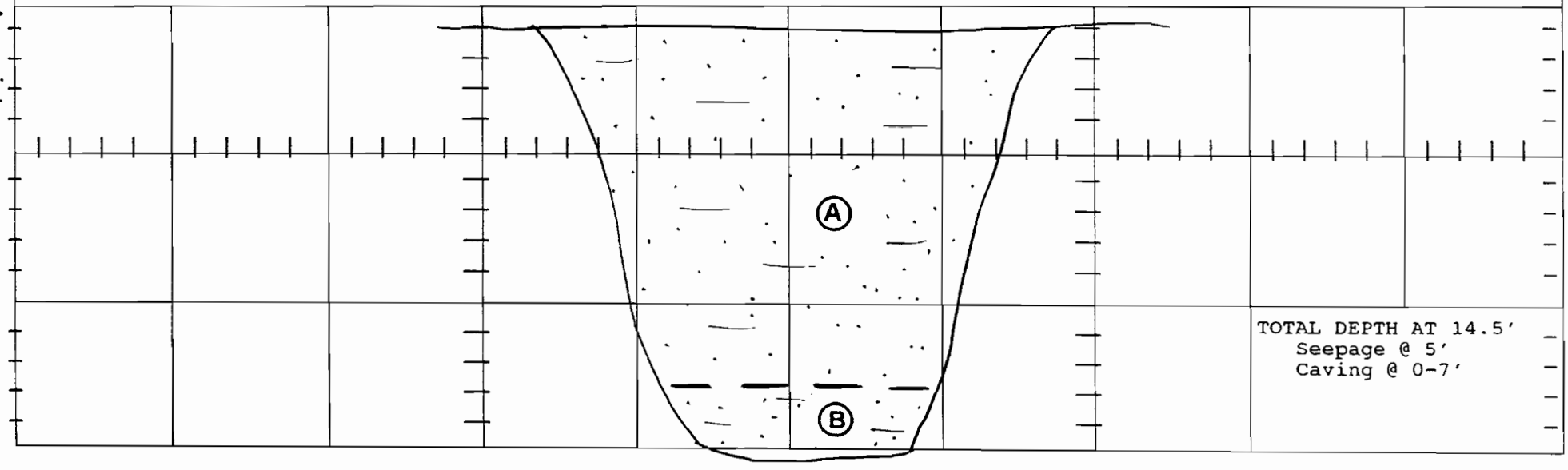
LOG OF TRENCH NO.: T-6

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1112±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Medium to dark brown, very moist to wet, loose, silty fine to medium SAND; seepage @ 5'		SM	1		
	Pauba Formation	Qp				
	B: @ 12.5': Medium red-brown to olive-red-brown, moist, dense, silty SAND to clean, medium grained SAND		SM/SP			

GRAPHIC REPRESENTATION Eastwall SCALE: 1" = 5' SURFACE SLOPE: 2W TREND: N10°W



TOTAL DEPTH AT 14.5'
Seepage @ 5'
Caving @ 0-7'

501-A - (10/90)

Leighton & Associates

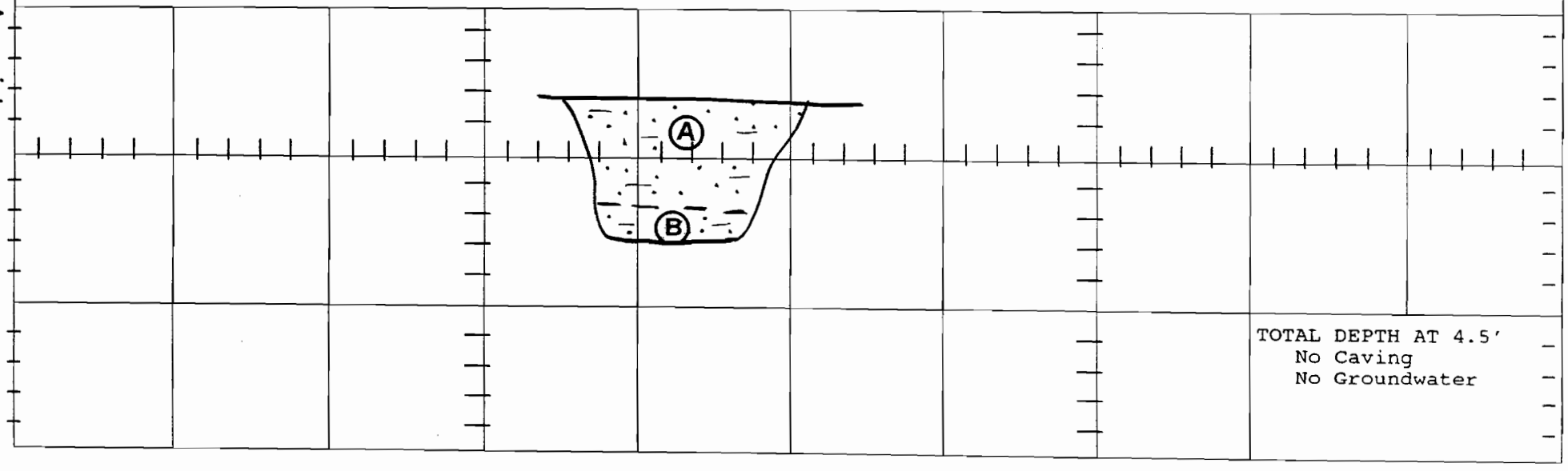
LOG OF TRENCH NO.: T-7

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1124±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium/Colluvium	Qal				
	A: @ 0′: Medium brown, very moist to wet, loose to medium dense, silty SAND		SM			
	Pauba Formation	Qp				
	B: @ 3.5′: Olive-brown, moist, dense to very dense, silty fine SAND to locally medium grained sand with some clay		SM/SP			

GRAPHIC REPRESENTATION SCALE: 1" = 5′ SURFACE SLOPE: 5SW TREND: N30°E



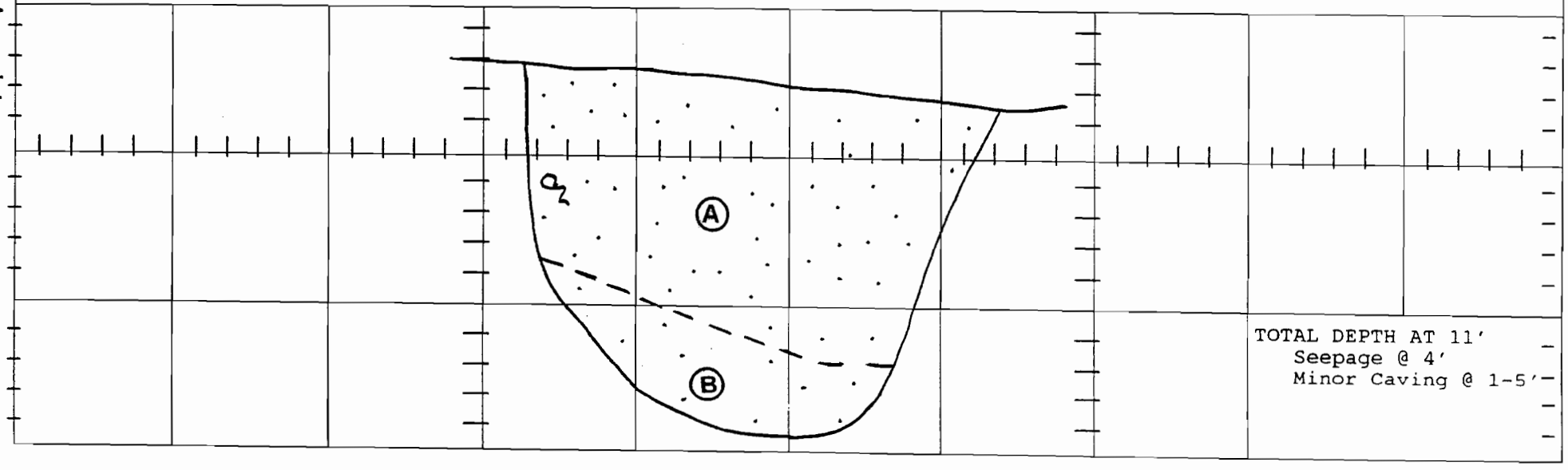
LOG OF TRENCH NO.: T-8

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1127±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium/Colluvium	Qal				
	A: @ 0': Medium brown to dark brown, very moist to wet, loose to locally medium dense SAND; seepage @ 4' on north wall		SM/SP			
	Pauba Formation	Qp				
	B: @ 9': Light olive-brown, moist, dense, fine SAND; mottled, local iron staining		SM			

GRAPHIC REPRESENTATION Eastwall SCALE: 1" = 5' SURFACE SLOPE: 5S TREND: N85°W



TOTAL DEPTH AT 11'
Seepage @ 4'
Minor Caving @ 1-5'

501-A - (10/90)

Leighton & Associates

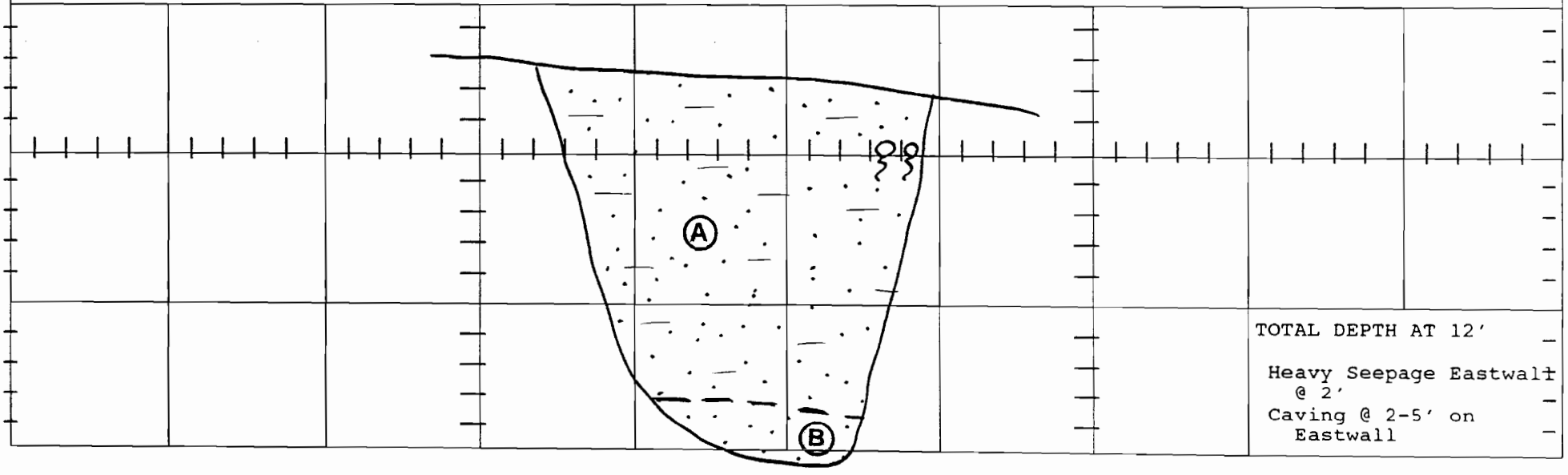
LOG OF TRENCH NO.: T-9

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1118±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0′: Dark brown, very moist to wet, loose to locally medium dense, silty, fine SAND		SM			
	Pauba formation	Qp				
	B: @ 10.5′: Medium red-brown,moist, dense to very dense, medium grained SAND; local iron staining, locally silty SAND		SP			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5′ SURFACE SLOPE: 5E TREND: E-W



TOTAL DEPTH AT 12′

Heavy Seepage Eastwall @ 2′

Caving @ 2-5′ on Eastwall

501-A - (10/90)

Leighton & Associates

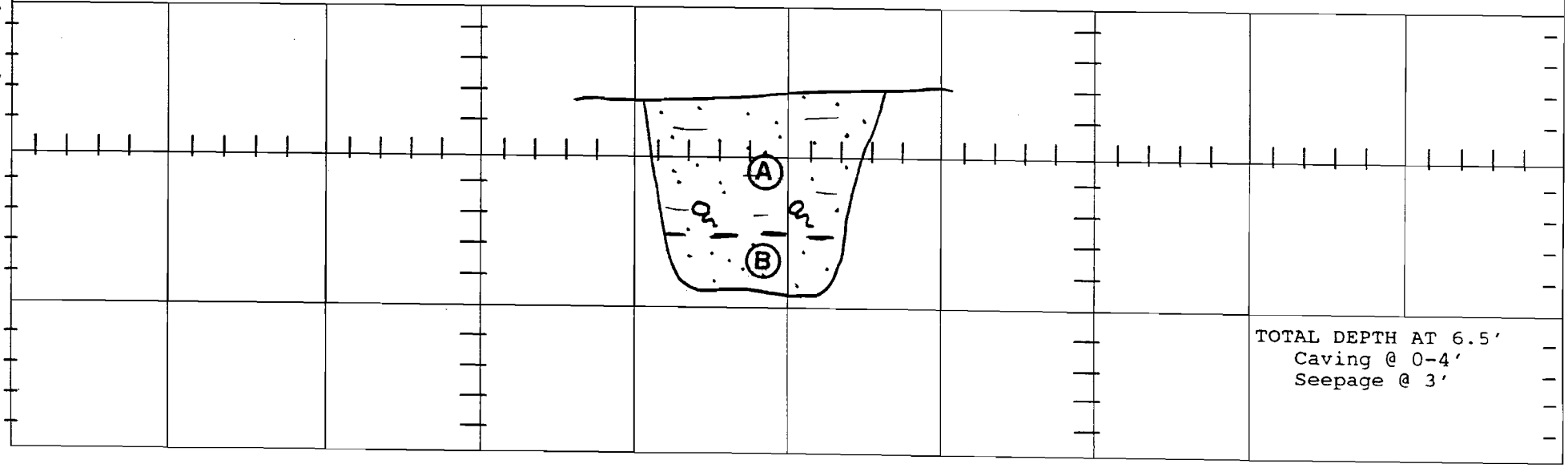
LOG OF TRENCH NO.: T-10

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1122±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown, wet, loose, silty SAND		SM			
	Pauba Formation	Qp				
	B: @ 4.5': Light olive-brown to medium brown, damp, dense to very dense, silty fine SAND		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 8SE TREND: N40°E



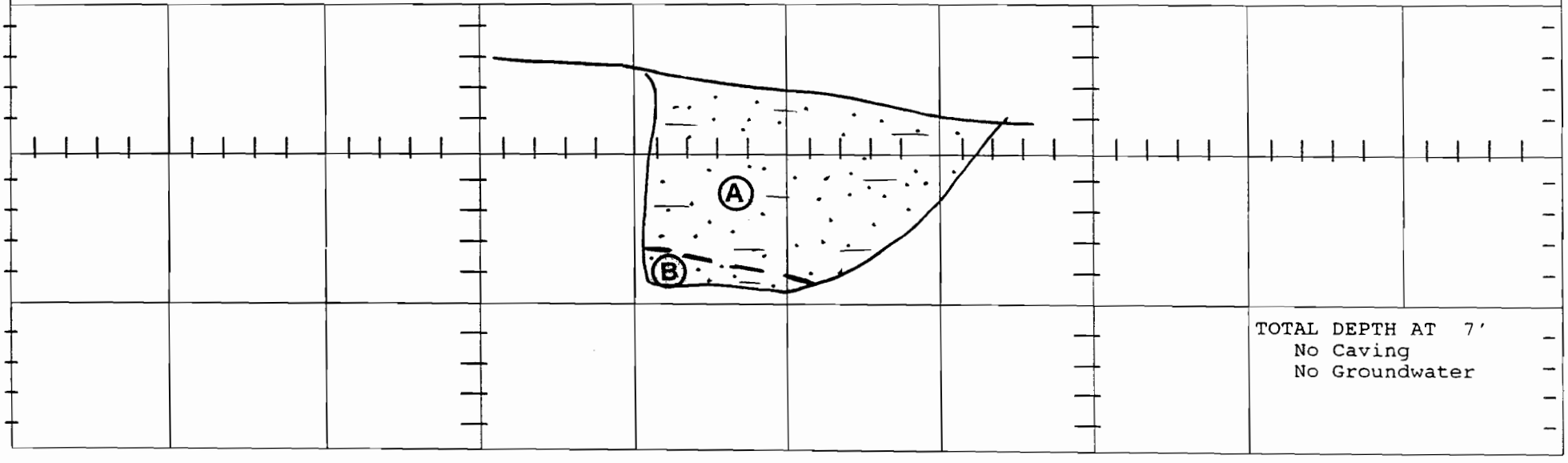
LOG OF TRENCH NO.: T-11

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1122±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Medium to dark brown, moist to very moist, loose to medium dense, silty SAND; porous		SM			
	Pauba Formation	Qp				
	B: @ 6': Olive-brown, damp, dense to very dense, fine SAND to silty fine SAND		SP/SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 16SE TREND: N50°W



501-A - (10/90)

Leighton & Associates

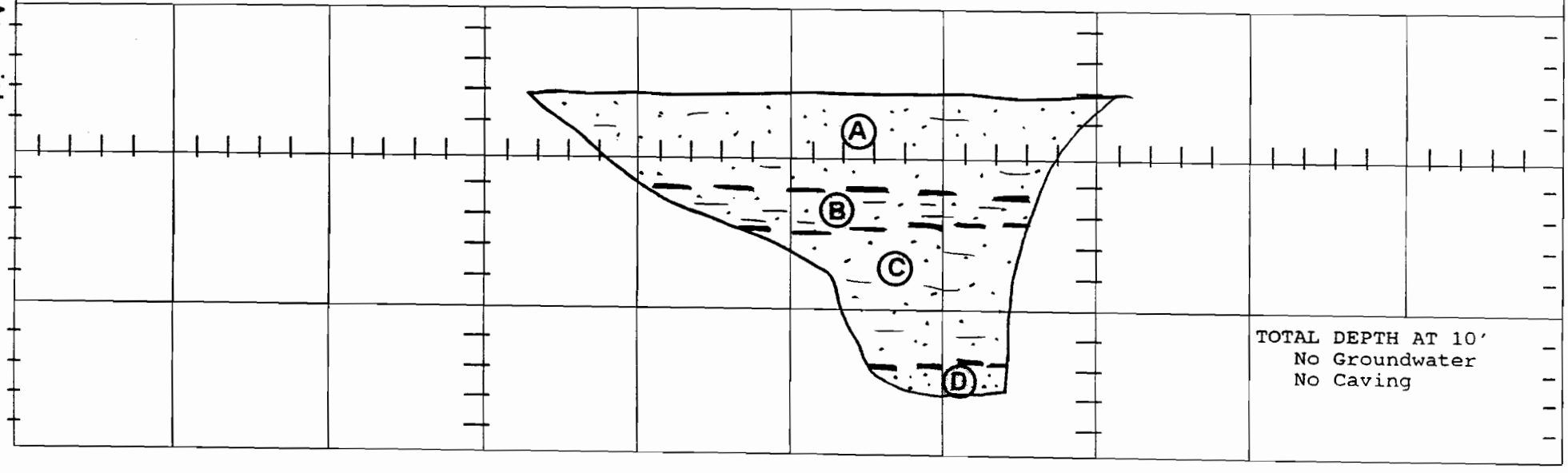
LOG OF TRENCH NO.: T-12

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1140±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0′: Dark brown, very moist, medium dense, silty SAND to clayey, silty sand		SM/SC	1		
	B: @ 3′: Grades to light brown to light red-brown, medium dense, slightly clayey, silty SAND (highly weathered Pauba Formation)					
	Pauba Formation	Qp				
	C: @ 4′: Red-brown, moist, medium dense, clayey, silty SAND; mottled		SM			
	D: @ 9′: Medium gray, damp to moist, medium dense, medium to coarse grained SAND; friable					

GRAPHIC REPRESENTATION SCALE: 1" = 5′ SURFACE SLOPE: TREND: N60°W



501-A - (10/90)

Leighton & Associates

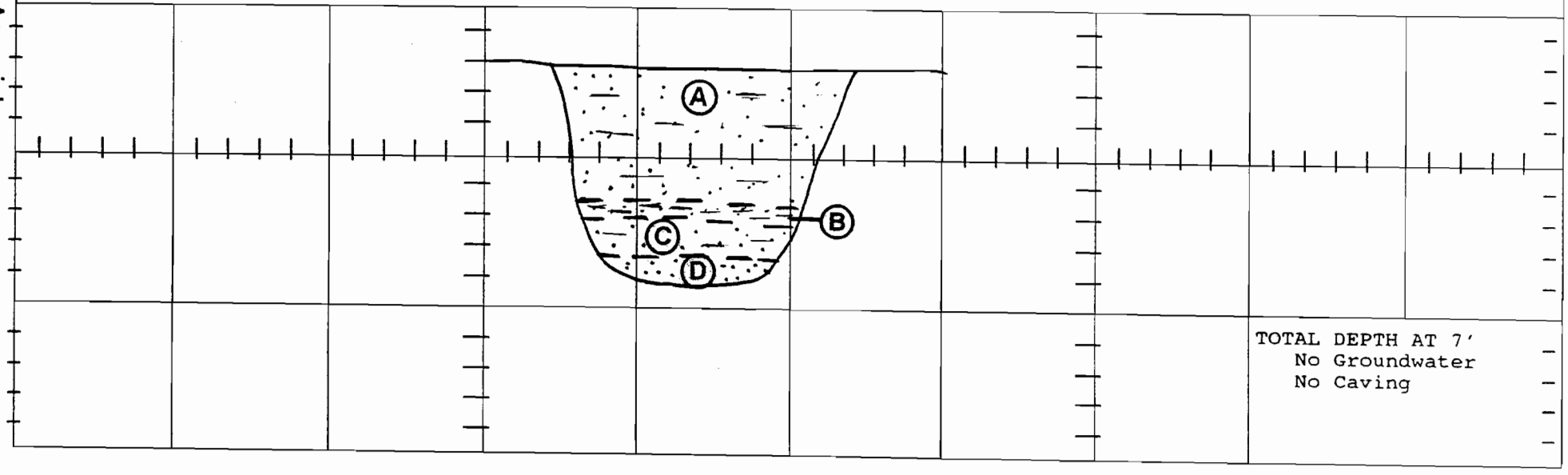
LOG OF TRENCH NO.: T-13

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1142±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown, moist, loose to medium dense, silty SAND; roots common to 2'; porous		SM			
	B: @ 4.5': Red-brown, moist, medium dense, clayey SAND; some pores					
	Pauba Formation	Qp				
	C: @ 5': Red-brown to olive-brown, moist, medium dense, clayey silty SAND; few gravels, mottled		SC			
	D: @ 6': Gray-red-brown, dense, medium SAND		SP			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: TREND:



TOTAL DEPTH AT 7'
No Groundwater
No Caving

501-A - (10/90)

Leighton & Associates

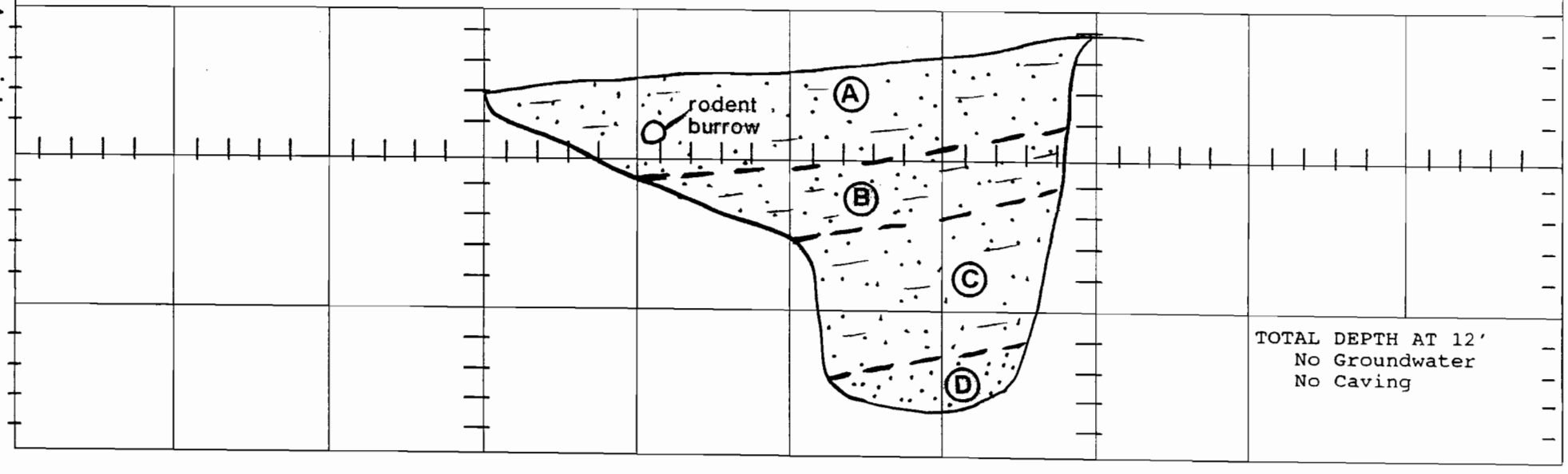
LOG OF TRENCH NO.: T-14

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1134±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown, moist to wet, loose to medium dense, silty SAND; roots common, very porous		SM			
	B: @ 3': Grades to medium brown to red-brown, moist, medium dense, slightly clayey, silty SAND		SC			
	Pauba Formation (weathered)	Qp				
	C: @ 4.5': Red-brown to medium brown, moist, medium dense, silty medium grained SAND; mottled		SM			
	D: @ 10': Gray-brown, damp to moist, medium SAND; friable					

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 12NW TREND: N65°W



501-A - (10/90)

Leighton & Associates

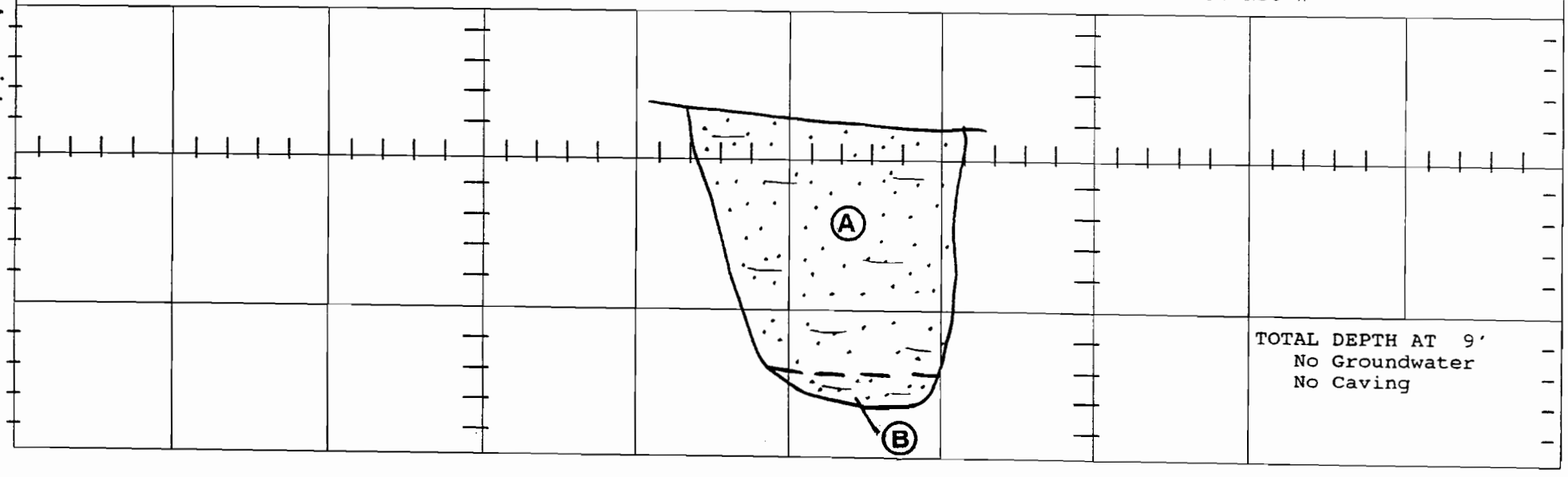
LOG OF TRENCH NO.: T-15

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1127±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Dark brown, damp to moist, loose to medium dense, silty SAND; roots common to 2', very porous		SM	1		
	Pauba Formation (Weathered)	Qp				
	B: @ 7.5': Red-brown to medium brown, damp, dense, silty SAND; mottled, few fine pores, some iron staining		SM			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: 10NW TREND: N50°W



TOTAL DEPTH AT 9'
No Groundwater
No Caving

501-A - (10/90)

Leighton & Associates

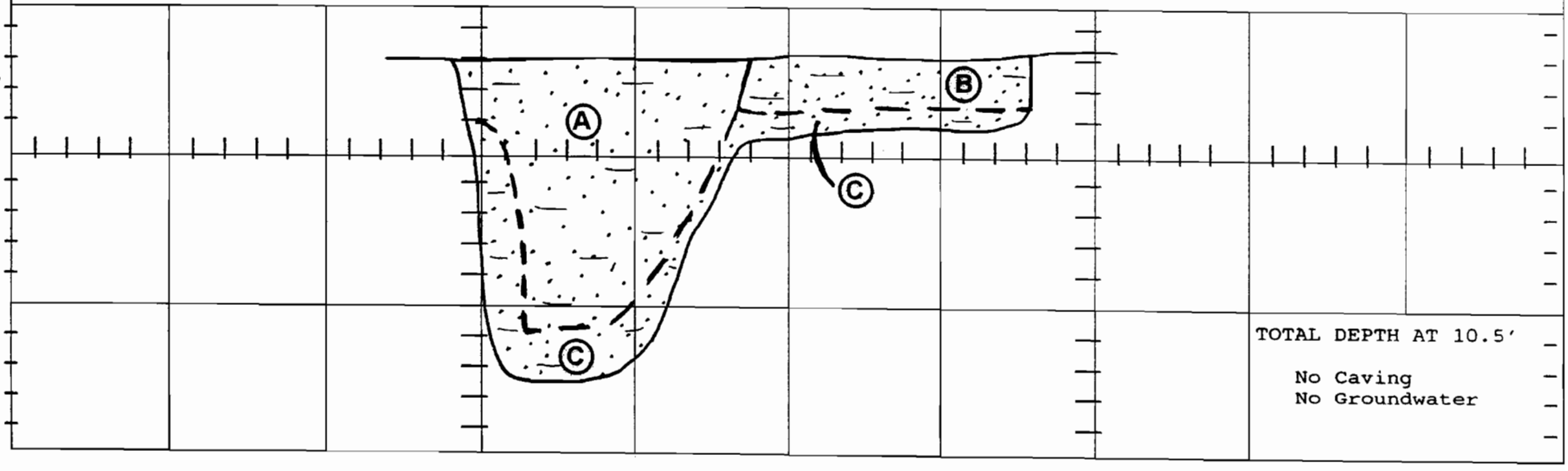
LOG OF TRENCH NO.: T-16

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1118±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Medium brown to dark brown, moist, loose (caves easily) silty SAND		SM			
	Topsoil	Col				
	B: Dark brown, moist, loose, silty SAND; some local clay; roots common		SM			
	Pauba Formation	Qp				
	C: Light olive-brown, damp, dense to very dense, silty fine SAND; mottled, iron stained		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: TREND: N75°W



TOTAL DEPTH AT 10.5'

No Caving
No Groundwater

501-A - (10/90)

Leighton & Associates

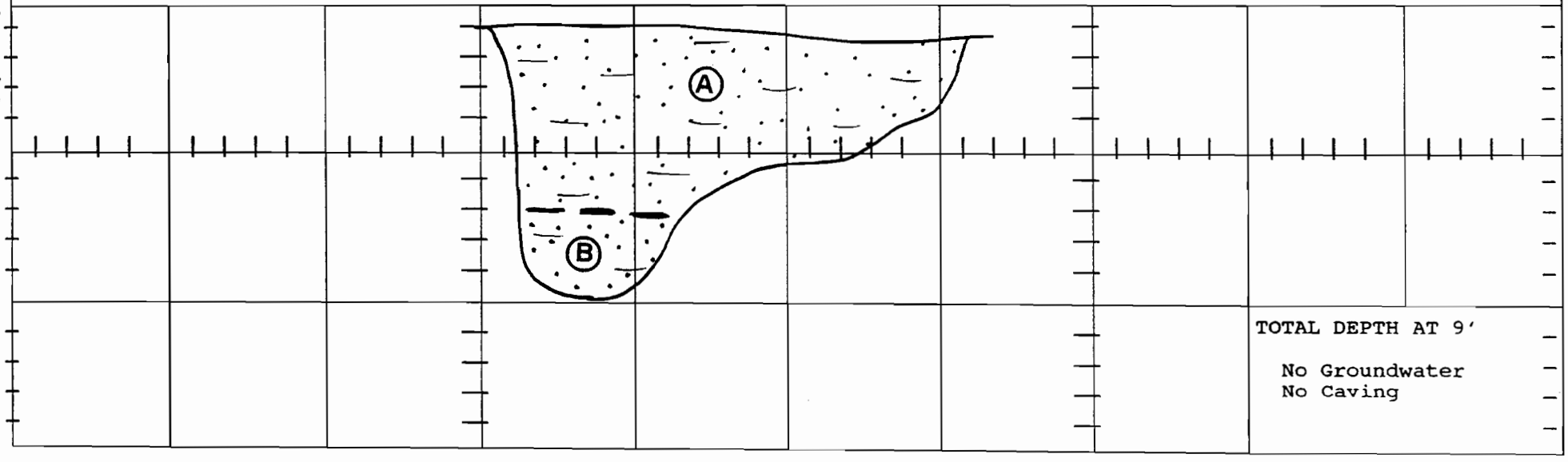
LOG OF TRENCH NO.: T-17

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1122±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Gray-brown, very moist, loose to medium dense, silty SAND; very porous to 4'		SM			
	Pauba Formation	Qp				
	B: @ 6': Gray-brown, moist, dense, silty SAND to silty medium grained sand		SM/SP			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 10W TREND: N5°E



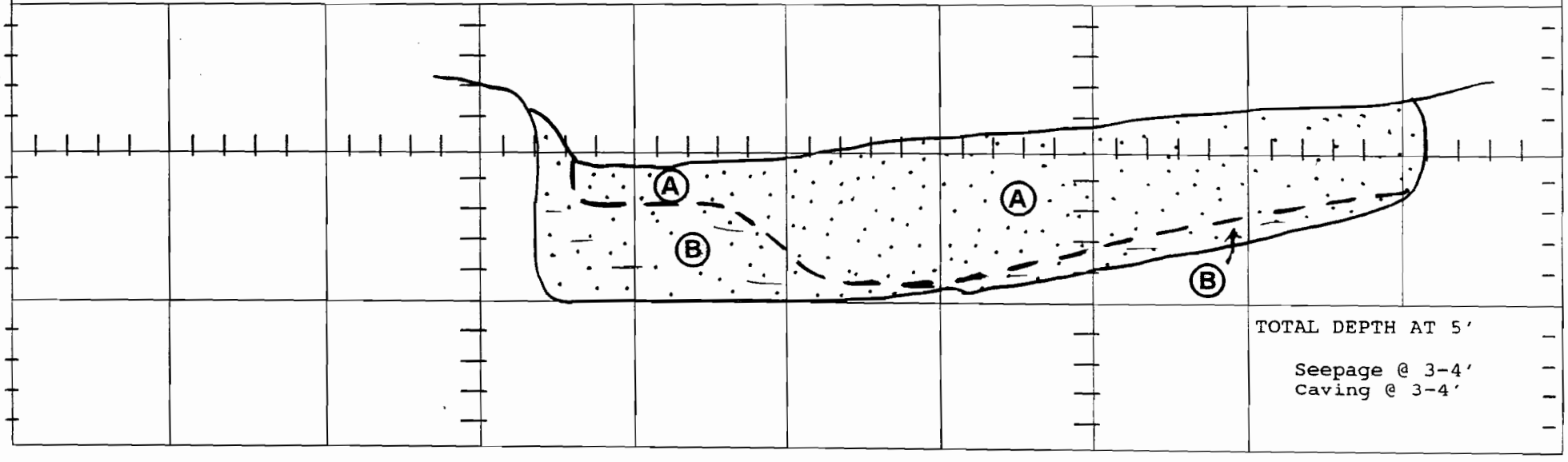
LOG OF TRENCH NO.: T-18

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1110±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Alluvium	Qal				
	A: @ 0': Gray-brown to red-brown, loose, medium grained SAND; seepage @ 3-4', local caving		SP			
	Pauba Formation	Qp				
	B: @ 5': Dark olive-brown to gray-brown, moist to very moist, medium dense, silty fine SAND		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 2S TREND: N65°W



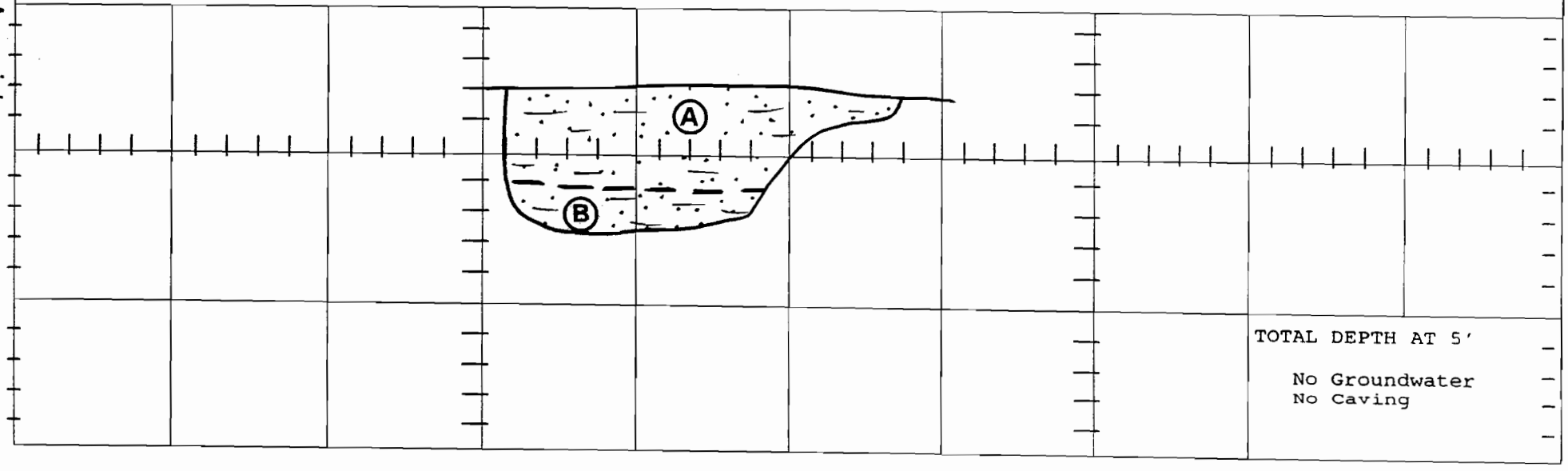
LOG OF TRENCH NO.: T-19

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1115±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark gray-brown, moist to wet, loose to medium dense, silty SAND; roots common to 1'		SM			
	Pauba Formation	Qp				
	B: @ 3': Grades to olive-gray-brown to red-brown, dense, silty SAND; some clayey sand		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 3S TREND: N60°W



501-A - (10/90)

Leighton & Associates

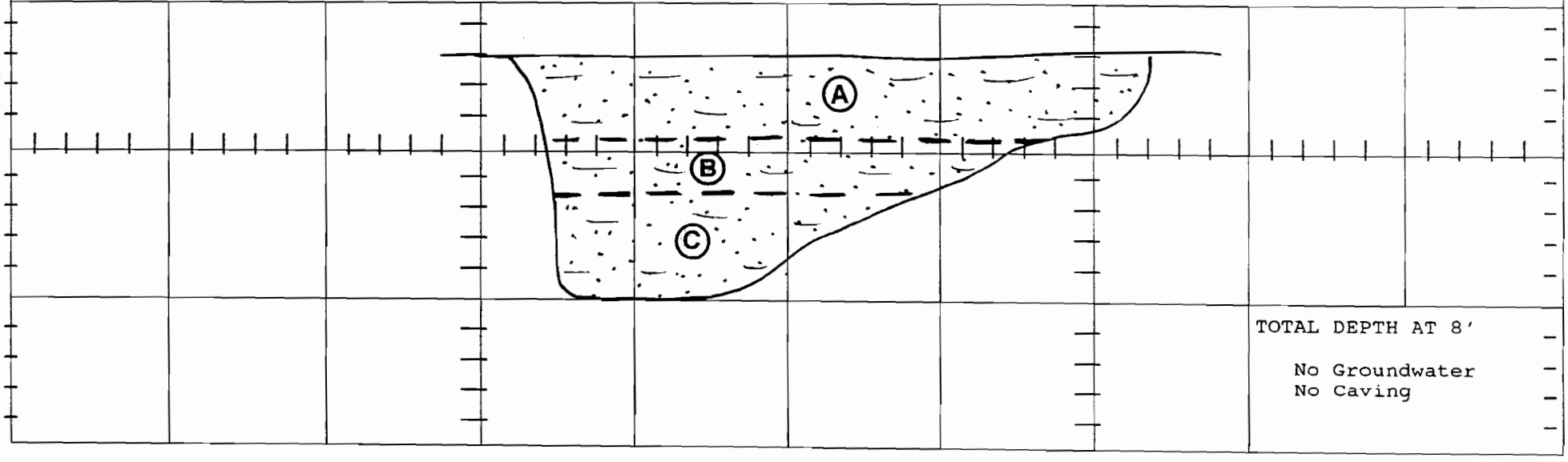
LOG OF TRENCH NO.: T-20

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1117±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown, very moist, loose to medium dense, silty SAND; very porous		SM			
	Highly Weathered Pauba					
	B: @ 3': Dark brown to olive dark red-brown, moist, medium dense, silty fine SAND; locally porous		SM			
	Pauba Formation	Qp				
	C: @ 4.5': Olive-brown to red-brown, moist, dense to very dense, silty fine SAND to slightly clayey, medium sand		SM-SC			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 3NW TREND: N50°W



501-A - (10/90)

Leighton & Associates

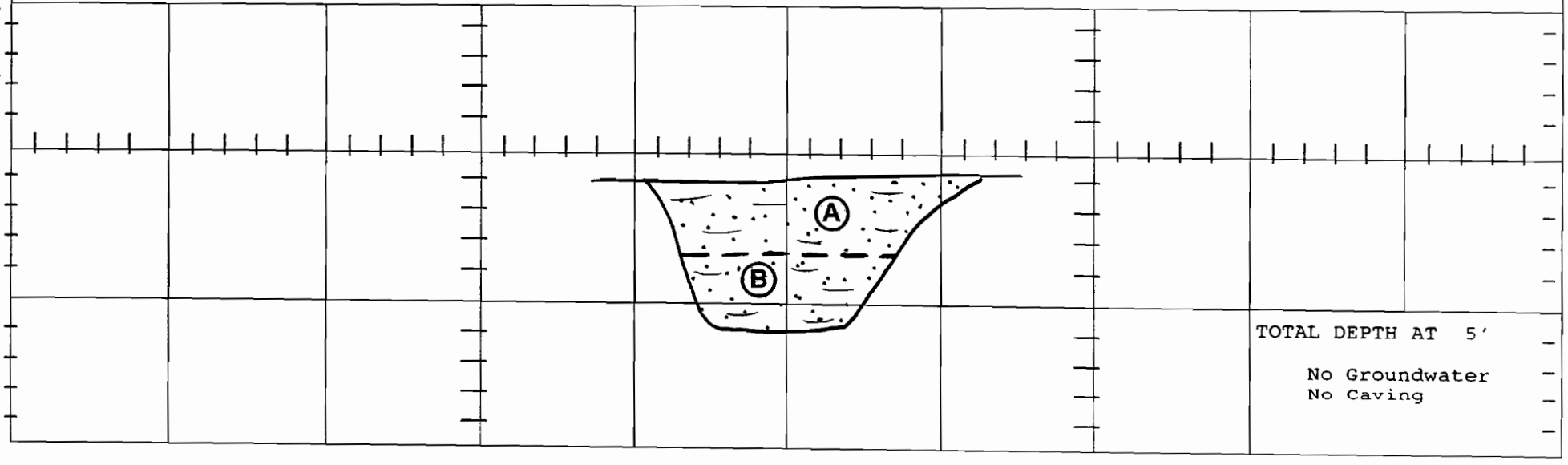
LOG OF TRENCH NO.: T-21

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1114±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil	Col				
	A: @ 0′: Dark brown, moist, medium dense, silty SAND, abundant roots		SM			
	Pauba formation	Qp				
	B: @ 2.5′: Olive-brown to red-brown, moist, dense to very dense, silty SAND		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5′ SURFACE SLOPE: 0 TREND: N20°W



501-A - (10/90)

Leighton & Associates

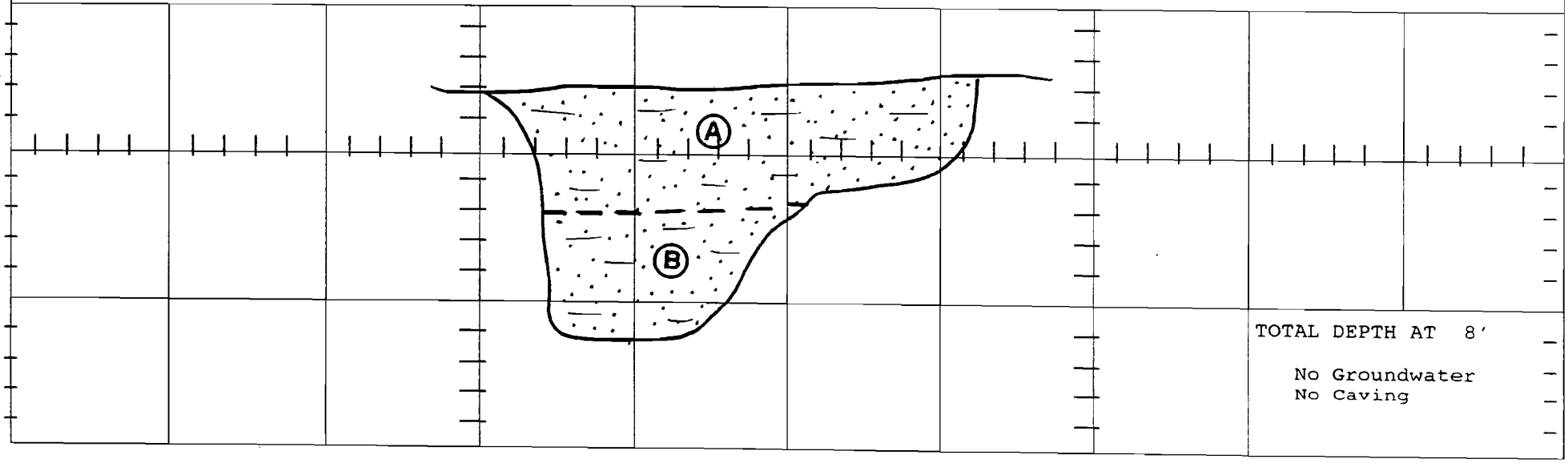
LOG OF TRENCH NO.: T-22

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1118±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark Brown, moist, loose to medium dense, silty, fine SAND; very porous		SM			
	Highly Weathered Pauba (?)	Qp(?)				
	B: @ 4': Dark brown to medium red-brown, moist, medium dense to dense, silty, very fine SAND; some mica, few pores to 6'		SM			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: 2SW TREND: N20°W



501-A - (10/90)

Leighton & Associates

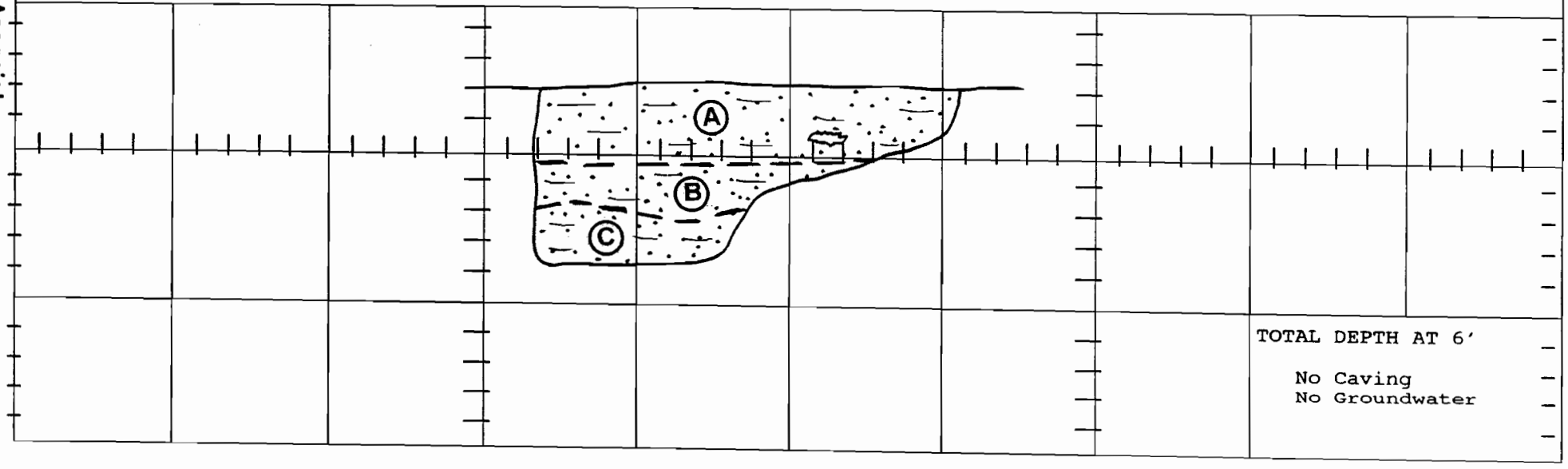
LOG OF TRENCH NO.: T-23

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1118±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moist. (%)	Density (pcf)
	Fill	Afu				
	A: @ 0': Dark brown to medium brown, moist, dense, silty SAND; some wood debris		SM			
	Topsoil	Col				
	B: @ 2.5': Brown, dry, medium dense, silty SAND; very porous, few roots		SM			
	Pauba Formation	Qp				
	C: @ 4': Olive-brown, damp, very dense, silty SAND		SM			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: TREND: °



501-A - (10/90)

Leighton & Associates

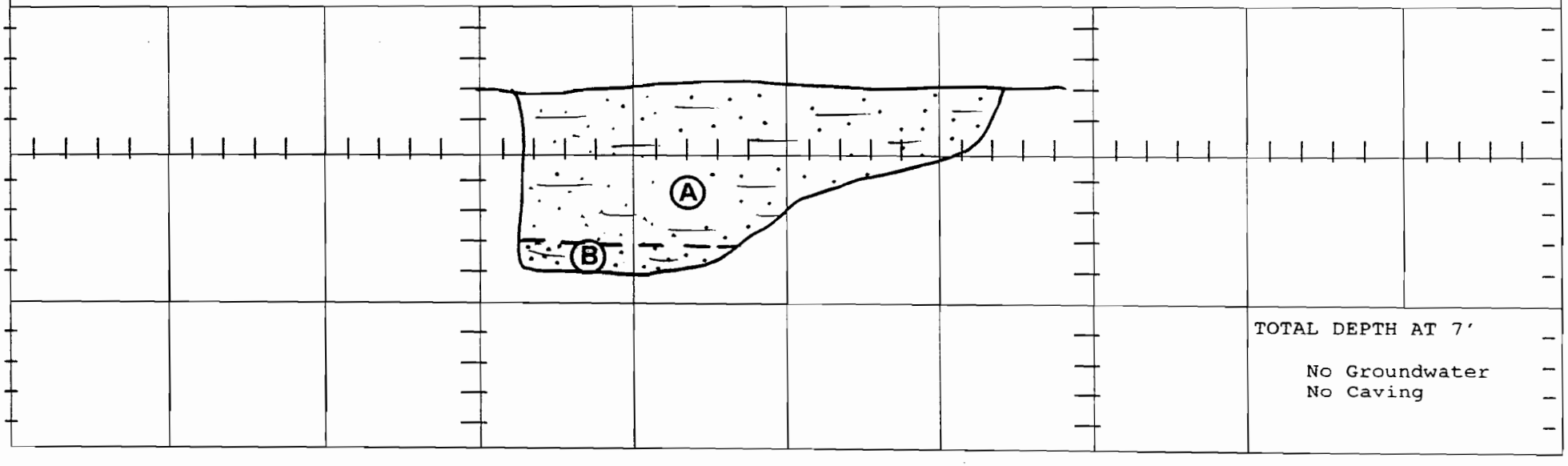
LOG OF TRENCH NO.: T-24

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1222±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown dry to moist, medium dense, silty fine SAND; very porous to 4'		SM			
	Pauba Formation	Qp				
	B: @ 5': Light olive gray, damp, dense to very dense, silty medium SAND; some mica		SM			

GRAPHIC REPRESENTATION Northwall SCALE: 1" = 5' SURFACE SLOPE: 5W TREND: N15°W



501-A - (10/90)

Leighton & Associates

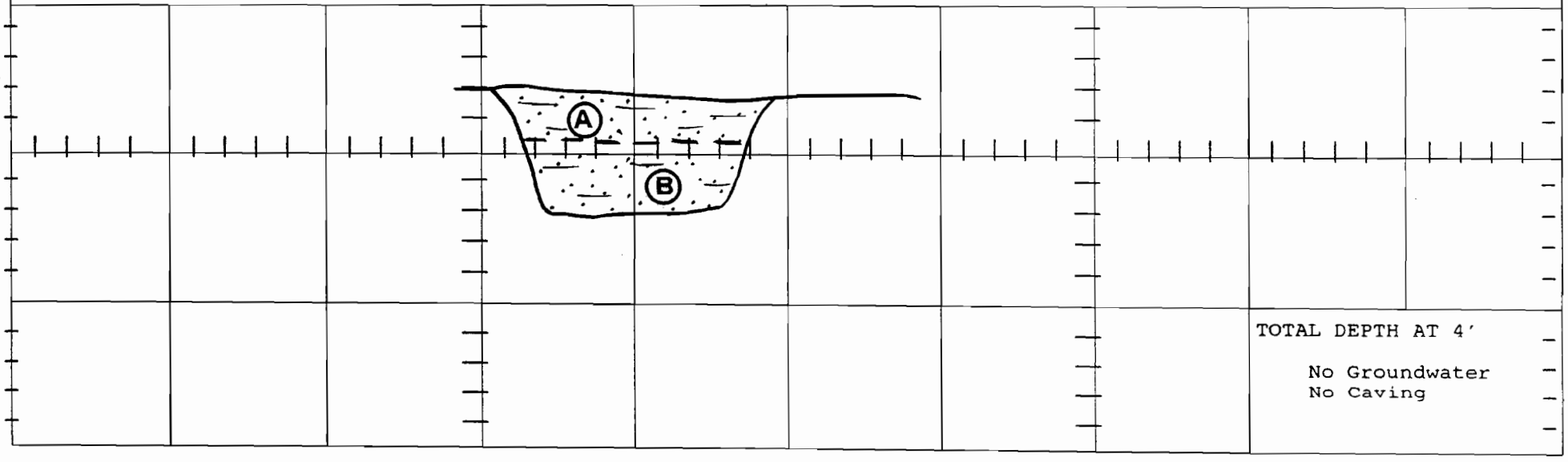
LOG OF TRENCH NO.: T-25

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1132±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Pauba formation	Qp	SM			
	A: @ 0': Medium olive-brown to gray-brown, moist, medium dense to dense, silty fine to medium SAND					
	B: @ 2': Gray-brown to red-gray-brown, moist, dense to very dense, silty, medium grained SAND; some silt, trace of clay, mica		SM-SC			

GRAPHIC REPRESENTATION Eastwall SCALE: 1" = 5' SURFACE SLOPE: 3W TREND: N15°W



501-A - (10/90)

Leighton & Associates

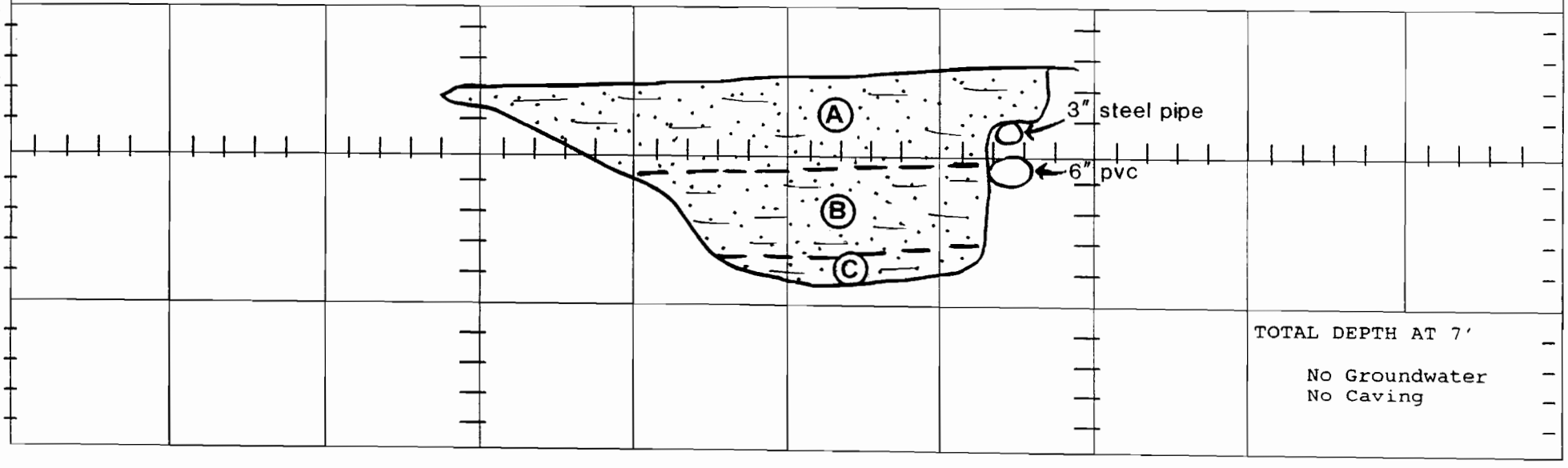
LOG OF TRENCH NO.: T-26

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1146±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark gray-brown, moist, medium dense, silty SAND; abundant roots, very porous		SM			
	B: @ 3': Grades to dark red-brown, very moist to wet, loose to medium dense, slightly clayey, silty SAND; abundant roots, porous		SM/SC			
	Pauba formation	Qp				
	C: @ 6': Gray-brown to red-brown, damp to moist, dense to very dense, silty SAND		SM			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: 3SE TREND: N15°W



501-A - (10/90)

Leighton & Associates

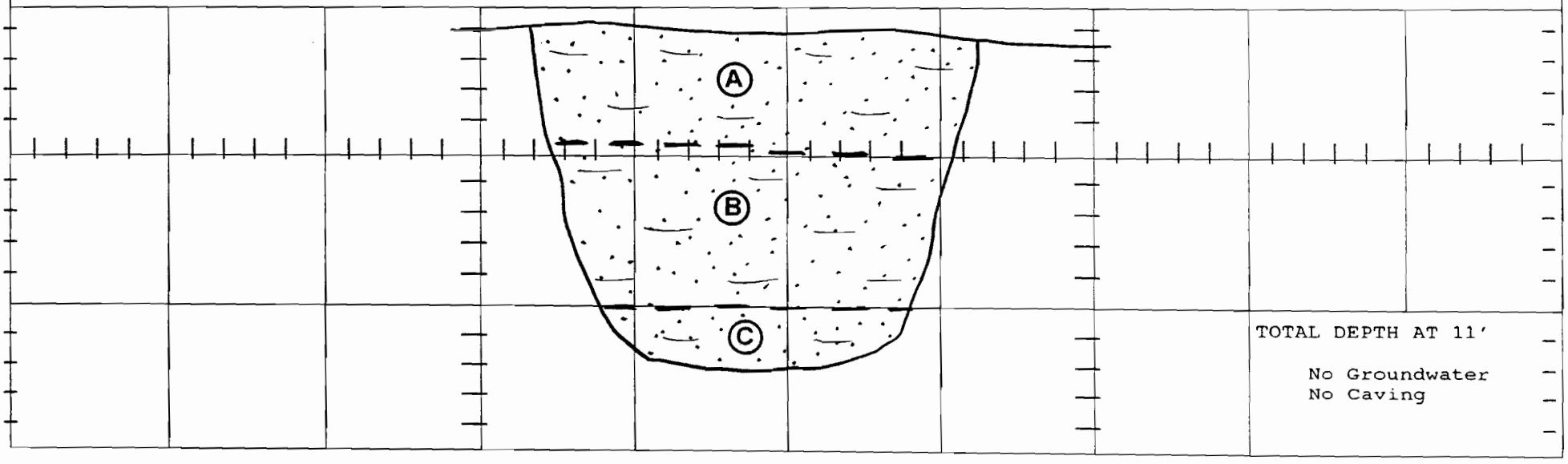
LOG OF TRENCH NO.: T-27

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1145±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark gray-brown, moist, loose to medium dense, silty SAND; very porous		SM			
	B: @ 4': Grades to dark brown to dark red-brown, moist, medium dense, silty SAND; porous to locally very porous; (highly weathered pauba)		SM			
	Pauba Formation	Qp				
	C: @ 9': Medium red-brown, damp to moist, dense to very dense silty SAND to medium grained sand; trace of clay		SM			

GRAPHIC REPRESENTATION Westwall SCALE: 1" = 5' SURFACE SLOPE: 3NW TREND: N10°W



501-A - (10/90)

Leighton & Associates

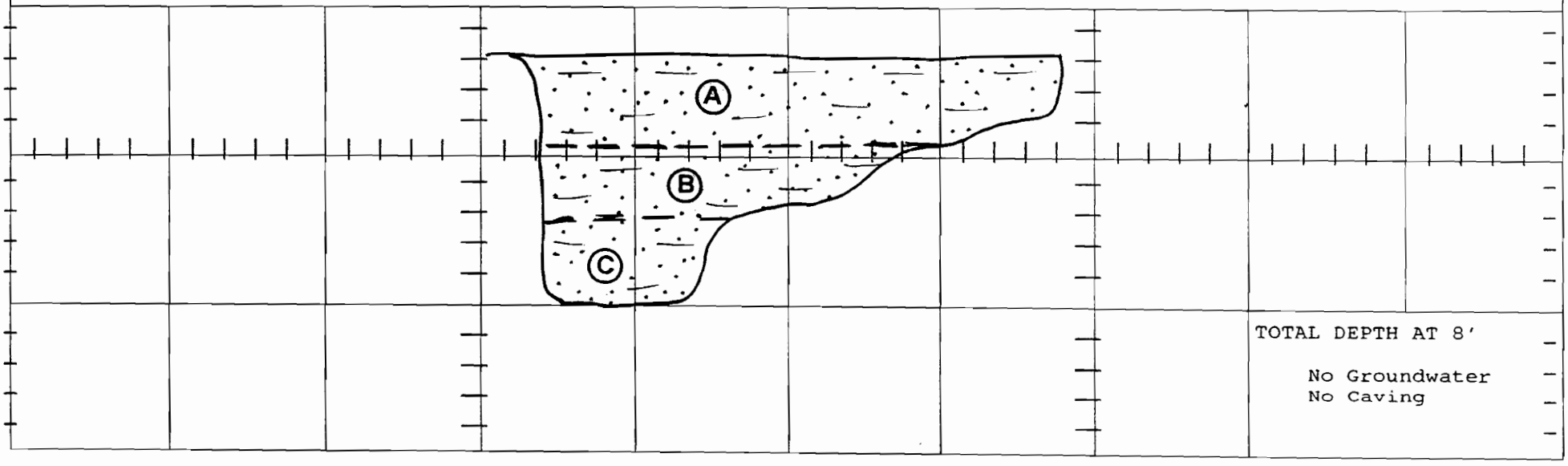
LOG OF TRENCH NO.: T-28

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1153±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil/Colluvium	Col				
	A: @ 0': Dark brown to gray-brown, moist, loose to medium dense, silty SAND; abundant roots, very porous		SM			
	B: @ 3': Grades to dark red-brown, moist, medium dense, slightly clayey, silty SAND; porous, few gravels		SM/SC	1		
	Pauba formation	Qp				
	C: @ 5': Olive-gray to medium gray-brown, moist, dense, silty fine SAND; some iron staining, mottled					

GRAPHIC REPRESENTATION Southwestwall SCALE: 1" = 5' SURFACE SLOPE: TREND: N15°W



501-A - (10/90)

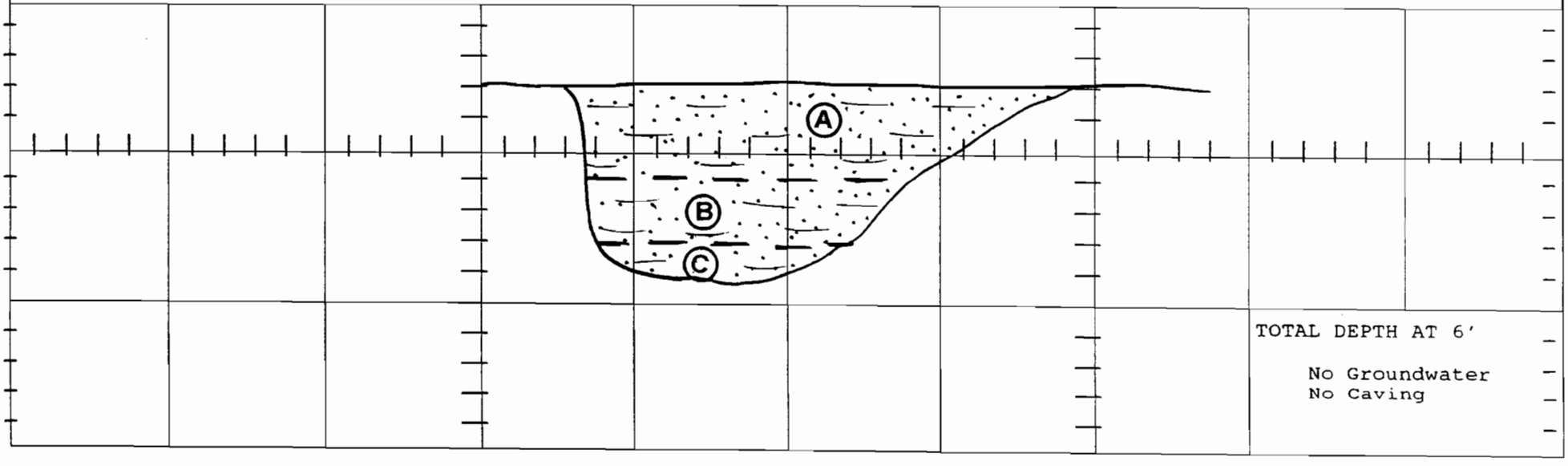
Leighton & Associates

LOG OF TRENCH NO.: T-29

Project Name: RogersDale	**Logged by:** RFR	ENGINEERING PROPERTIES
Project Number: 11980052-001	**Elevation:** 1145±	
Equipment: Case 580 Backhoe	**Location:** See Geotechnical Map	

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil	Col				
	A: @ 0': Dark brown to gray-brown, moist to wet, loose to medium dense, silty SAND; very porous		SM	1		
	B: @ 3': Grades to medium red-brown, moist, medium dense, silty SAND; trace of clay, moderately porous		SM			
	Pauba Formation	Qp				
	C: @ 5': Gray-brown to red-gray-brown, moist, dense, silty fine to medium SAND; trace of clay		SM/SC	2		

GRAPHIC REPRESENTATION Southwestwall SCALE: 1" = 5' SURFACE SLOPE: 0 TREND: N25°W



501-A - (10/90)

Leighton & Associates

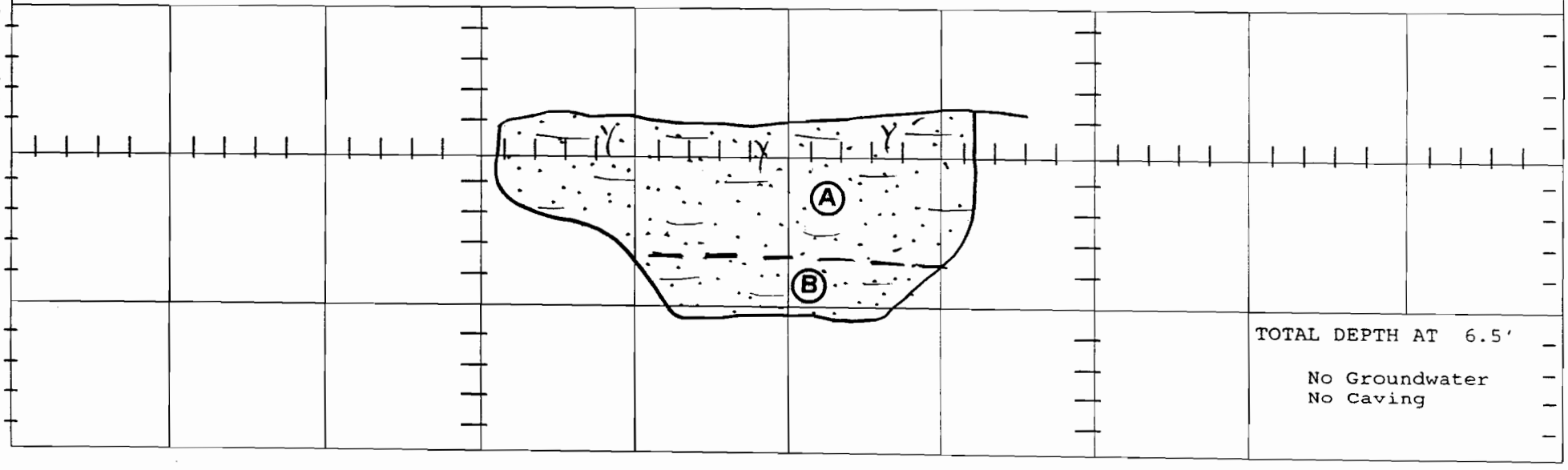
LOG OF TRENCH NO.: T-30

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1140±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moist. (%)	Density (pcf)
	Topsoil	Col				
	A: @ 0': Dark brown, moist, loose to medium dense, silty SAND; very porous, roots		SM			
	Pauba formation	Qp				
	B: @ 4.5': Gray-brown to red-gray-brown, damp, dense to very dense, silty SAND; grades to medium to coarse sand; slightly porous		SM/SP			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: 0 TREND: N45°W



TOTAL DEPTH AT 6.5'

No Groundwater
No Caving

501-A - (10/90)

Leighton & Associates

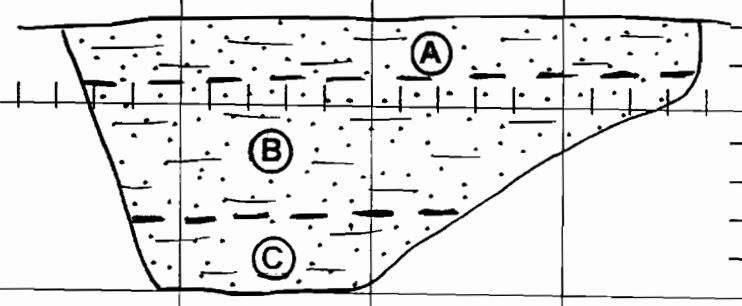
LOG OF TRENCH NO.: T-31

Project Name: RogersDale
Project Number: 11980052-001
Equipment: Case 580 Backhoe

Logged by: RFR
Elevation: 1141±
Location: See Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 3-3-98 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moist. (%)	Density (pcf)
	Fill	Afu				
	A: @ 0': Dark gray to red-brown, damp, dense, silty SAND		SM			
	Topsoil/Colluvium	Col				
	B: @ 1.5': Dark gray-brown, moist, loose to medium dense, silty SAND; very porous		Sp			
	Pauba formation	Qp				
	C: @ 5': Dark gray-brown, moist, dense to very dense, silty SAND; trace of clay		SM/SC			

GRAPHIC REPRESENTATION SCALE: 1" = 5' SURFACE SLOPE: TREND: °



TOTAL DEPTH AT 7'

No Groundwater
No Caving

501-A - (10/90)

Leighton & Associates

MB-1

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1136.0 feet	BORING	B- 1

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, semicompact, fine SILTY SAND with minor clay and coarse sand, slightly moist.
	125	9.5	30	2.5	2				. . . traces of fine gravel
			19	1.4	3	5			. . . coarsens to fine to medium SAND, only trace clay
	118	7.9	26	2.5	4			SM	Red-brown, semicompact, fine to coarse SILTY SAND with fine gravel, slightly moist.
			13	1.4	5	10			

Notes:

1. Total depth of boring was 11.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-2

TEST BORING LOG

TYPE: 8" Hollow Stem Auger | ELEVATION: ~1125.0 feet | BORING: B-2

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Light brown, semicompact SILTY SAND, dry to slightly moist.
	121	5.2	32	2.5	2				... traces of CLAY
			21	1.4	3	5			
				bag	4			SC	Light brown, compact, fine CLAYEY SAND with minor SILT, slightly moist to moist.
	123	12.0	44	2.5	5				
			24	1.4	6	10		SP	Brown, compact to dense, fine to coarse, micaceous SAND with minor SILT, moist.
									... only trace SILT and fine SAND; scattered fine to medium GRAVEL
	112	8.1	34	2.5	7	15			
									... only trace GRAVEL
			43	1.4	8	20			
	110	9.1	43	2.5	9	25		CL	Light olive brown micaceous SANDY CLAY, moist.
								SM	Light olive, semicompact, fine SILTY SAND with CLAY, moist.
			15	1.4	10	30			
driven 11"	120	8.7	50	2.5	11	35		SP SM	Olive brown, dense, micaceous, fine to medium SAND with minor SILT, slightly moist to moist, locally voided.
									... fine to coarse SAND with SILT, with lenses of coarse SAND
									... clean fine to medium SAND
			43	1.4	12	40		ML	Olive, very stiff, micaceous CLAYEY SILT, moist.

Notes:

1. Total depth of boring was 41.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-3

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1129.0 feet	BORING	B- 3

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Brown SANDY SILT with scattered voids, slightly moist, slightly to moderately indurated.
	110	4.2	34	2.5	2			SM	Brown, compact, fine to coarse SILTY SAND, slightly moist, moderately indurated.
			24	1.4	3	5			. . . less coarse sand; minor CLAY
	105	12.1	27	2.5	4			SM	Red-brown, compact to dense, micaceous, fine to coarse SILTY SAND, moist.
			31	1.4	5	10			
	109	7.9	48	2.5	6	15			. . . minor SILT
			48	1.4	7	20			. . . higher SILT content
									. . . scattered fine to medium GRAVEL
	112	5.0	55	2.5	8	25			
			53	1.4	9	30			. . . trace CLAY; only trace GRAVEL

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY	BHR	DATE	7-20-92

MB-4

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1121.0 feet	BORING	B- 4

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Light red-brown SANDY SILT, root voids, slightly moist, moderately indurated.
	115	6.7	42	2.5	2				
	114	9.4	21	2.5	3	5		SM	Light red-brown, fine to medium SILTY SAND; poorly indurated
			31	1.4	4			SC	Red-brown and olive brown, compact, micaceous, fine CLAYEY SAND, moist.
	123	8.6	36	2.5	5	10		SM	Red-brown, fine to coarse SILTY SAND, moist.
								SC	Gray-brown, fine to coarse CLAYEY SAND, moist, moderately indurated.
			39	1.4	6	15		SM	Red-brown, dense, fine to medium SILTY SAND, moist.
	111	8.8	40	2.5	7	20		SP SM	Light red-brown, fine to coarse SAND with SILT, very moist.
			12	1.4	8	25		ML	Olive to red-brown, stiff, micaceous CLAYEY SILT, moist, slightly indurated.
	119	13.9	29	2.5	9	30		SM	Olive-brown, micaceous, fine SILTY SAND with trace clay, moist, slightly indurated.

Notes:

1. Total depth of boring was 31 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-5

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1118.0 feet	BORING	B-5

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Olive SANDY SILT with minor CLAY. slightly moist to moist.
	100	13.9	5	2.5	2				
			31	1.4	3	5		SM	Light red-brown, compact, fine to medium SILTY SAND with thin lenses of fine to medium clayey sand.
				bag	4				
driven 11"	113	4.3	50	2.5	5			SM	Light brown to light olive-brown, dense, fine micaceous SILTY SAND, moist.
				bag	6				
			72	1.4	7	10			. . . color change to red-brown; only trace SILT
	104	8.3	44	2.5	8	15		SP	Red-brown, fine to coarse SAND, moist.

Notes:

1. Total depth of boring was 16 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-6

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1131.0 feet	BORING	B- 6

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Light red-brown SANDY SILT, slightly moist, moderately indurated.
	107	3.5	38	2.5	2				
			28	1.4	3	5		SM	Light red-brown, compact, fine to medium SILTY SAND, slightly moist, moderately indurated.
	110	5.8	41	2.5	4			SM	Red-brown, fine to coarse SILTY SAND, slightly moist, poorly indurated.
			29	1.4	5	10		SM	Light red-brown, compact, fine to medium SILTY SAND, slightly moist, poorly indurated.

Notes:

1. Total depth of boring was 11.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-7

TEST BORING LOG

TYPE	8" Hollow Stem Auger						ELEVATION ~1126.0 feet	BORING B-7
							ML	PAUBA FORMATION: Light red-brown SANDY SILT with clay locally, slightly moist.
driven 10.5"	104	8.0	50	2.5	1		SM	Brown, fine to medium SILTY SAND with traces of clay, voids, slightly moist, poorly to moderately indurated.
				bag	2			
			44	1.4	3	5	SM	Red-brown, dense, fine to coarse SILTY SAND, moist.
								. . . 3" bed of dark brown fine to coarse SAND
	114	13.3	49	2.5	4	10	SM	Light brown, fine, micaceous SILTY SAND, locally clayey, moist.

Notes:

1. Total depth of boring was 10 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-20-92

MB-8

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1141.0 feet	BORING	B- 8

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to coarse SILTY SAND with minor clay and traces of fine to medium gravel, voids, slightly moist, moderately indurated.
driven 11"	121	5.4	50	2.5	2				
			47	1.4	3	5		SP	Light red-brown, dense, fine to medium SAND with traces of SILT, scattered pinhole voids, slightly moist, poorly to moderately indurated.
	109	3.7	36	2.5	4				. . . becomes fine to coarse; very poorly indurated
			23	1.4	5	10			. . . compact

Notes:

1. Total depth of boring was 11.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-21-92

MB-9

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1134.5 feet	BORING	B-9

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to medium SILTY SAND with minor clay locally, voids, slightly moist.
	113	5.3	17	2.5	2				
			9	1.4	3	5		SP	Light red-brown, loose, fine to coarse, micaceous SAND with minor CLAY, slightly moist.
	108	6.6	16	2.5	4				. . . CLAY absent below approximately 7'
									. . . traces of SILT below approximately 9'
			28	1.4	5	10			. . . compact
	106	4.3	39	2.5	6	15			. . . traces of fine GRAVEL and CLAY below approximately 17'
			48	1.4	7	20			. . . dense

Notes:

1. Total depth of boring was 21.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-21-92

MB-10

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1127.5 feet	BORING	B-10

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, semicompact, fine to coarse SILTY SAND, dry to slightly moist.
	105	2.7	25	2.5	2				
			15	1.4	3	5			. . . traces of fine GRAVEL
	110	7.0	14	2.5	4			SP	Red-brown, semicompact, fine to coarse, micaceous SAND with traces of SILT, moist.
			16	1.4	5	10			. . . fine to medium SAND
	117	8.9	34	2.5	6	15		SP	Red-brown, fine to coarse SAND, minor SILT and CLAY, moist.
			33	1.4	7	20		SP	Olive-brown, compact, fine micaceous SAND, minor SILT, moist.
	110	7.1	45	2.5	8	25		SP	Red-brown, fine to coarse micaceous SAND, minor SILT and fine GRAVEL, moist.
			25	1.4	9	30		SC	Olive, compact, fine CLAYEY SAND, moist.

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-21-92

MB-11

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1121.5 feet	BORING	B-11

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			ML	PAUBA FORMATION: Red-brown SANDY SILT, voids, slightly moist, poorly indurated.
	108	3.8	42	2.5	2				
	114	7.1	23	2.5	3	5		SM	Red-brown, fine to coarse SILTY SAND, voids, moist, very poorly indurated.
			21	1.4	4			SP	Light red-brown, compact to dense, fine to medium SAND, traces of SILT, moist.
	111	7.9	29	2.5	5	10			. . . fine to coarse SAND with fine GRAVEL
			50	1.4	6	15			
								SM	Olive, semicompact, fine micaceous SILTY SAND, moist.
	115	10.1	39	2.5	7	20			. . . lenses of fine to coarse SILTY SAND
			14	1.4	8	25			. . . traces of CLAY
								SM	Olive, fine to coarse micaceous SILTY SAND, voids, moist, poorly indurated.
driven 11"	117	7.5	55	2.5	9	30			. . . coarsens downward with scattered fine GRAVEL

Notes:

1. Total depth of boring was 31 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-21-92

NB-12

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1128.5 feet	BORING	B-12

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SP	PAUBA FORMATION: Red-brown, fine to coarse micaceous SAND, scattered fine GRAVEL, minute voids, slightly moist.
	119	6.4	40	2.5	2				
			24	1.4	3	5		SM	Light red-brown, compact, fine to coarse SILTY SAND, slightly moist.
	111	6.6	28	2.5	4				
			26	1.4	5	10			. . . becomes micaceous
								SP	Red-brown, fine to coarse, micaceous SAND, moist.
	106	8.3	37	2.5	6	15			. . . lense of fine to medium SILTY SAND

Notes:

1. Total depth of boring was 16 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY **BHR** DATE 7-21-92

MB-13

TEST BORING LOG

TYPE: 8" Hollow Stem Auger | ELEVATION: ~1142.0 feet | BORING: B-13

DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	UNIFIED SOIL CLASS.	STRIKE/DIP and other DEPTH-SPECIFIC NOTES
			bag	1		ML	PAUBA FORMATION: Brown SANDY SILT, traces of CLAY, voids, slightly moist.
123	6.4	23	2.5	2			
		14	1.4	3	5	SC	Brown, semicompact, fine to medium CLAYEY SAND, traces of SILT and coarse SAND, slightly moist.
120	9.8	19	2.5	4		SM	Brown, fine to coarse SILTY SAND, scattered fine GRAVEL, moist.
101	8.4	19	2.5	5	10	SP	Light red-brown, compact, fine to coarse, micaceous SAND, traces of fine to medium GRAVEL, moist.
		22	1.4	6			
111	5.4	32	2.5	7	15		
		34	1.4	8	20		. . . lense of fine to medium SILTY SAND
109	6.2	40	2.5	9	25		

Notes:

1. Total depth of boring was 26 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY: BHR | DATE: 7-21-92

MB-14

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1135.0 feet	BORING	B-14

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SP	PAUBA FORMATION: Red-brown, compact, fine to coarse SAND, minor SILT and CLAY, voids, dry to slightly moist, moderately indurated.
	124	5.8	44	2.5	2				
			31	1.4	3	5			
	110	7.5	20	2.5	4				. . . traces of fine GRAVEL, slightly moist to moist
			34	1.4	5	10			
	108	3.7	32	2.5	6	15			

Notes:

1. Total depth of boring was 16 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY **BHR** DATE 7-21-92

MB-15

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1144.0 feet	BORING	B-15

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to medium SILTY SAND, numerous voids, dry, poorly to moderately indurated.
	111	4.4	39	2.5	2				
			17	1.4	3	5			. . . becomes more clayey
								SC	Red-brown, semicompact, fine to coarse CLAYEY SAND, scattered fine GRAVEL, scattered voids, slightly moist, poorly indurated.
	118	8.6	20	2.5	4			SP	
			22	1.4	5	10		SC	Brown, fine to coarse SAND, traces of SILT and scattered fine GRAVEL, slightly moist to moist.
									Red-brown, compact, fine to coarse CLAYEY SAND, minor SILT, moist.
	113	5.2	33	2.5	6	15			. . . scattered fine GRAVEL
								SP	Light red-brown, compact, fine to medium SAND, minor SILT, slightly moist to moist.
			35	1.4	7	20			
	100	6.4	37	2.5	8	25			. . . thin lenses of medium to coarse SAND
								SM	Red-brown, dense, fine to coarse SILTY SAND, moist.
			51	1.4	9	30			

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/22/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-22-92

MB-16

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1144.0 feet	BORING	B-16

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine SILTY SAND, traces of CLAY, dry to slightly moist, poorly indurated.
	118	9.5	22	2.5	2	5		SC	Red-brown, fine to coarse CLAYEY SAND, traces of SILT, voids, moist, poorly indurated.
			11	1.4	3	10		SP	Light red-brown, semicompact, fine to coarse SAND, traces of SILT, moist.
	109	5.0	34	2.5	4	15		SP	Light red-brown, compact, fine to medium, micaceous SAND, traces of SILT, traces of CLAY locally, moist. . . . thin beds with coarse SAND
			34	1.4	5	20			. . . fine to coarse SAND below approximately 19'
	112	5.6	40	2.5	6	25		SM	Light tan to red-brown, fine to coarse SILTY SAND with fine to medium GRAVEL, traces of CLAY locally, slightly moist.
			56	1.4	7	30		SM	Olive-brown, dense, fine to medium SILTY SAND, moist.
	108	20.6	30	2.5	8	35		SM	Olive-brown, fine to medium, micaceous SILTY SAND with traces of CLAY, locally, scattered minute voids, moist.
			88	1.4	9	40		SM	Pale brown, dense, fine to coarse SILTY SAND with scattered fine GRAVEL, moist.
	123	14.7	46	2.5	10	45		SC	Olive, fine CLAYEY SAND with SILT, minute voids, moist, poorly indurated.
			16	1.4	11	50			. . . lens of fine micaceous SILTY SAND

Notes:

1. Total depth of boring was 51.5 feet.
2. No groundwater was encountered.
3. No caving was.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/22/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-22-92

MB-17

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1142.0 feet	BORING	B-17

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, semicompact, fine SILTY SAND, traces of CLAY and coarse SAND, slightly moist to moist.
			14	1.4	2	5		SM	Red-brown, compact, fine to coarse, micaceous SILTY SAND, moist.
	112	9.4	14	2.5	3	10			
			33	1.4	4	15			
	118	11.7	29	2.5	5	20			. . . traces of fine GRAVEL
			49	1.4	6	25		SM	Light red-brown, dense, fine to coarse SILTY SAND with scattered fine GRAVEL, moist. . . . bed of olive, fine, micaceous SILTY SAND
	118	11.7	24	2.5	7	30			. . . less SILTY, very moist to wet
	115	10.9						SM	Olive, dense, fine to medium SILTY SAND, traces of mica, moist to very moist.
			40	1.4	8	35			. . . color change to olive-brown; micaceous
driven 11"	126	10.0	55	2.5	9	40			. . . fine SAND with traces of CLAY . . . change to light olive, less SILTY, compact
			29	1.4	10	45		SC	Light olive, compact, fine micaceous CLAYEY SAND, trace SILT and coarse SAND, moist, poorly indurated.
	116	19.3	22	2.5	11	50			

Notes:

1. Total depth of boring was 51 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/22/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-22-92

MB-18

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1125.5 feet	BORING	B-18

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Light red-brown to light brown, fine to coarse SILTY SAND, voids, dry, moderately indurated.
	116	3.5	55	2.5	2				. . . few voids below about 3'
			31	1.4	3	5		SM	Light brown, compact, fine to medium, micaceous SILTY SAND, traces of fine GRAVEL, scattered minute voids, slightly moist, poorly indurated.
	114	5.5	40	2.5	4	10			
			25	1.4	5	15		SM	Brown, compact, fine SILTY SAND, trace CLAY and coarse SAND, moist.
	117	14.3	26	2.5	6	20			
			34	1.4	7	25			. . . bed of pale brown, fine to coarse SAND
	115	13.6	26	2.5	8	30			

Notes:

1. Total depth of boring was 31 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/22/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY BHR | DATE 7-22-92

MB-19

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1132.0 feet	BORING	B-19

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown fine to coarse CLAYEY SAND.
								SM	Brown, compact, fine to medium SILTY SAND.
			25	1.4	2	5			. . . lenses of fine to coarse SAND
	104	14.3	41	2.5	3	10			
			39	1.4	4	15			. . . dense . . . lense of SILTY SAND
	110	4.8	50	2.5	5	20			
			38	1.4	6	25		SC	Pale brown, dense, fine to medium CLAYEY SAND.
								SM	Light brown, fine to medium SILTY SAND.
	115	7.5	48	2.5	7	30			
			32	1.4	8	35		ML	Brown, very stiff SANDY SILT.
								SW	Light brown, fine to coarse SAND.
	101	3.4	40	2.5	9	40			
								ML	Brown, stiff SANDY SILT.
			17	1.4	10	45			
								SM	Brown fine SILTY SAND.
	116	12.9	46	2.5	11	50			

Notes:

1. Total depth of boring was 51 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/23/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-23-92

MB-20

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1109.0 feet	BORING	B-20

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	ALLUVIUM: Brown, fine to medium SILTY SAND.
								SM	Brown, fine SILTY SAND with CLAY, voids.
	104	1.6	30	2.5	2			ML	Red-brown, dense CLAYEY SILT.
			33	1.4	3	5			
								ML	PAUBA FORMATION: Red-brown, compact, CLAYEY SILT.
								SM	Brown to red-brown, fine to coarse SILTY SAND.
driven 11"	117	3.3	50	2.5	4				
			52	1.4	5	10		SP	Brown to red-brown, dense, fine to coarse SAND with SILT

Notes:

1. Total depth of boring was 11.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/23/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-23-92

MB-21

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1150.0 feet	BORING	B-21

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, fine to coarse CLAYEY SAND.
	125	10.5	20	2.5	2	5			
								SM	Pale brown, semicompact, fine to coarse SILTY SAND with CLAY.
			20	1.4	3	10			
	111	6.7	22	2.5	4	15			
			37	1.4	5	20			. . . dense
	106	9.4	33	2.5	6	25			. . . lense of SANDY SILT
								SP	Light brown, compact, fine to coarse SAND with fine GRAVEL.
			35	1.4	7	30			
								SM	Brown, dense, fine SILTY SAND with CLAY.

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/23/92.
5. Elevation was obtained from play by NBS/Lowry, dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-23-92

MB-22

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1147.0 feet	BORING	B-22

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, compact, fine to coarse CLAYEY SAND.
			27	1.4	2	5			
	116	9.9	19	2.5	3	10		SM	Pale brown, compact, fine to coarse SILTY SAND.
			26	1.4	4	15			
	107	7.2	27	2.5	5	20		SP	Pale brown, fine to coarse SAND with fine GRAVEL.
			35	1.4	6	25		SM	Pale brown, compact, fine to coarse SILTY SAND.
	121	5.5	43	2.5	7	30		SP	Yellow brown, fine to coarse SAND with GRAVEL.

Notes:

1. Total depth of boring was 31 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/23/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-23-92

MB-23

TEST BORING LOG

TYPE: 8" Hollow Stem Auger | ELEVATION: ~1152.5 feet | BORING: B-23

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, compact, fine to coarse CLAYEY SAND. . . . locally SANDY CLAY
			30	1.4	2	5			
								SM	Pale brown, fine to coarse SILTY SAND with CLAY. . . . color change to yellow brown; little to no CLAY
	113	7.0	23	2.5	3	10			
								SP	Yellow-brown, fine to coarse SAND.
			31	1.4	4	15		SM	Red-brown, compact, fine to medium SILTY SAND.
								SP	Red-brown, fine to coarse SAND with fine GRAVEL.
	115	7.4	43	2.5	5	20			
								SP SM	Brown, dense, fine to coarse SAND with SILT.
			38	1.4	6	25			
								SP	Yellow-brown, fine to coarse GRAVELY SAND.
	117	8.4	48	2.5	7	30			
								SP SM	Red-brown, dense, fine to coarse SAND with SILT.
			43	1.4	8	35			
	116	16.3	31	2.5	9	40		ML	Olive to red-brown, very stiff, (fine) SANDY SILT with CLAY.
			32	1.4	10	45			. . . lense of CLAYEY SILT
								SM	Olive, dense, fine SILTY SAND.
	111	17.4	25	2.5	11	50			

Notes:

1. Total depth of boring was 51 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/23/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-23-92

MB-24

TEST BORING LOG

TYPE: 8" Hollow Stem Auger | ELEVATION: ~1154.0 feet | BORING: B-24

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, fine to coarse CLAYEY SAND.
	118	10.7	21	2.5	2	5			
			18	1.4	3	10		SM	Light brown to yellow brown, semicompact, fine to coarse SILTY SAND. ... color change to red-brown
	108	7.2	32	2.5	4	15		SP	Light brown, fine to coarse SAND.
			37	1.4	5	20		SM	Light brown, dense, fine to coarse SILTY SAND.
	108	6.2	39	2.5	6	25		SP SM	Red-brown, fine to coarse SAND with SILT.
			45	1.4	7	30		SP	Yellow-brown, dense, fine to coarse SAND.
	111	6.3	50	2.5	8	35			
	117	17.0	42	2.5	9	40		ML	Olive-brown, fine micaceous SANDY SILT.
			77	1.4	10	45		SM	Olive-brown, very dense, fine to medium SILTY SAND.
			54	1.4	11	50		SP	Light brown, dense, fine to coarse SAND with GRAVEL.

Notes:

1. Total depth of boring was 51.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/24/92.
5. Elevation was obtained from plan by NBS/Lowry dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-24-92

MB-25

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1151.0 feet	BORING	B-25

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, semicompact, fine to coarse CLAYEY SAND.
			18	1.4	2	5			
	110	5.7	17	2.5	3	10		SP SM	Red-brown, compact, fine to coarse SAND with SILT.
			28	1.4	4	15		SP	Yellow-brown, compact, fine to coarse SAND with fine GRAVEL.
	103	5.9	22	2.5	5	20			
				bag	6				
			32	1.4	7	25			
	107	3.9	39	2.5	8	30		SP	Yellow-brown, fine to coarse GRAVELLY SAND.
			50	1.4	9	35		SP SM	Yellow-brown, dense, fine to coarse SAND with SILT.
	119	16.0	31	2.5	10	40		ML	Olive, very stiff, fine SANDY SILT.
			47	1.4	11	45		SM	Olive, dense, fine to medium SILTY SAND.
driven 11"	123	6.2	50	2.5	12	50			. . . fine to coarse SILTY SAND

Notes:

1. Total depth of boring was 51 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/24/92.
5. Elevation was obtained from plan by NBS/Lowry dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-24-92

MB-26

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1148.0 feet	BORING	B-26

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, compact, fine to coarse CLAYEY SAND.
	120	4.9	30	2.5	2				
			21	1.4	3	5			
	117	11.0	22	2.5	4			SM	Yellow-brown, semicompact, fine to coarse SILTY SAND.
			17	1.4	5	10			
	110	4.9	28	2.5	6	15		SP	Light-brown to yellow-brown, compact, fine to coarse SAND with fine GRAVEL.
			24	1.4	7	20			
									. . . color change to red-brown
	109	4.3	30	2.5	8	25			
								SM	Red-brown, fine to medium SILTY SAND.
			79	1.4	9	30		SM	Olive, very dense, fine SILTY SAND.

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/24/92.
5. Elevation was obtained from plan by NBS/Lowry dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-24-92

MB-27

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1145.5 feet	BORING	B-27

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to medium SILTY SAND with CLAY, voids.
	127	7.5	22	2.5	2				
			16	1.4	3	5		SC	Red-brown, semi-compact, fine to coarse CLAYEY SAND.
	121	9.8	26	2.5	4			SM	Light brown, semicompact, fine to coarse SILTY SAND with fine GRAVEL.
			18	1.4	5	10			
								SP	Red-brown, dense, fine to coarse SAND with fine GRAVEL.
	102	7.1	34	2.5	6	15			
			36	1.4	7	20			
	106	6.3	30	2.5	8	25			
			38	1.4	9	30			

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encoutered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/24/92.
5. Elevation was obtained from plan by NBS/Lowry dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-24-92

MB-28

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1147.0 feet	BORING	B-28

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to medium SILTY SAND, scattered voids.
	122	5.8	37	2.5	2				
			20	1.4	3	5		SM	Red-brown, semicompact, fine to coarse SILTY SAND with CLAY.
	123	9.9	25	2.5	4			SC	Light brown, fine to coarse CLAYEY SAND.
			20	1.4	5	10		SM	Light brown, semicompact, fine to coarse SILTY SAND with CLAY.
	108	7.5	37	2.5	6	15		SP	Light brown to yellow-brown, fine to coarse SAND with fine GRAVEL.
			32	1.4	7	20		SM	Light yellow-brown, fine to medium SILTY SAND.
									. . . color change to red-brown
	104	6.0	33	2.5	8	25			
driven 10"			83	1.4	9	30		ML	Gray-brown, very hard, CLAYEY SILT with fine SAND.

Notes:

1. Total depth of boring was 31.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/27/92.
5. Elevation was obtained from plan by NBS/Lowry dated May, 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-27-92

MB-29

TEST BORING LOG

TYPE 8" Hollow Stem Auger | ELEVATION ~1147.0 feet | BORING B-29

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	PAUBA FORMATION: Red-brown, compact, fine to coarse CLAYEY SAND.
			25	1.4	2				
	126	9.1	22	2.5	3	5		SM	Red-brown, semicompact, fine to coarse SILTY SAND with CLAY.
			18	1.4	4				
	110	9.3	21	2.5	5	10		SP	Yellow brown, semicompact, fine to coarse SAND with fine GRAVEL.
			43	1.4	6	15		SM	Yellow-brown, dense, fine to medium SILTY SAND.
driven 11"	109	6.6	50	2.5	7	20		SM	Red-brown fine SILTY SAND.
									. . . color change to light brown
			48	1.4	8	25			
				bag	9				
	126	9.8	56	2.5	10	30			

Notes:

1. Total depth of boring was 31 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/27/92.
5. Elevation was obtained from plan by NBS/Lowry dated May, 1992, scale: 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-27-92

MB-30

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1153.5 feet	BORING	B-30

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	PAUBA FORMATION: Red-brown, fine to medium SILTY SAND with CLAY.
								SC	Yellow brown, semicompact, fine to coarse CLAYEY SAND.
								SC	Red-brown, semicompact, fine to coarse SILTY SAND with CLAY.
			19	1.4	2	5		SP SM	Yellow brown, fine to coarse SAND with a trace of CLAY.
								SP	Yellow brown, fine to coarse SAND.
	112	6.0	20	2.5	3	10			
								SP	Yellow brown, compact, fine to coarse SAND with a trace of SILT.
								SP SM	Yellow-brown, dense, fine to medium SILTY SAND.
			32	1.4	4	15			
								SP	Red-brown, dense, fine to coarse SAND with fine GRAVEL.
	115	6.6	36	2.5	5	20			
				bag	6				
			42	1.4	7	25			

Notes:

1. Total depth of boring was 26.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite 7/27/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale: 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-27-92

MB-31

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1155.0 feet	BORING	B-31

STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SC	FILL: Red brown CLAYEY SAND.
	123	8.3	39	2.5	2	5			
								SM	PAUBA FORMATION: Yellow-brown, fine to coarse SILTY SAND.
			5	1.4	3	10			. . . very loose
								SP	Reddish brown, fine to coarse SAND with fine GRAVEL.
	112	6.3	31	2.5	4	15			
								SP SC	Reddish brown, fine to coarse SAND with trace of CLAY.
			28	1.4	5	20			. . . compact

Notes:

1. Total depth of boring was 21.5 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/21/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-27-92

MB-3

TEST BORING LOG

TYPE	8" Hollow Stem Auger	ELEVATION	~1125.0 feet	BORING	B-32

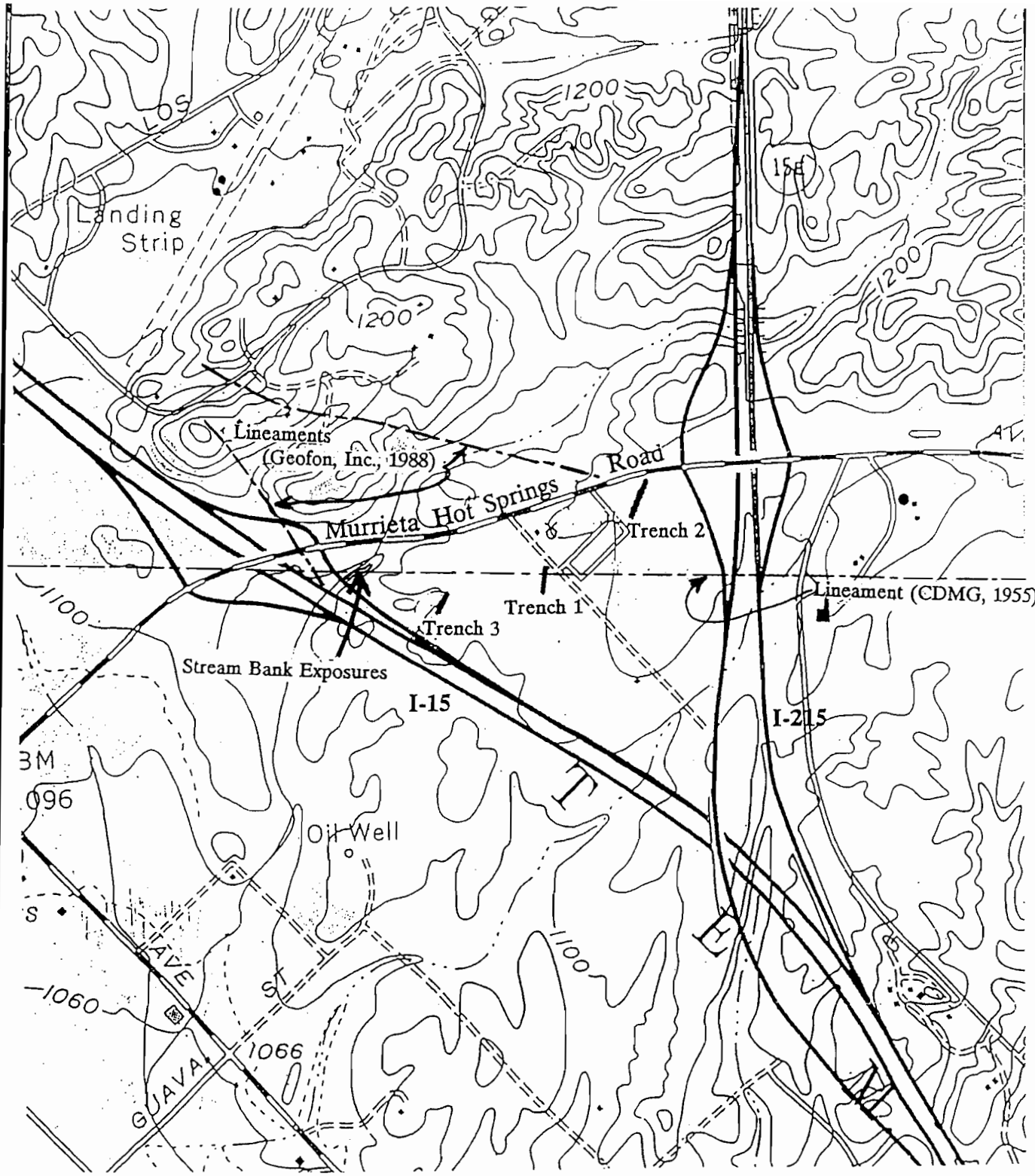
STRIKE/DIP and other DEPTH-SPECIFIC NOTES	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS/FOOT	SAMPLE SIZE (inches)	SAMPLE NO.	DEPTH (feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS.	
				bag	1			SM	ALLUVIUM: Brown, fine to medium SILTY SAND with scattered voids.
	106	3.5	20	2.5	2				
	117	9.8	28	2.5	3	5		SC	Brown, fine CLAYEY SAND with minor voids.
	113	10.7	30	2.5	4				
								ML	PAUBA FORMATION: CLAYEY SILT with fine SAND
	119	10.5	33	2.5	5	10			

Notes:

1. Total depth of boring was 11 feet.
2. No groundwater was encountered.
3. No caving was encountered.
4. Boring was backfilled with cuttings and sealed with bentonite, 7/20/92.
5. Elevation was obtained from plan by NBS/Lowry, dated May 1992, scale 1" = 100'.

THIS BORING LOG SUMMARY APPLIES ONLY AT THE TIME AND LOCATION INDICATED. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND TIMES.

LOGGED BY WMC | DATE 7-27-92



N

Scale: 1 inch = 1000 feet

Ref: U.S.G.S. 7.5 minute Quadrangle Series (Topographic), Murrieta Quadrangle, 1:24,000, dated 1953, revised 1979.

MURRIETA SPRINGS MALL
MURRIETA, CALIFORNIA

SITE PLAN

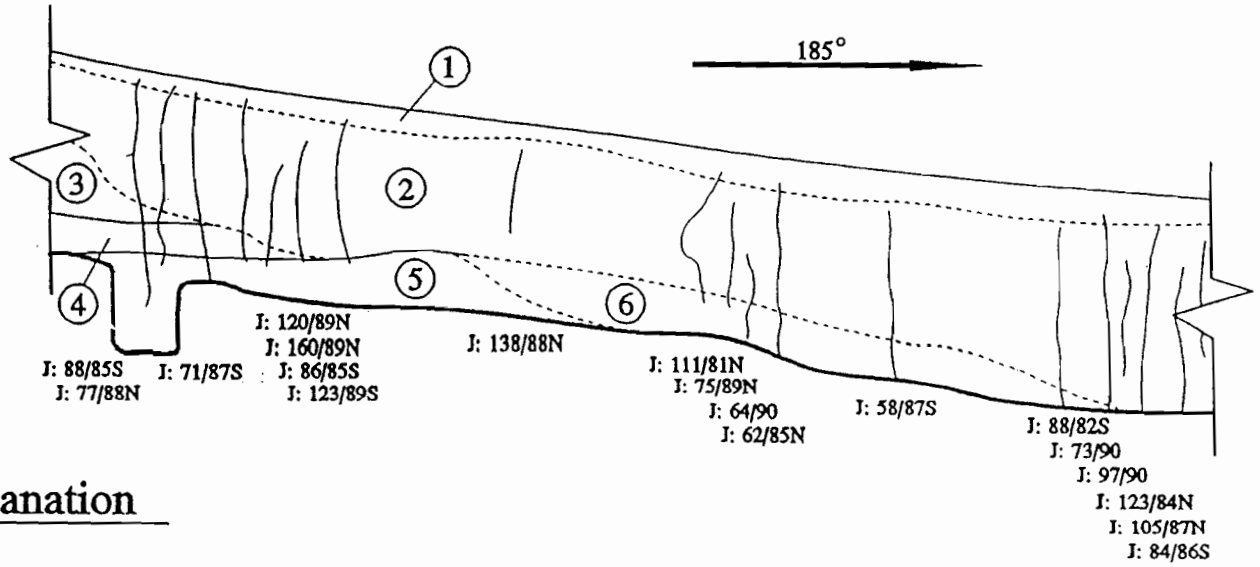
MOORE & TABER
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10/2/92	692-123

Job No. 692-123 - October 2, 1992

Moore & Taber Fault Trench Location Map

Trench 1 (continued)



Explanation

1. Residual Soil: Red-brown SANDY SILT
2. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with traces of GRAVEL
3. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with CLAY
4. Pauba Formation: Red-brown SANDY SILTSTONE
5. Pauba Formation: Red-brown fine to coarse SANDSTONE with traces of GRAVEL
6. Pauba Formation: Red-brown SILTY SANDSTONE with GRAVEL

—·····— Geologic Contact, dashed where gradational

⟨ Joint, attitude shown below trench log, e.g. J:49/88S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

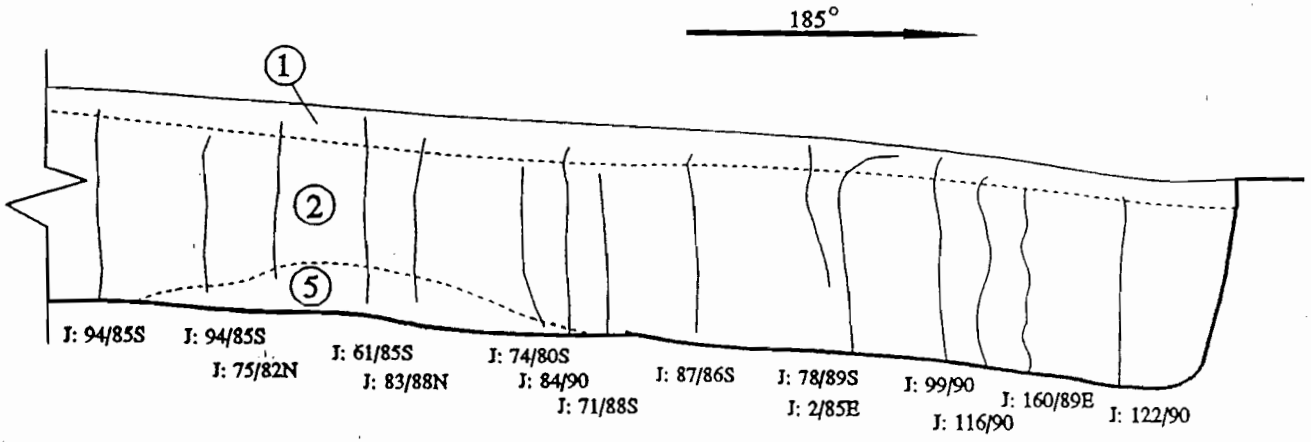
MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 2b - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
DHR	DHR		10 / 1 / 92	692-123

Trench 1 (continued)



Explanation

1. Residual Soil: Red-brown SANDY SILT
2. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with traces of GRAVEL
5. Pauba Formation: Red-brown fine to coarse SANDSTONE with traces of GRAVEL

---- Geologic Contact, dashed where gradational

) Joint, attitude shown below trench log, e.g. J:49/88S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

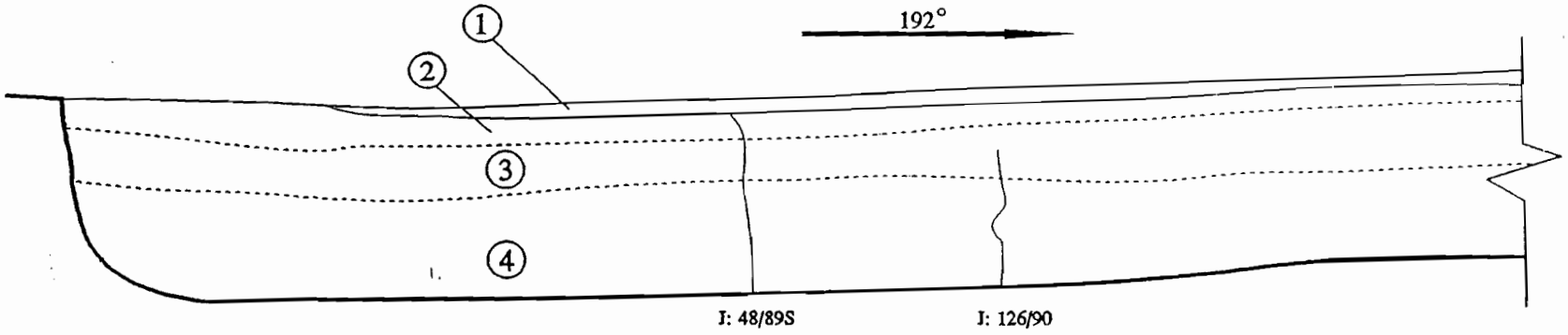
MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 2c - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10 / 1 / 92	692-123

Trench 2



Explanation

1. Residual Soil: Red-brown coarse SAND
2. Residual Soil: Red-brown SANDY SILT
3. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with CLAY
4. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE

—--- Geologic Contact, dashed where gradational

⟨ Joint, attitude shown below trench log, e.g. J:49/88S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

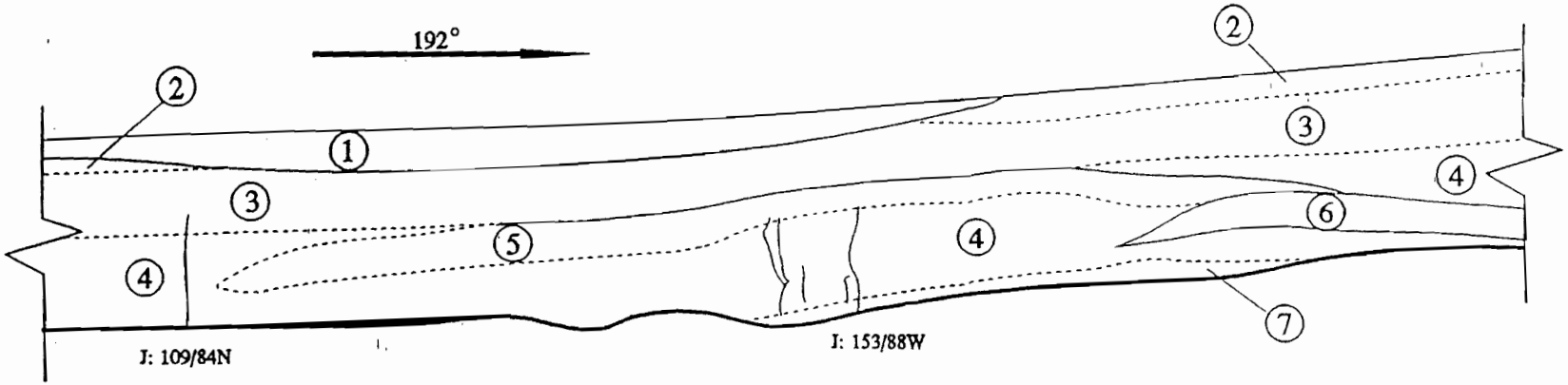
MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 2d - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10 / 1 / 92	692-123

Trench 2 (continued)



Explanation

1. Residual Soil: Red-brown coarse SAND
2. Residual Soil: Red-brown SANDY SILT
3. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with CLAY
4. Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE
5. Pauba Formation: (paleosol) dark brown CLAYEY SILT with SAND
6. Pauba Formation: Yellow-brown SANDY SILTSTONE
7. Pauba Formation: Red-brown fine to medium SILTY SANDSTONE

---- Geologic Contact, dashed where gradational

Joint, attitude shown below trench log, e.g. J:49/88S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

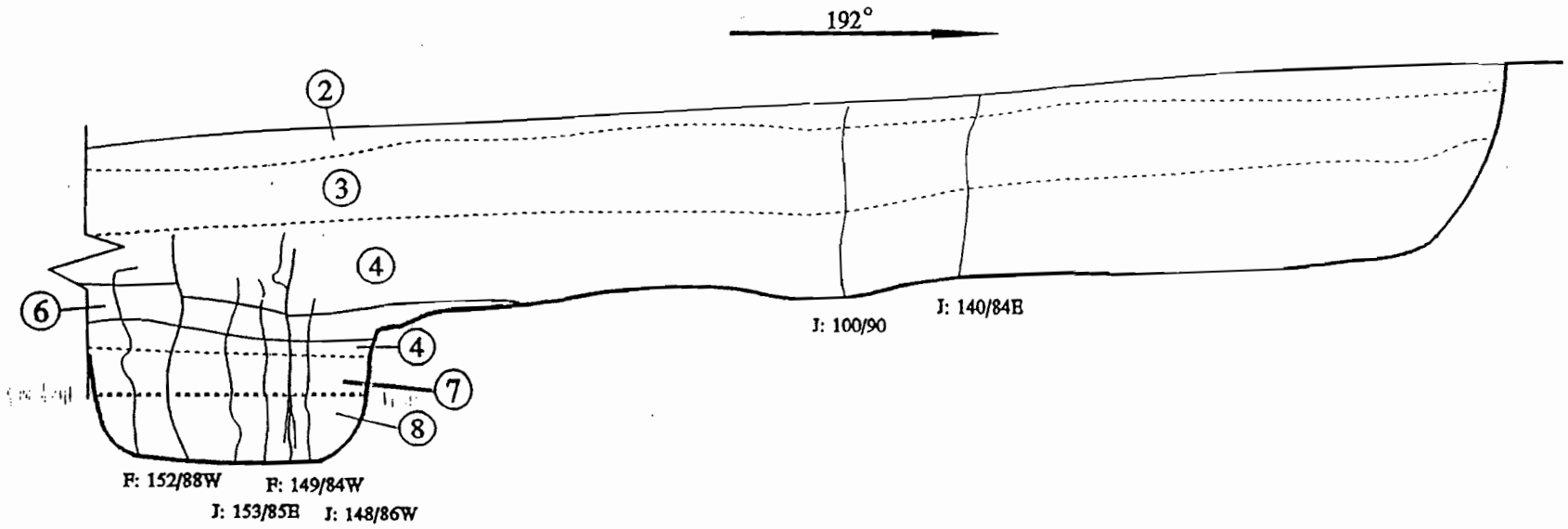
MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 2e - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10 / 1 / 92	692-123

Trench 2 (continued)



Explanation

(2) Residual Soil: Red-brown SANDY SILT

(3) Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE with CLAY

(4) Pauba Formation: Red-brown fine to coarse SILTY SANDSTONE

(6) Pauba Formation: Yellow-brown SANDY SILTSTONE

(7) Pauba Formation: Red-brown fine to medium SILTY SANDSTONE

(8) Pauba Formation: Red-brown fine to coarse SANDSTONE

Geologic Contact, dashed where gradational

Joint, attitude shown below trench log, e.g. J:49/88S

Fault, attitude shown below trench log, e.g. F:23/74S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

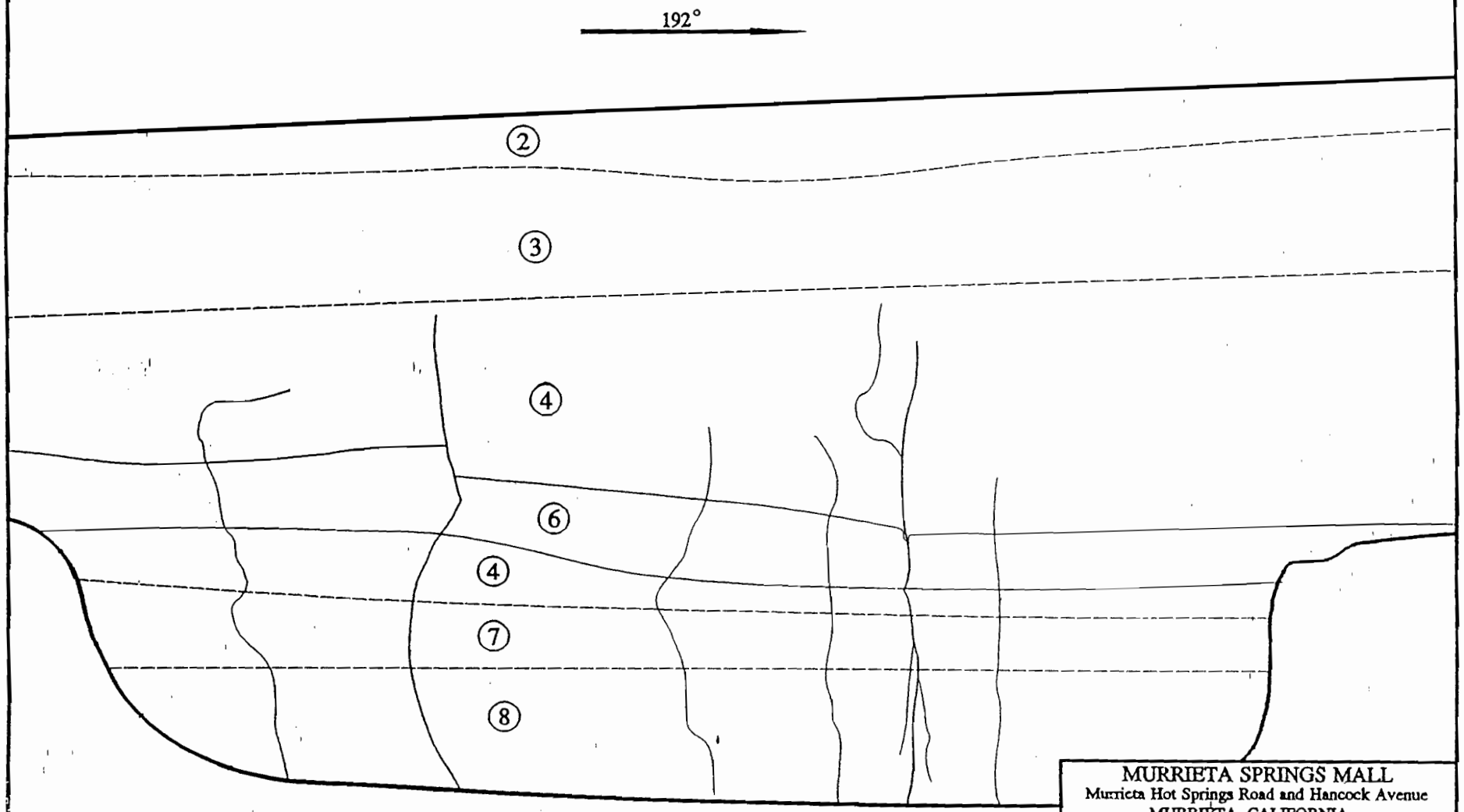
Figure 2f - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	ATTN(YR)	DATE	JOB No.
BHR	BHR		10 / 1 / 92	692-123

Trench 2 (partial)

Scale: 1 inch = 2 feet
(No Vertical Exaggeration)



See Figure 2f for Explanation.

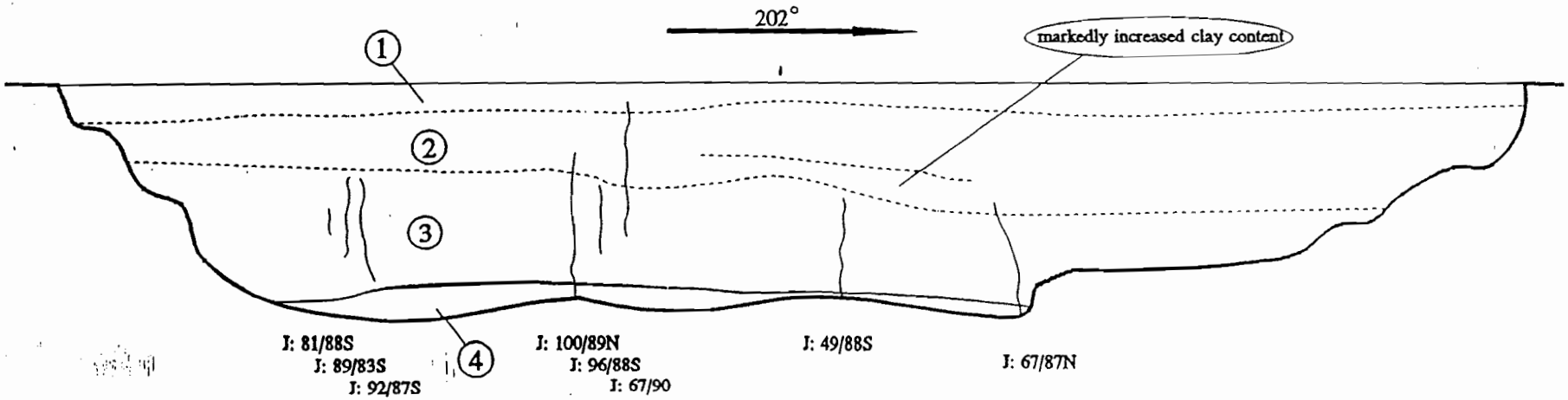
MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 3 - DETAIL LOG: TRENCH 2

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10 / 4 / 92	692-123

Trench 3



Explanation

1. Residual Soil: Light red-brown SANDY SILT
2. Residual Soil: Light red-brown fine to medium SILTY SAND with CLAY
3. Pauba Formation: Light red-brown fine to medium SILTY SANDSTONE
4. Pauba Formation: Light red-brown SANDY SILTSTONE & fine SILTY SANDSTONE

——·· Geologic Contact, dashed where gradational

⌇ Joint, attitude shown below trench log, e.g. J:49/88S

Scale: 1 inch = 10 feet (Horizontal)
1 inch = 5 feet (Vertical)
Vertical Exaggeration: 2 : 1

MURRIETA SPRINGS MALL
Murrieta Hot Springs Road and Hancock Avenue
MURRIETA, CALIFORNIA

Figure 2b - LOG OF TRENCHS

M&T AGRA
Geotechnical & Environmental Services

FIELD	DRAFT	APPROVED	DATE	JOB No.
BHR	BHR		10 / 1 / 92	692-123

APPENDIX C

LABORATORY TESTING AND TEST RESULTS

APPENDIX C

Laboratory Testing Procedures and Test Results

Atterberg Limits: The Atterberg Limits were determined in accordance with ASTM Test Method D4318 for engineering classification of the fine-grained materials. Test results are presented in test data herein.

Grain Size Test: Percent Passing the No. 200 Sieve: Percent soil particle finer than 0.075 mm was evaluated for subgrade soils in general accordance with ASTM 1140.

Consolidation Tests: Consolidation tests were performed in accordance with ASTM Test Method D2435 on selected, relatively undisturbed ring samples. 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 in the test data herein.

Expansion Index Tests: The expansion potential of selected materials was evaluated in accordance with ASTM Test Method D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached.

Hydrocollapse Tests: Hydrocollapse test was performed in accordance with ASTM Test Method D4546/D5333 on selected, relatively undisturbed ring sample. A sample was placed in a consolidometer and loads were applied in geometric progression. The percent hydrocollapse for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The hydrocollapse pressure curve is presented in the test data.

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed in accordance with ASTM Test Method D2216 and D2937 on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data.

"R"-Value: The resistance "R"-value was determined by the California Materials Method No. 301 for subgrade soils. Three samples were prepared and exudation pressure and "R"-value determined on each one. The graphically determined "R"-value at exudation pressure of 300 psi is summarized in the test data.

Laboratory Testing Procedures and Test Results (Cont.)

Chloride Content, Sulfate Content, Minimum Resistivity and pH Tests: Chloride content, Sulfate Content, Minimum resistivity and pH tests were performed in general accordance with California Test Method 422, 417, and 532. The results are presented in the test data.

Leighton and Associates, Inc.

ATTERBERG LIMITS

ASTM D 4318

Project Name:	MURRIETA TRIANGLE	Tested By:	PRC	Date:	2/3/06
Project No. :	601178-002	Input By:	PRC	Date:	2/3/06
Boring No.:	LB-4	Checked By:	PRC	Date:	2/6/06
Sample No.:	R-4	Depth (ft.)	7.5		
Sample Description:	ML, BROWN LEAN SILT				

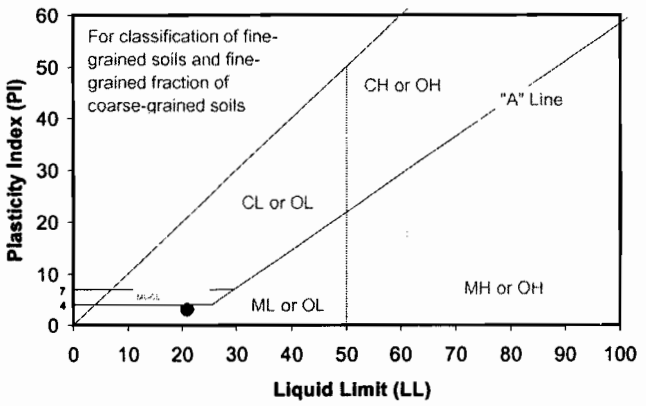
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			33	23	13	
Wet Wt. of Soil + Cont. (gm)	45.92	45.90	65.58	65.47	59.75	
Dry Wt. of Soil + Cont. (gm)	44.80	44.71	60.98	60.89	55.78	
Wt. of Container (gm)	38.59	38.36	38.37	39.29	39.04	
Moisture Content (%) [Wn]	18.0	18.7	20.3	21.2	23.7	

Liquid Limit	**21**
Plastic Limit	**18**
Plasticity Index	**3**
Classification	**ML**

PI at "A" - Line = 0.73(LL-20) =

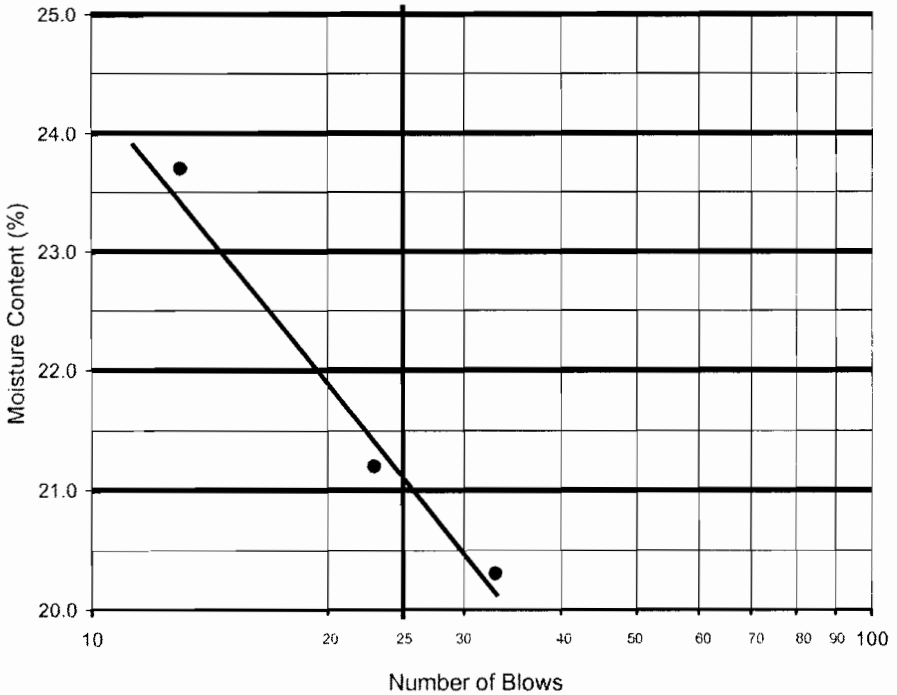
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Rev. 08-04

Boring No.	LB-1	LB-2						
Sample No.	R-3	S-9						
Depth (ft.)	5	21-21.5						
Sample Type	RING	SPT						
Visual Soil Classification	SM	SC-SM						
Moisture Correction								
Wet Weight of Soil + Container (gm.)	508.0	590.1						
Dry Weight of Soil + Container (gm.)	495.8	547.1						
Weight of Container (gm)	217.0	217.8						
Moisture Content (%)	4.4	13.1						
Container No.:	QR	GH						
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	508.0	590.1						
Weight of Container (gm.)	217.0	217.8						
Weight of Dry Sample (gm.)	278.8	329.3						
Container No.:	QR	GH						
After Wash								
Dry Weight of Sample + Container (gm)	443.4	427.1						
Weight of Container (gm)	217.0	217.8						
Dry Weight of Sample (gm)	226.4	209.3						
% Passing No. 200 Sieve	**19**	**36**						
% Retained No. 200 Sieve	81	64						

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton Consulting, Inc.

Project Name: MURRIETA TRIANGLE
Project No.: 601178-002
Client Name:
Tested By: JB Date: 1/31/06

Rev. 08-04

200 Wash

Leighton Consulting, Inc.

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	MURRIETA TRIANGLE	Tested By:	CBC	Date:	2/9/06
Project No. :	601178-002	Checked By:	PRC	Date:	2/13/06
Boring No.:	LB-3	Depth (ft.)	0-5		
Sample No. :	B-1	Location:			
Sample Description:	SM, DARK BROWN SILTY SAND				

Dry Wt. of Soil + Cont. (gm.)	3869.8
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	3869.8
Weight Soil Retained on #4 Sieve	83.5
Percent Passing # 4	97.8

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.9959
Wt. Comp. Soil + Mold (gm.)	608.0	634.1
Wt. of Mold (gm.)	207.2	207.2
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-10	E-10
Wet Wt. of Soil + Cont. (gm.)	312.3	634.1
Dry Wt. of Soil + Cont. (gm.)	288.8	369.4
Wt. of Container (gm.)	12.3	207.2
Moisture Content (%)	8.5	15.6
Wet Density (pcf)	120.9	128.6
Dry Density (pcf)	111.4	111.3
Void Ratio	0.513	0.507
Total Porosity	0.339	0.336
Pore Volume (cc)	70.2	69.3
Degree of Saturation (%) [S meas]	**44.7**	**82.9**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
2/9/06	12:23	1.0	0	0.5000
2/9/06	12:33	1.0	10	0.4995
	Add Distilled Water to the Specimen			
2/10/06	8:00	1.0	1167	0.4959
2/10/06	9:00	1.0	1227	0.4959

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-3.6
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**0**

Rev. 08-04

Leighton Consulting, Inc.

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	MURRIETA TRIANGLE	Tested By:	CBC	Date:	2/9/06
Project No. :	601178-002	Checked By:	PRC	Date:	2/13/06
Boring No.:	LB-14	Depth (ft.)	5-10		
Sample No. :	B-3	Location:			
Sample Description:	(CL)s, PALE BROWN LEAN CLAY WITH SAND				

Dry Wt. of Soil + Cont. (gm.)	2923.7
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2923.7
Weight Soil Retained on #4 Sieve	49.9
Percent Passing # 4	98.3

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0084
Wt. Comp. Soil + Mold (gm.)	603.7	634.2
Wt. of Mold (gm.)	191.4	191.4
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-15	E-15
Wet Wt. of Soil + Cont. (gm.)	312.3	634.2
Dry Wt. of Soil + Cont. (gm.)	288.8	380.0
Wt. of Container (gm.)	12.3	191.4
Moisture Content (%)	8.5	16.5
Wet Density (pcf)	124.4	133.4
Dry Density (pcf)	114.6	114.5
Void Ratio	0.471	0.483
Total Porosity	0.320	0.326
Pore Volume (cc)	66.3	68.0
Degree of Saturation (%) [S meas]	**48.8**	**92.4**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
2/9/06	12:52	1.0	0	0.5000
2/9/06	13:02	1.0	10	0.4988
	Add Distilled Water to the Specimen			
2/10/06	8:00	1.0	1138	0.5084
2/10/06	9:00	1.0	1198	0.5084

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	9.6
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**9**

Rev. 08-04

Leighton Consulting, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	MURRIETA TRIANGLE	Tested By:	JMB	Date:	1/31/06
Project No.:	601178-002	Checked By:	JMB	Date:	2/1/06
Boring No.:	LB-2	Sample Type:	IN SITU		
Sample No.:	R-2	Depth (ft.)	5.0		
Sample Description:	SC, DARK YELLOWISH BROWN CLAYEY SAND.				

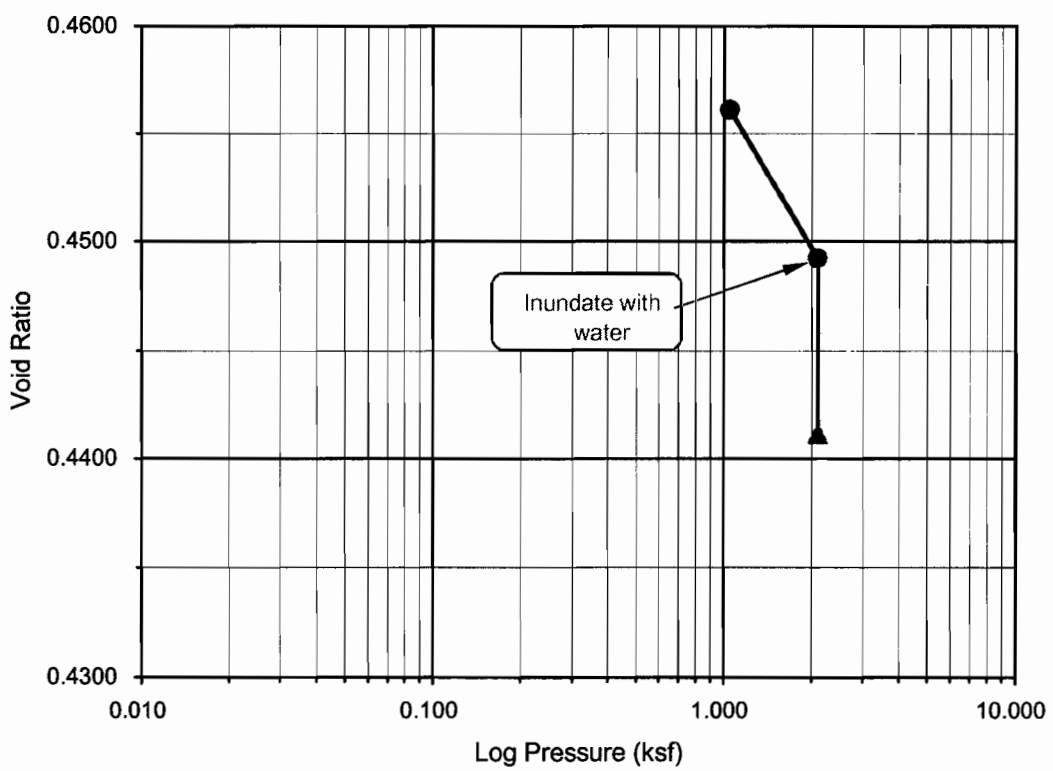
Initial Dry Density (pcf):	115.0
Initial Moisture (%):	9.8
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	117.0
Final Moisture (%) :	16.2
Initial Void ratio:	0.4656
Specific Gravity(assumed):	2.70
Initial Saturation (%)	57.0

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0565	0.9935	0.00	-0.65	0.4561	-0.65
2.100	0.0612	0.9888	0.00	-1.12	0.4492	-1.12
H2O	0.0667	0.9833	0.00	-1.67	0.4411	-1.67

Percent Swell / Settlement After Inundation = -0.56

Void Ratio - Log Pressure Curve



Rev. 08-04

Leighton Consulting, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	MURRIETA TRIANGLE	Tested By:	JMB	Date:	1/31/06
Project No.:	601178-002	Checked By:	JMB	Date:	2/1/06
Boring No.:	LB-3	Sample Type:	IN SITU		
Sample No.:	R-2	Depth (ft.)	2.5		

Sample Description: SC-SM, DARK YELLOWISH BROWN SILTY, CLAYEY SAND.

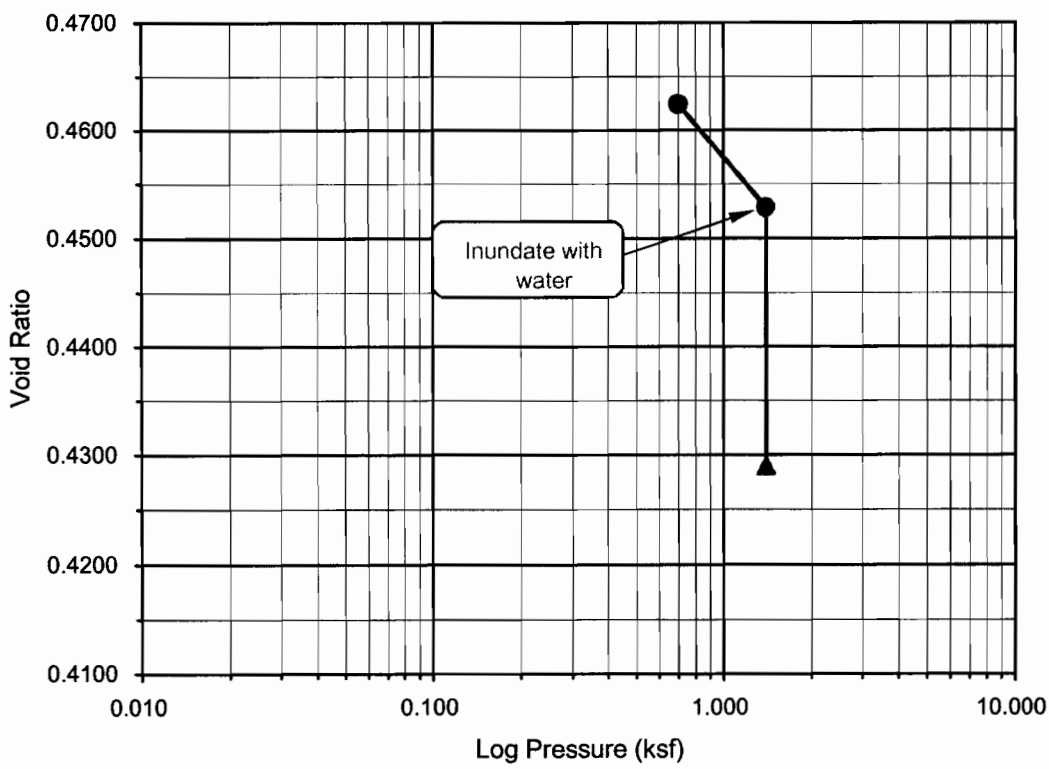
Initial Dry Density (pcf):	114.3
Initial Moisture (%):	7.6
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	118.0
Final Moisture (%) :	14.6
Initial Void ratio:	0.4752
Specific Gravity(assumed):	2.70
Initial Saturation (%)	43.4

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.700	0.0587	0.9913	0.00	-0.87	0.4624	-0.87
1.400	0.0652	0.9848	0.00	-1.52	0.4528	-1.52
H2O	0.0813	0.9687	0.00	-3.13	0.4290	-3.13

Percent Swell / Settlement After Inundation = -1.63

Void Ratio - Log Pressure Curve



Rev. 08-04

Leighton Consulting, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	MURRIETA TRIANGLE	Tested By:	JMB	Date:	1/31/06
Project No.:	601178-002	Checked By:	JMB	Date:	2/1/06
Boring No.:	LB-16	Sample Type:	IN SITU		
Sample No.:	R-2	Depth (ft.)	5.0		
Sample Description:	SM, DARK YELLOWISH BROWN SILTY SAND.				

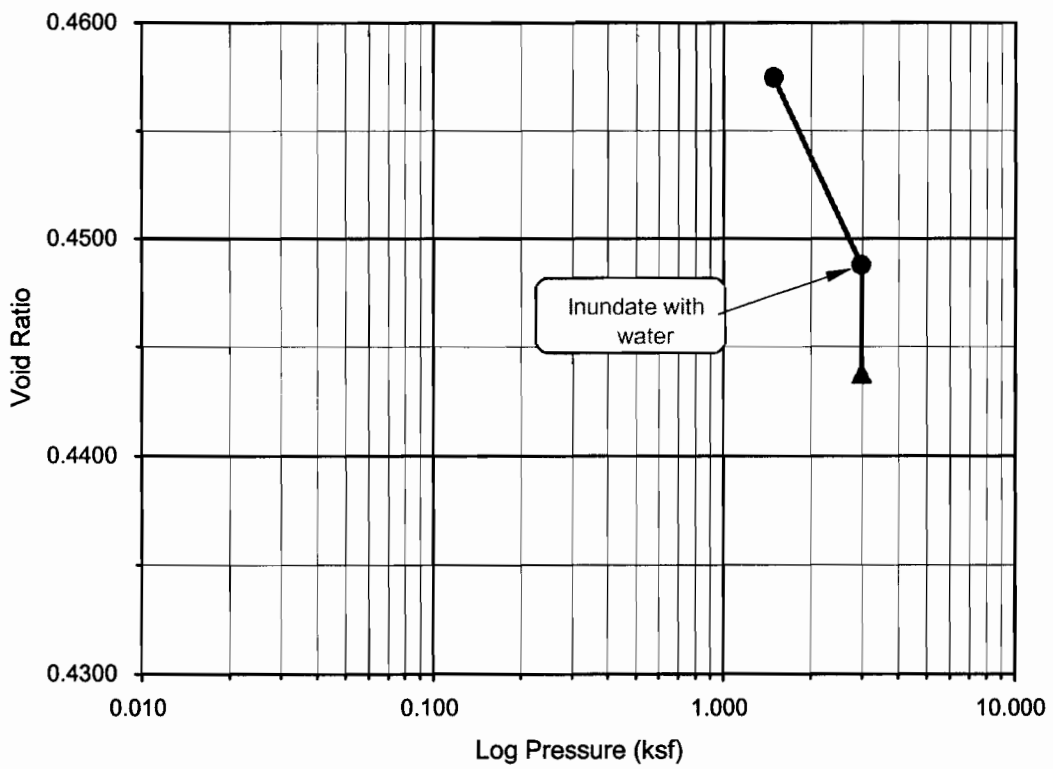
Initial Dry Density (pcf):	114.4
Initial Moisture (%):	10.7
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	116.8
Final Moisture (%) :	16.8
Initial Void ratio:	0.4731
Specific Gravity(assumed):	2.70
Initial Saturation (%)	60.9

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.488	0.0606	0.9894	0.00	-1.06	0.4575	-1.06
2.975	0.0665	0.9835	0.00	-1.65	0.4488	-1.65
H2O	0.0699	0.9801	0.00	-1.99	0.4438	-1.99

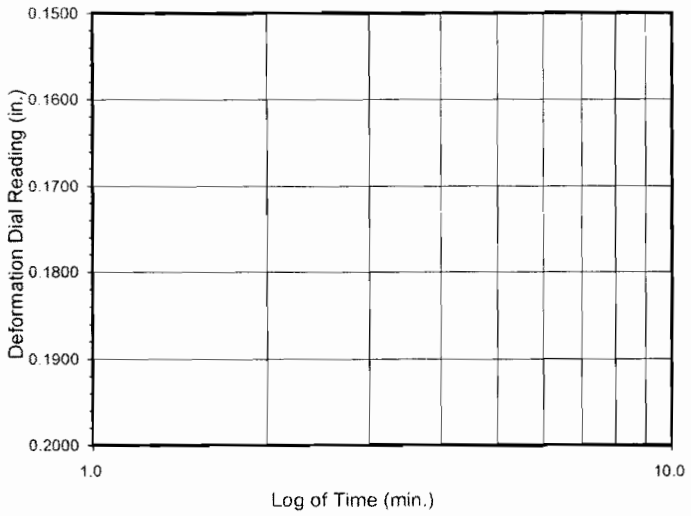
Percent Swell / Settlement After Inundation = -0.35

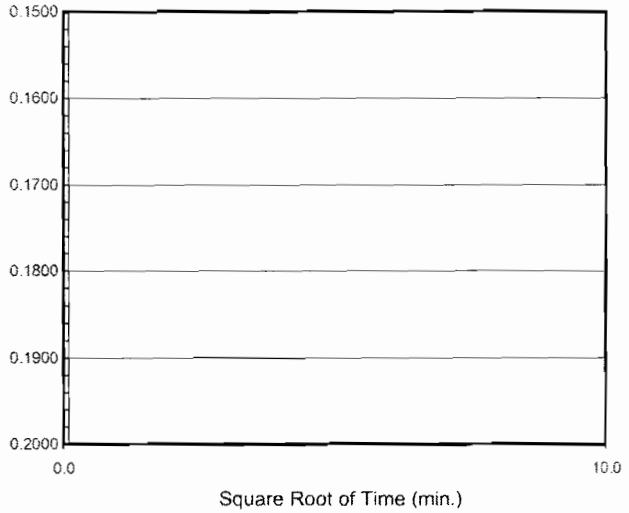
Void Ratio - Log Pressure Curve

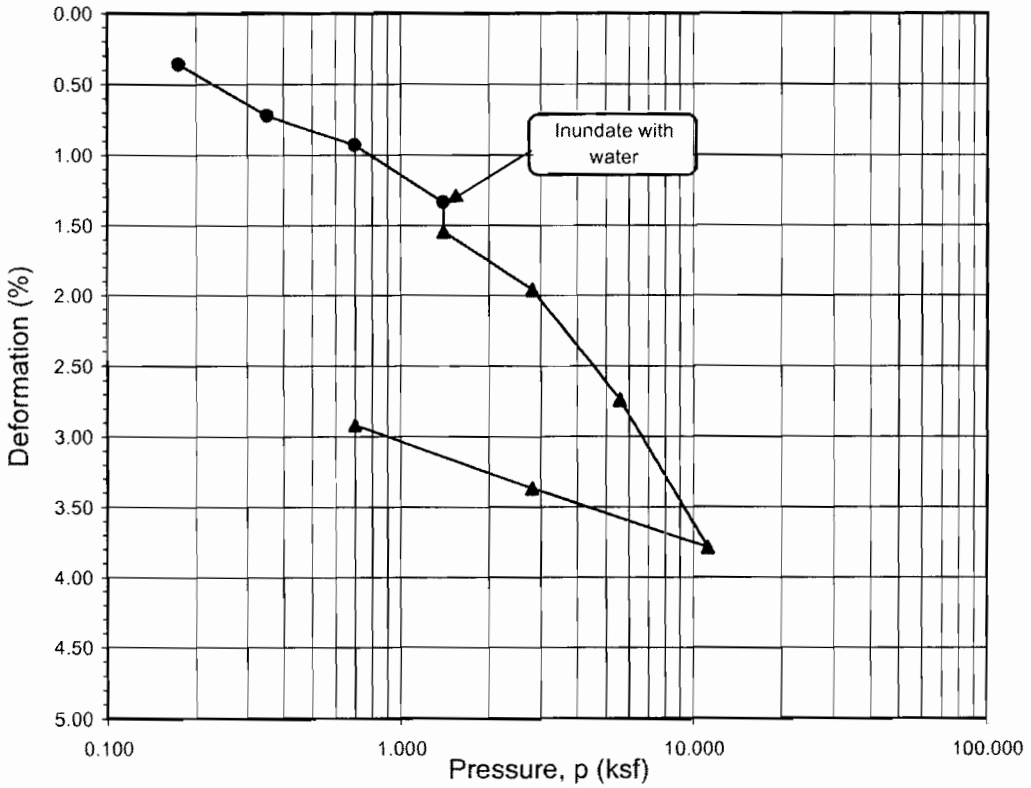


Rev. 08-04

Collapse-Swell, LB-16, R-2







Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**R-4**	**7.5**	**10.9**	**11.9**	**120.0**	**123.6**	**0.405**	**0.364**	**73**	**88**

Sample Description:

SC, DARK YELLOWISH BROWN CLAYEY SAND

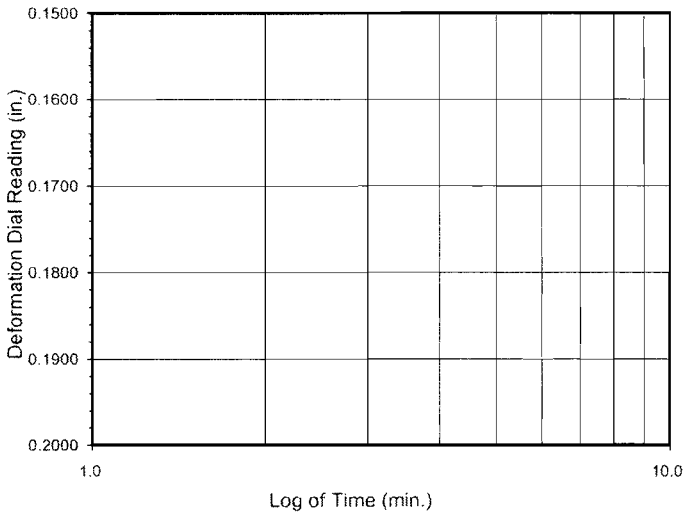
Project No.:	601178-002
Project Name:	MURRIETA TRIANGLE

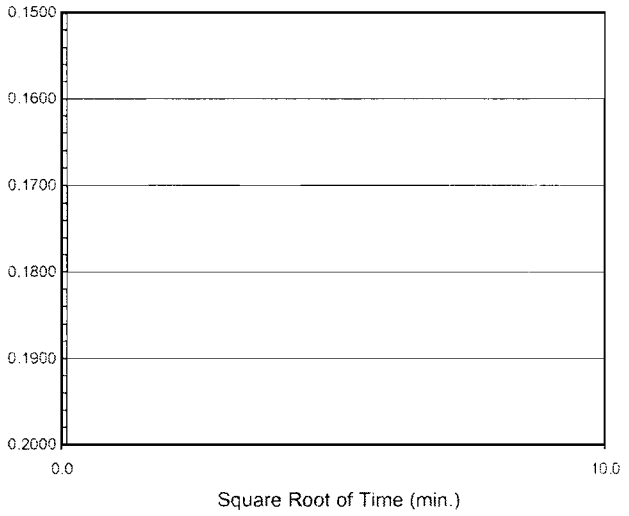
Leighton Consulting, Inc.

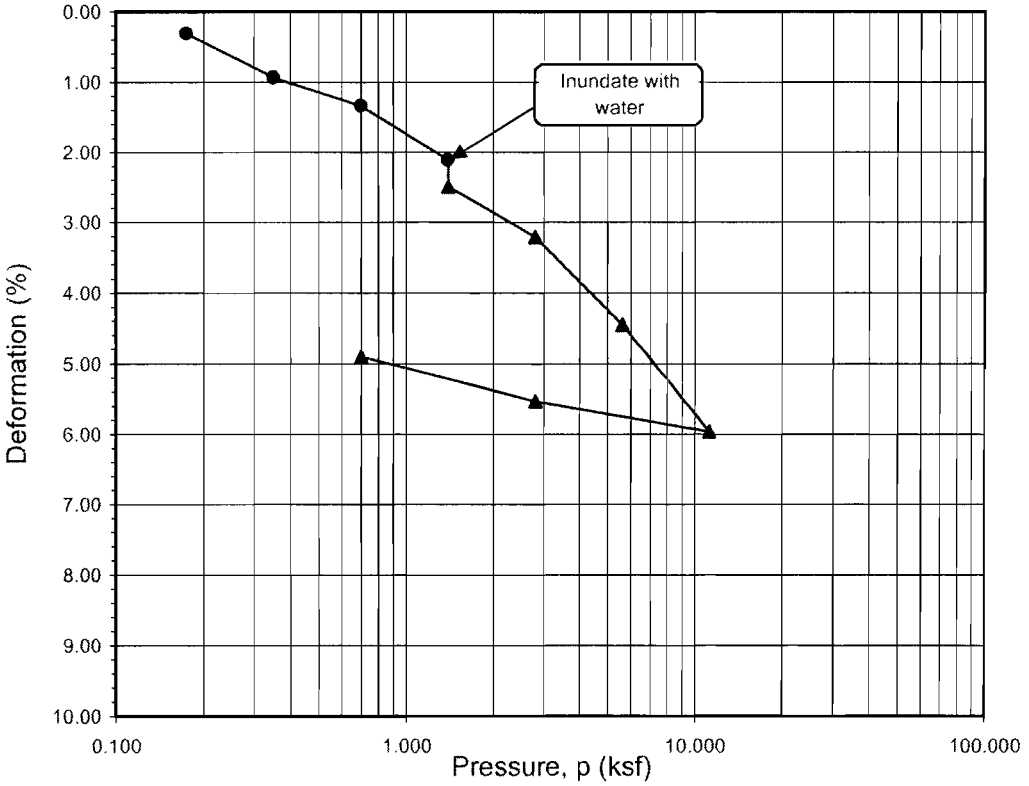
ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04







Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-17	**R-3**	**7.5**	**12.2**	**13.0**	**117.4**	**123.5**	**0.436**	**0.365**	**75**	**96**

Sample Description:

SC, DARK YELLOWISH BROWN CLAYEY SAND

Project No.:	601178-002
Project Name:	MURRIETA TRIANGLE

Leighton Consulting, Inc.

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Rev. 08-04

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Murrieta Triangle	Tested By :	GEB	Date:	02/01/06
Project No.:	601178-002	Input By :	JHW	Date:	02/02/06
Boring No.:	LB-15	Depth (ft.)	0-5		
Sample No. :	B-2				
Soil Identification:	Dark Brown Silty Sand (SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03319

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3776.0	3870.0	3931.0	3874.0		
Weight of Mold (g)	1852.0	1852.0	1852.0	1852.0		
Net Weight of Soil (g)	1924.0	2018.0	2079.0	2022.0		
Wet Weight of Soil + Cont. (g)	540.50	475.30	471.70	494.10		
Dry Weight of Soil + Cont. (g)	520.50	449.00	435.90	446.50		
Weight of Container (g)	51.80	53.90	53.90	54.50		
Moisture Content (%)	4.27	6.66	9.37	12.14		
Wet Density (pcf)	127.8	134.0	138.1	134.3		
Dry Density (pcf)	122.6	125.7	126.3	119.8		

Maximum Dry Density (pcf) **126.5** **Optimum Moisture Content (%)** **8.5**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

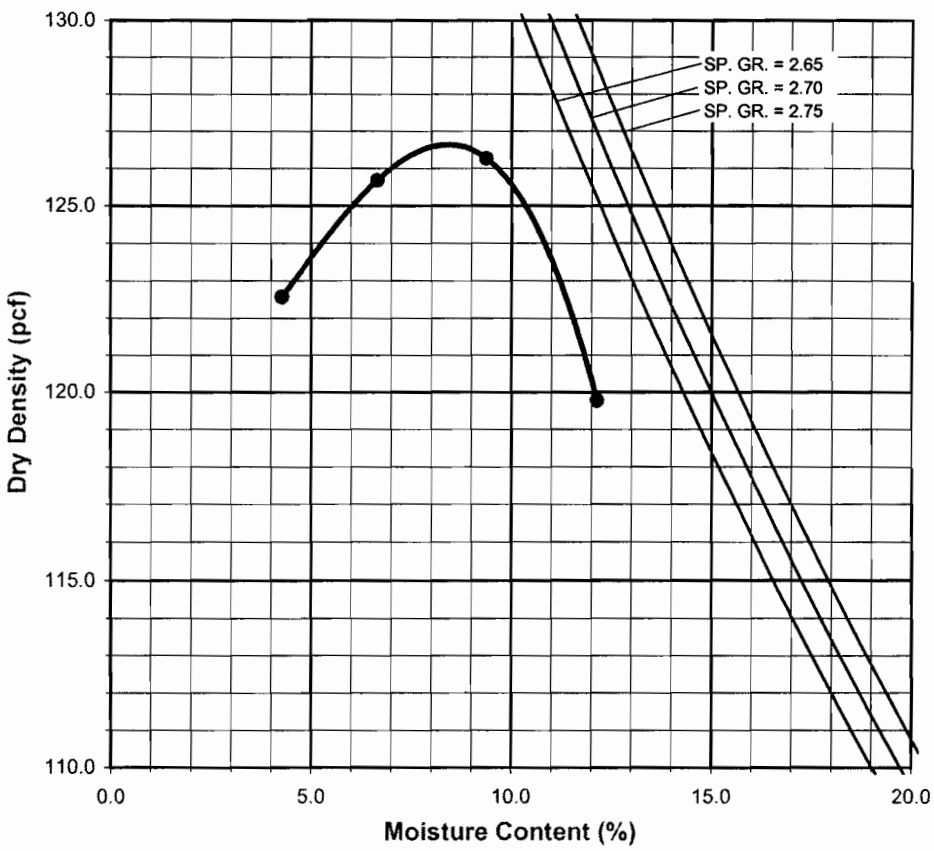
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



MX LB-15, B-2 @ 0-5

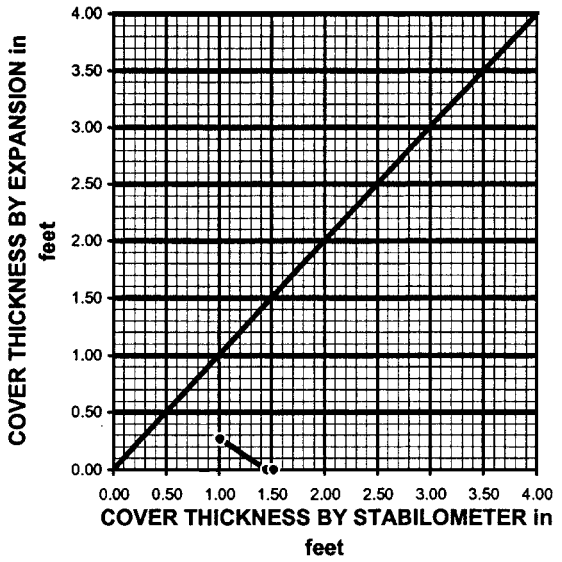
Leighton Consulting, Inc.

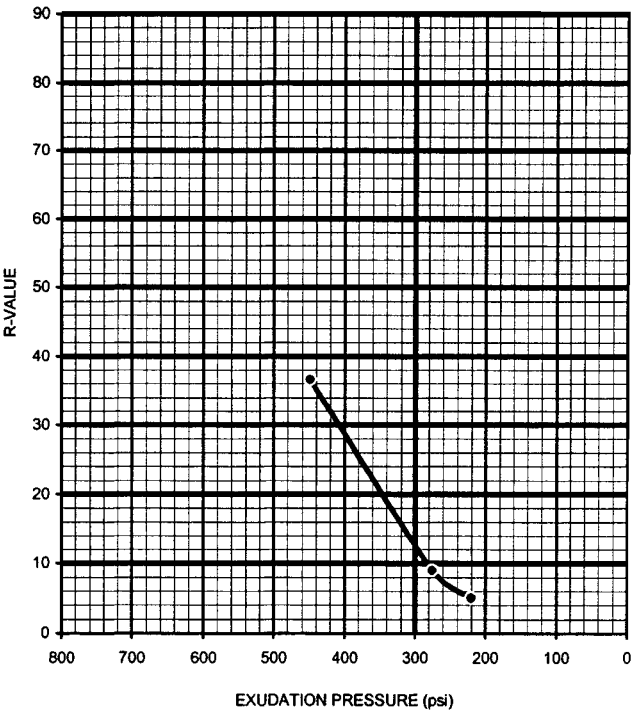
R-VALUE TEST RESULTS

Project Name:	MURRIETA TRIANGLE	Date:	2/9/06
Project Number:	601178-002	Technician:	BRM
Boring Number:	LB-4	Depth:	0-5
Sample Number:	B-1	Sample Location:	
Sample Description:	SM, BROWN SILTY SAND		

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	9.1	10.1	11.2
HEIGHT OF SAMPLE, Inches	2.50	2.58	2.58
DRY DENSITY, pcf	130.5	128.0	125.4
COMPACTOR AIR PRESSURE, psi	350	140	60
EXUDATION PRESSURE, psi	449	275	220
EXPANSION, Inches x 10exp-4	7	0	0
STABILITY Ph 2,000 lbs (160 psi)	79	135	142
TURNS DISPLACEMENT	4.45	5.18	6.10
R-VALUE UNCORRECTED	37	8	5
R-VALUE CORRECTED	37	9	5

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.02	1.46	1.52
EXPANSION PRESSURE THICKNESS, ft.	0.26	0.00	0.00





R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	13
EQUILIBRIUM R-VALUE:	13

Rev. 08-04

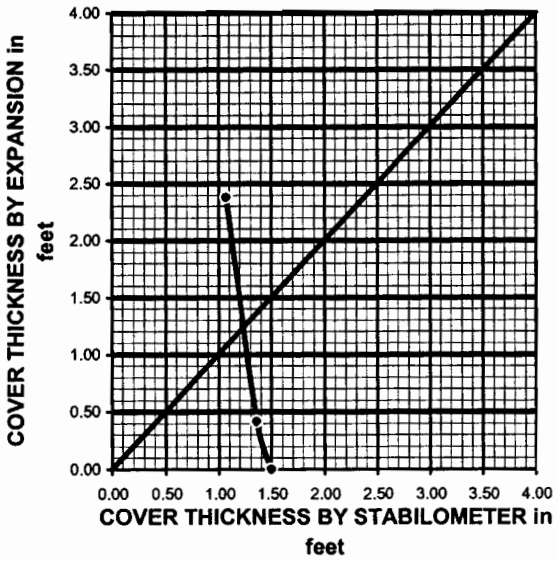
Leighton Consulting, Inc.

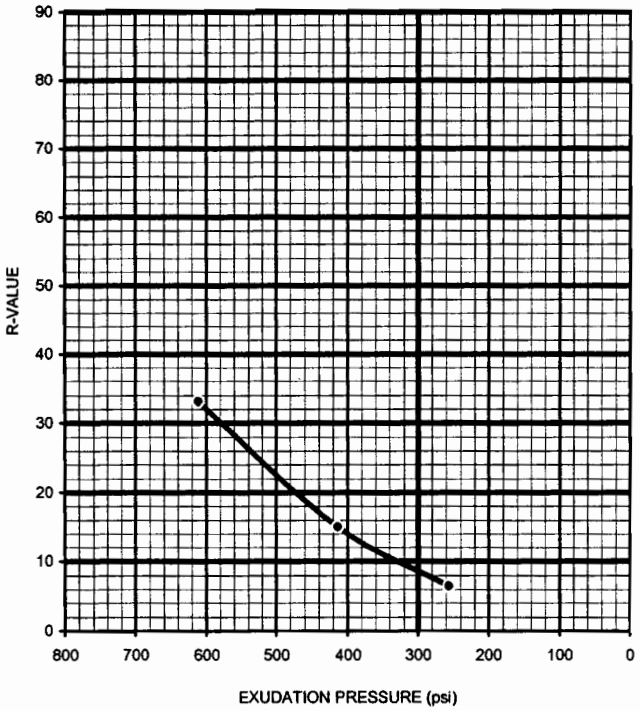
R-VALUE TEST RESULTS

Project Name:	MURRIETA TRIANGLE	Date:	2/9/06
Project Number:	601178-002	Technician:	BRM
Boring Number:	LB-11	Depth:	0-5
Sample Number:	B-1	Sample Location:	
Sample Description:	SM, BROWN SILTY SAND		

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	10.7	11.8	12.9
HEIGHT OF SAMPLE, Inches	2.47	2.56	2.54
DRY DENSITY, pcf	127.7	125.4	121.4
COMPACTOR AIR PRESSURE, psi	290	160	100
EXUDATION PRESSURE, psi	611	414	256
EXPANSION, Inches x 10exp-4	63	11	0
STABILITY Ph 2,000 lbs (160 psi)	86	122	140
TURNS DISPLACEMENT	4.35	4.78	5.20
R-VALUE UNCORRECTED	33	14	6
R-VALUE CORRECTED	33	15	6

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.07	1.36	1.50
EXPANSION PRESSURE THICKNESS, ft.	2.38	0.41	0.00





R-VALUE BY EXPANSION:	23
R-VALUE BY EXUDATION:	19
EQUILIBRIUM R-VALUE:	19

Rev. 08-04

Leighton Consulting, Inc.

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: MURRIETA TRIANGLE
Project No. : 601178-002
Boring No.: LB-9
Sample No. : B-1
Visual Soil Identification: SC

Tested By : JMB Date: 2/13/06
Data Input By: JMB Date: 2/13/06
Checked By: PRC Date: 2/13/06
Depth (ft.) : 0-5.0

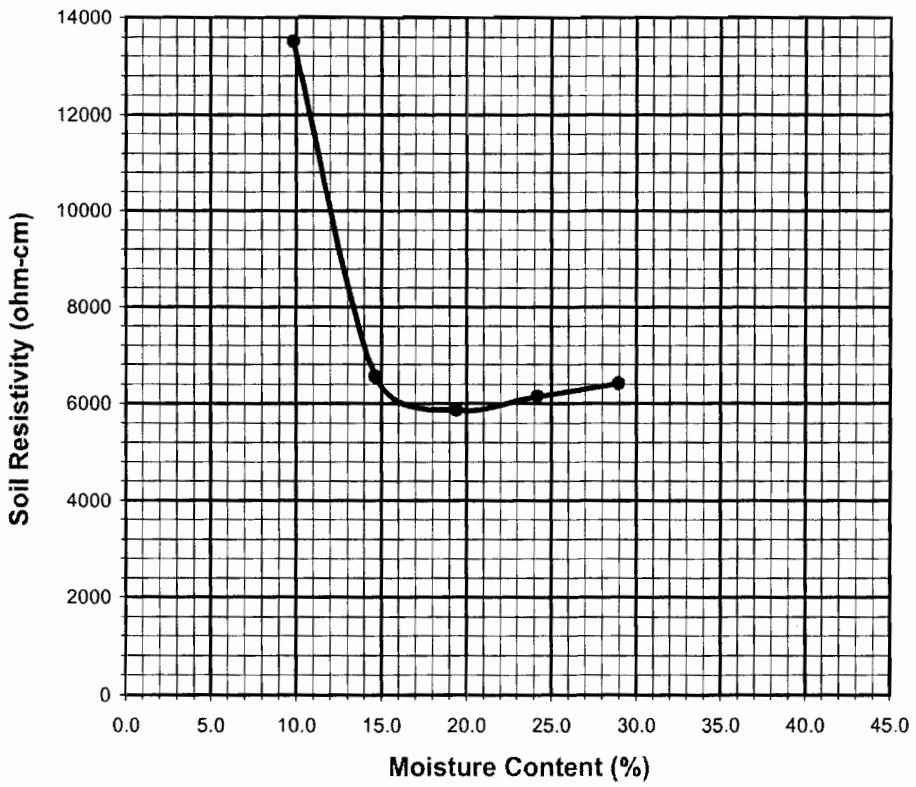
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (g)	380.00
Dry Wt. of Soil + Cont. (g)	372.10
Wt. of Container (g)	217.10
Moisture Content (%) (MCi)	5.10

Initial Soil Weight (gm)(Wt)	2200.0
Box Constant:	6.75

MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	100	200	300	400	500
Adj. Moisture Content (%) (MC)	9.87	14.65	19.43	24.21	28.98
Resistance Rdg. (ohm)	2000	970	870	910	950
Soil Resistivity (ohm-cm)	13492	6544	5869	6139	6409



Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
5869	**19.43**	**180**	**32**	**7.51**

Rev. 11-04

Leighton Consulting, Inc.

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: MURRIETA TRIANGLE
Project No. : 601178-002
Boring No.: LB-14
Sample No. : B-3
Visual Soil Identification: SC

Tested By : JMB Date: 2/13/06
Data Input By JMB Date: 2/13/06
Checked By: PRC Date: 2/13/06
Depth (ft.) : 5-10.0

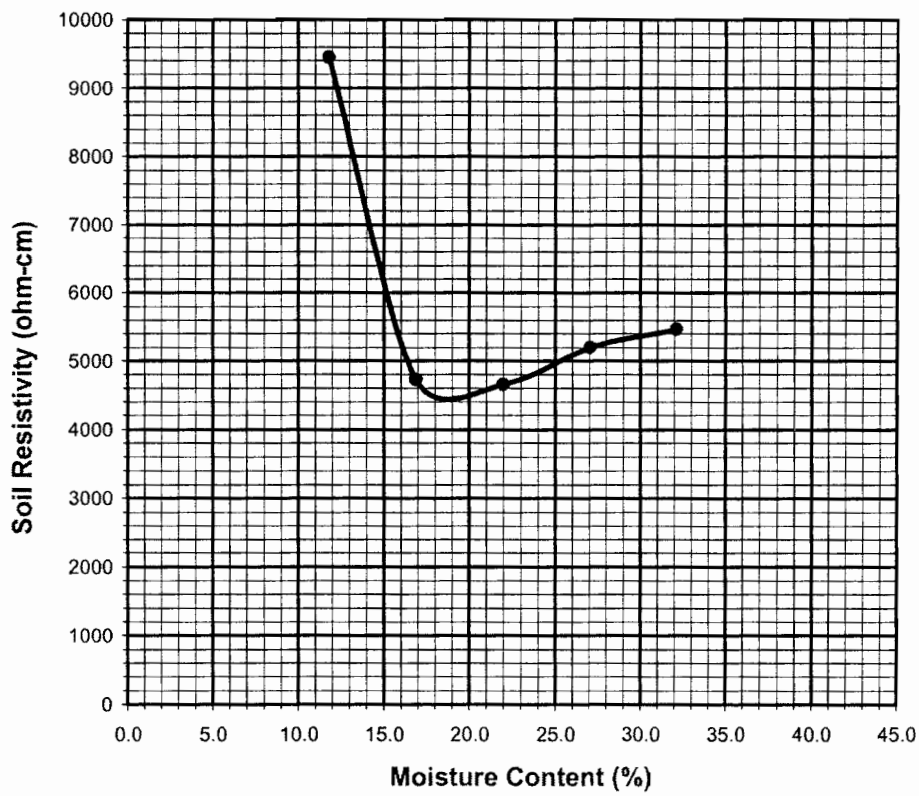
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)	282.0
Dry Wt. of Soil + Cont. (gm.)	278.0
Wt. of Container (gm.)	218.6
Moisture Content (%) (MCi)	6.7

Initial Soil Weight (gm)(Wt)	2100.0
Box Constant:	6.75

MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	100	200	300	400	500
Adj. Moisture Content (%) (MC)	11.82	16.90	21.98	27.06	32.15
Resistance Rdg. (ohm)	1400	700	690	770	810
Soil Resistivity (ohm-cm)	9444	4722	4655	5194	5464



Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
4655	**21.98**	**450**	**54**	**7.54**

Rev. 11-04

Laboratory Testing Procedures and Test Results

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples. 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 in the test data.

Direct Shear Tests: Direct shear tests were performed on selected remolded and/or undisturbed samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.005. The test results are presented in the test data.

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-1 @ 25'	Qp (undisturbed)	39.5	22
B-3 @ 1'	Col (undisturbed)	33.9	261
B-5 @ 1'	Col (undisturbed)	30.5	355
B-8 @ 5'	Qal (undisturbed)	45.0	232
B-10 @ 2'	Afu (undisturbed)	52.6	478
T-15 @ 0-5'	Qal (remolded)	31.9	254
T-29 @ 2'	Col (remolded)	32.1	178
T-29 @ 5'	Qp (remolded)	32.4	341

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, U.B.C. Standard No. 29-2. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Compacted Dry Density (pcf)	Expansion Index	Expansion Potential
B-3 @ 1'-4'	Reddish-brown, medium SM	119.5	0	Very Low
T-28 @ 2'-5'	Brown, medium to coarse SM	115.1	3	Very Low

Laboratory Testing Procedures (Cont'd.)

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

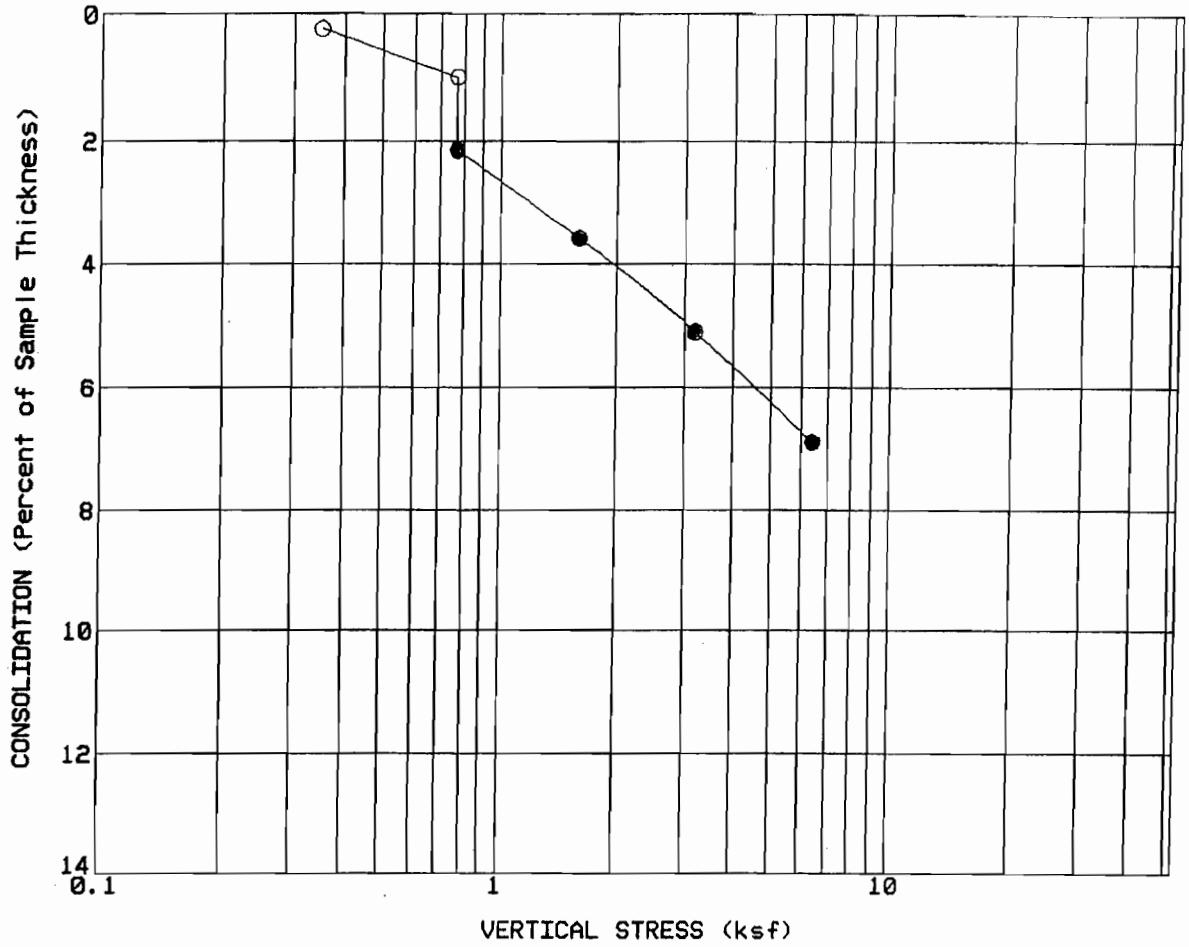
Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-3 @ 1'-4'	Brown, clayey SAND	133.8	7.3
B-5 @ 1'-4'	Reddish-brown, clayey, fine to medium SAND	130.8	9.1
T-15 @ 0-5'	Dark brown, silty SAND	130.7	8.8
T-29 @ 2'-4'	Reddish-brown, silty SAND	131.4	8.1
T-29 @ 5'	Gray to reddish-brown, silty SAND	135.6	6.7

"R"-Value: The resistance "R"-value was determined by the California Materials Method No. 301 for subgrade soils. Three samples were prepared and exudation pressure and "R"-value determined on each one. The graphically determined "R"-value at exudation pressure of 300 psi is summarized in the table below:

Sample Location	Sample Description	R-Value
T-12 @ 1'-1.5'	Dark brown, clayey to silty SAND	46
T-28 @ 2'-5'	Dark red-brown, silty SAND	21

* Based on the 1997 edition of the Uniform Building Code, Table No. 19-A-4, prepared by the International Conference of Building Officials (ICBO).

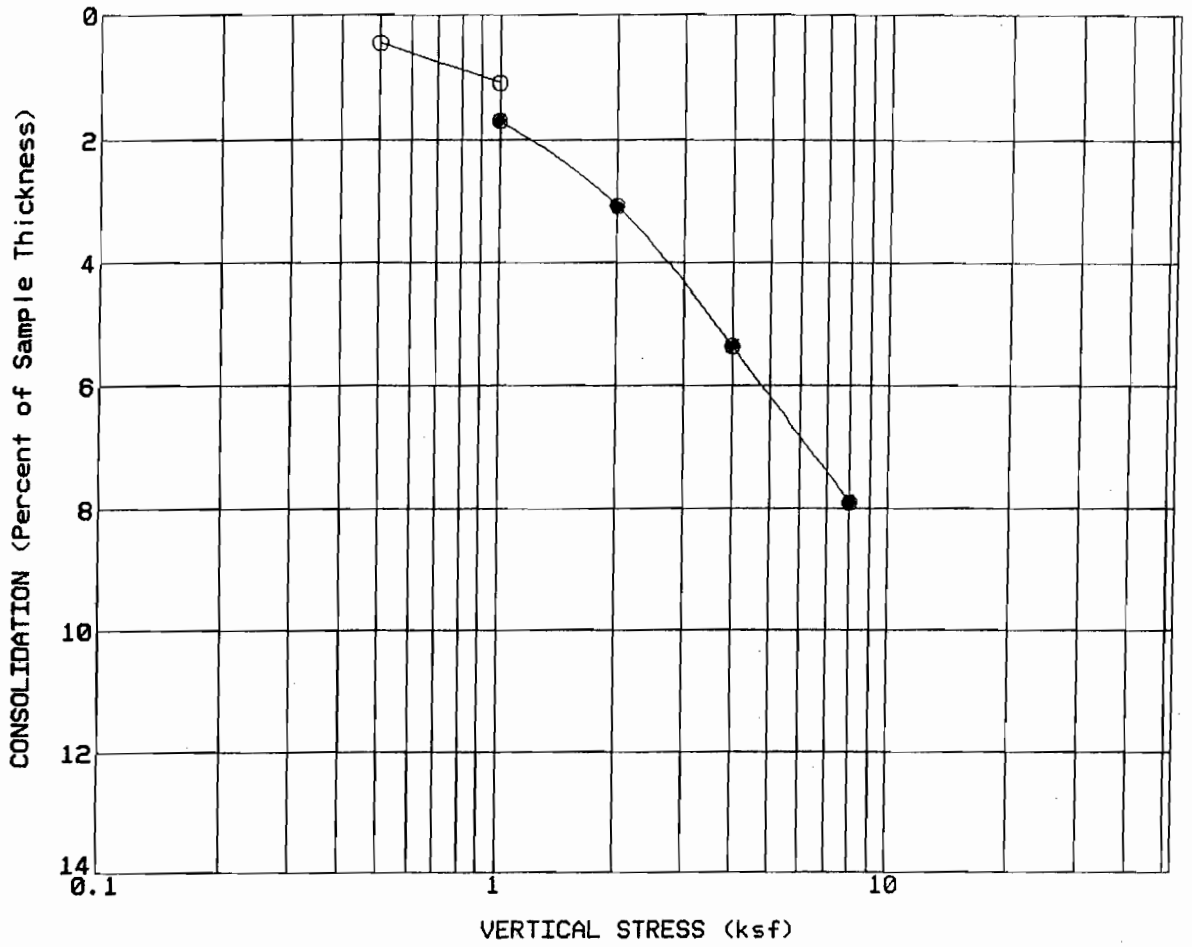


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	*B-5*	**Dry Density (psf)**	
Sample No.	*4*	**Moisture Content (%):**	
Depth (ft)	*10.0*	**Before**	
Soil Type	*SP*	**After**	
Sample Description	*Undisturbed*		

CONSOLIDATION CURVE
ASTM D2435

Project No. *11980052-001*
Project Name *RogersDale - Murrieta*
Date **3-26-98** **Figure No.**

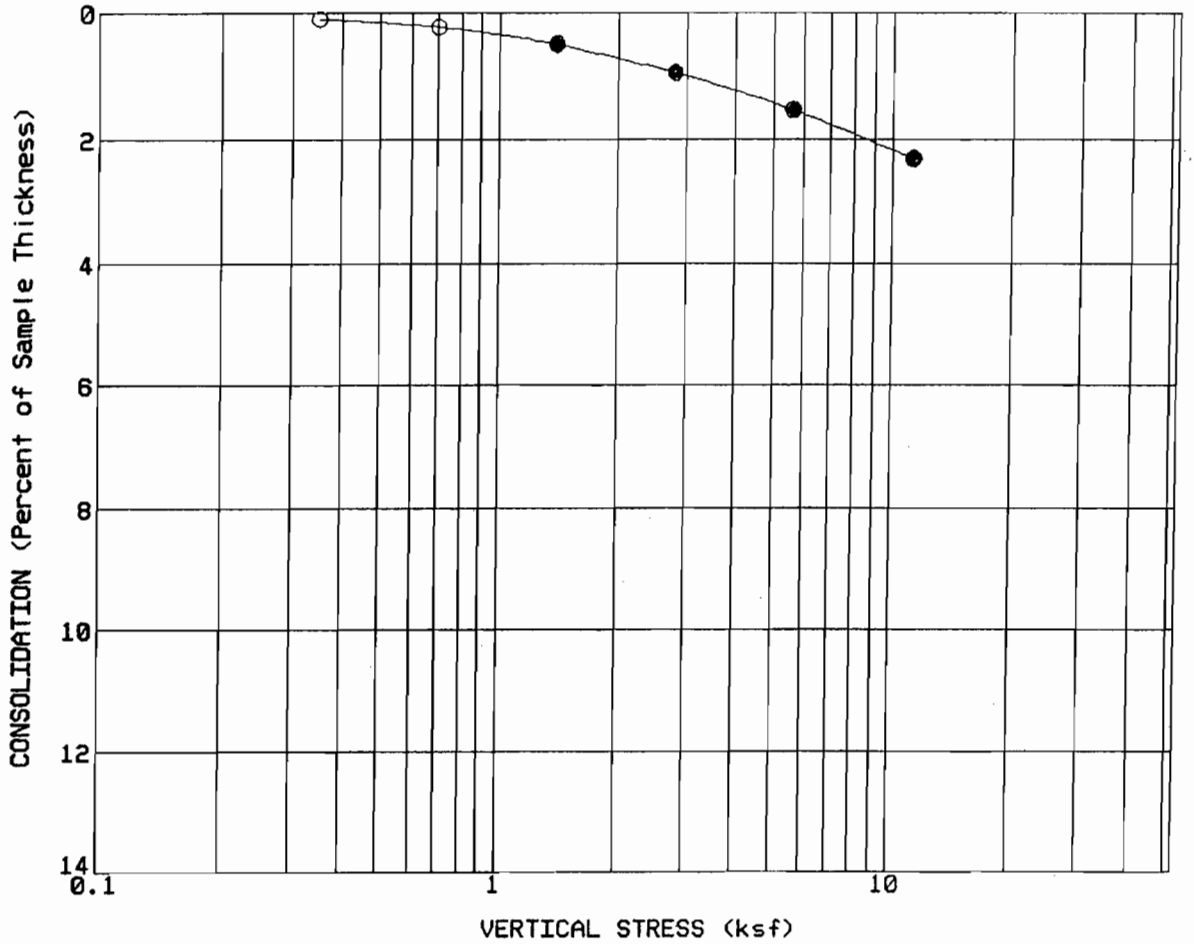


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	*B-9*	**Dry Density (psf)**	
Sample No.	*2*	**Moisture Content (%):**	
Depth (ft)	*4.0*	**Before**	
Soil Type	*ML*	**After**	
Sample Description	*Undisturbed*		

CONSOLIDATION CURVE
ASTM D2435

Project No. *11980052-001*
Project Name *RogersDale - Murrieta*
Date **3-26-98** **Figure No.**

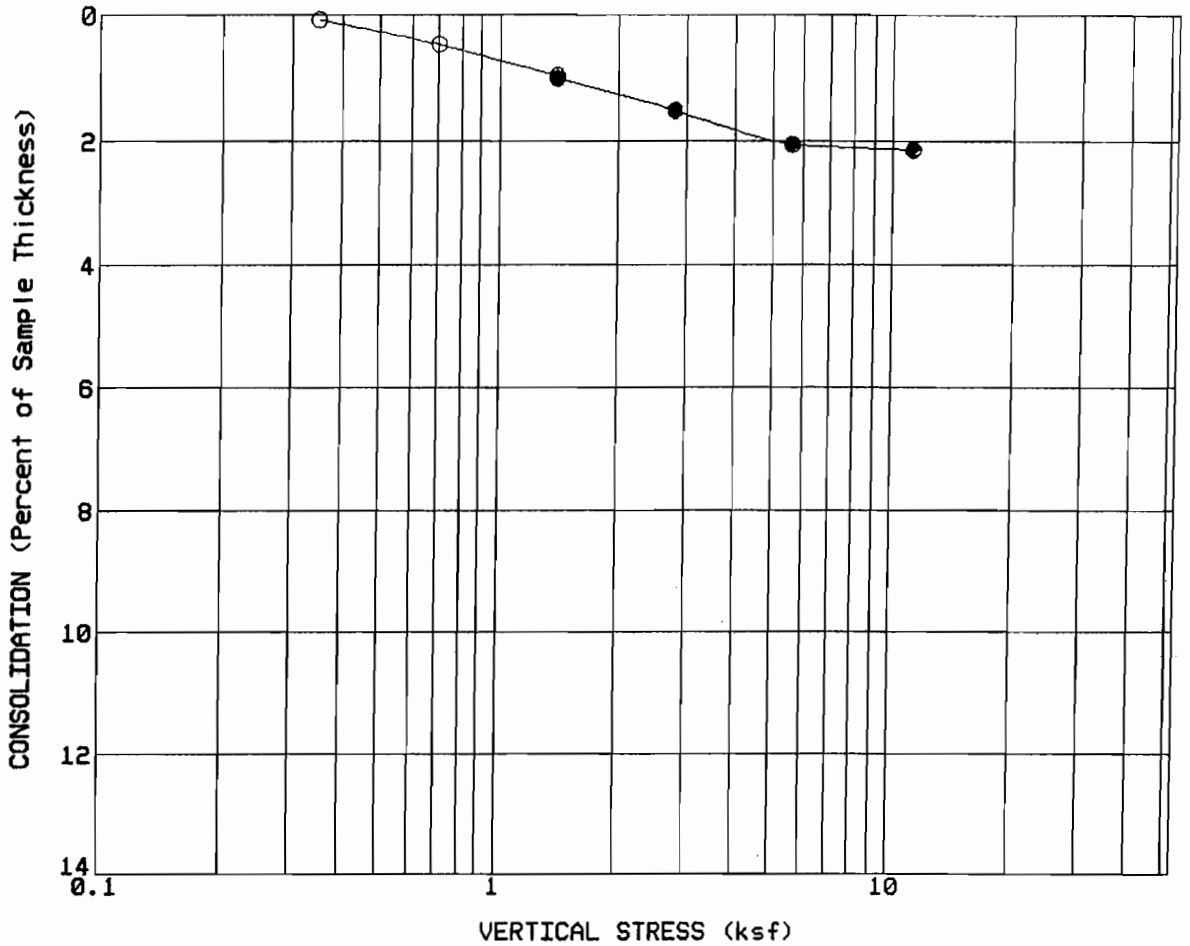


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	T-29	Dry Density (psf)	
Sample No.	2	Moisture Content (%):	
Depth (ft)	5.0	Before	
Soil Type	SM/SC	After	
Sample Description	Remolded		

CONSOLIDATION CURVE
ASTM D2435

Project No. 11980052-001
Project Name RogersDale - Murrieta
Date 3-26-98 Figure No.



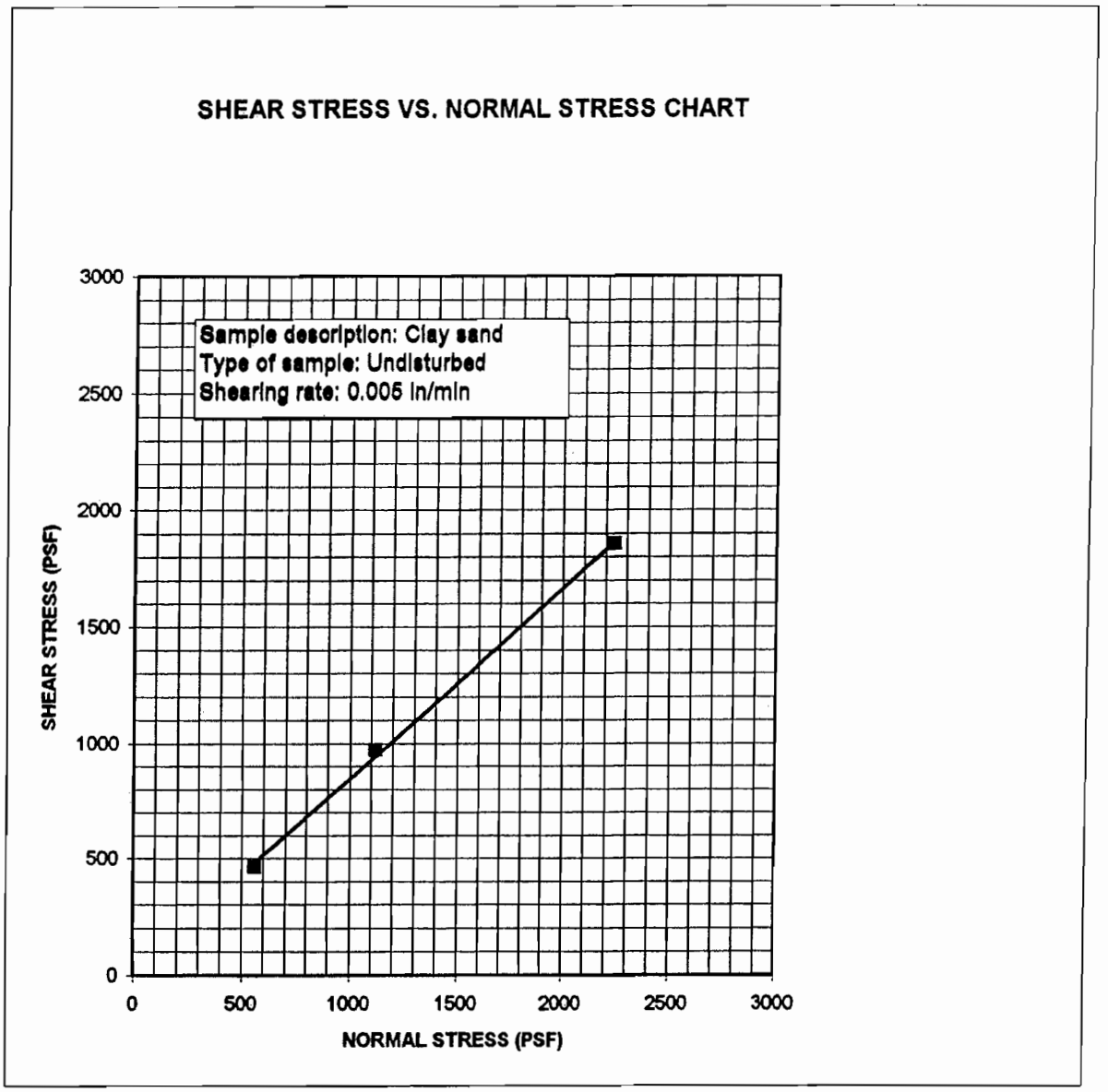
LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	T-29	Dry Density (psf)	
Sample No.	1	Moisture Content (%):	
Depth (ft)	0.0	Before	
Soil Type	SM	After	
Sample Description	Remolded		

CONSOLIDATION CURVE
ASTM D2435

Project No. 11980052-001
Project Name RogersDale - Murrieta
Date 3-26-98 Figure No.

DIRECT SHEAR TEST RESULTS

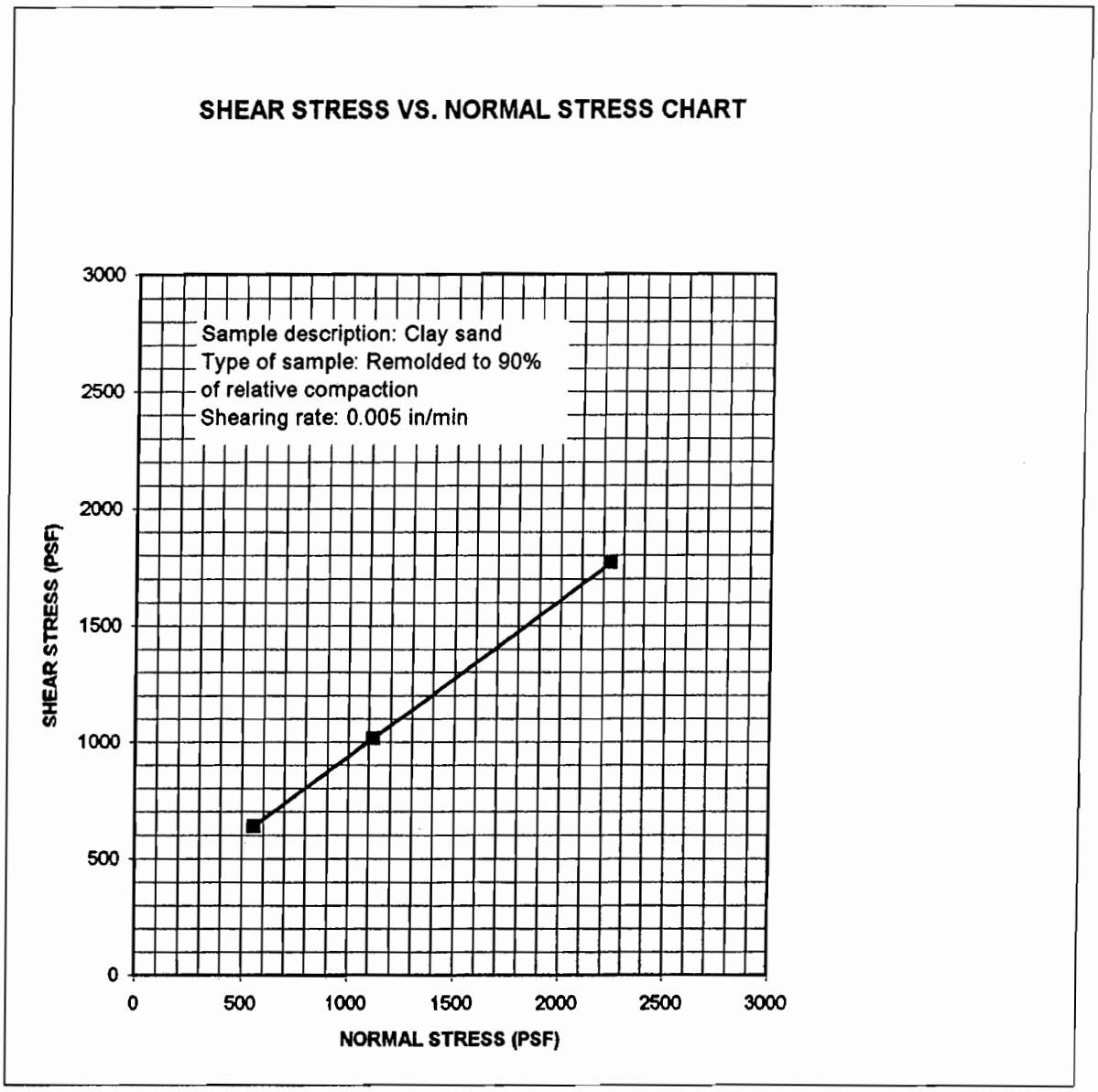


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
B-1 @ 25'	SM-SC	6.7 %	25.3 %	39.5	21.8 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

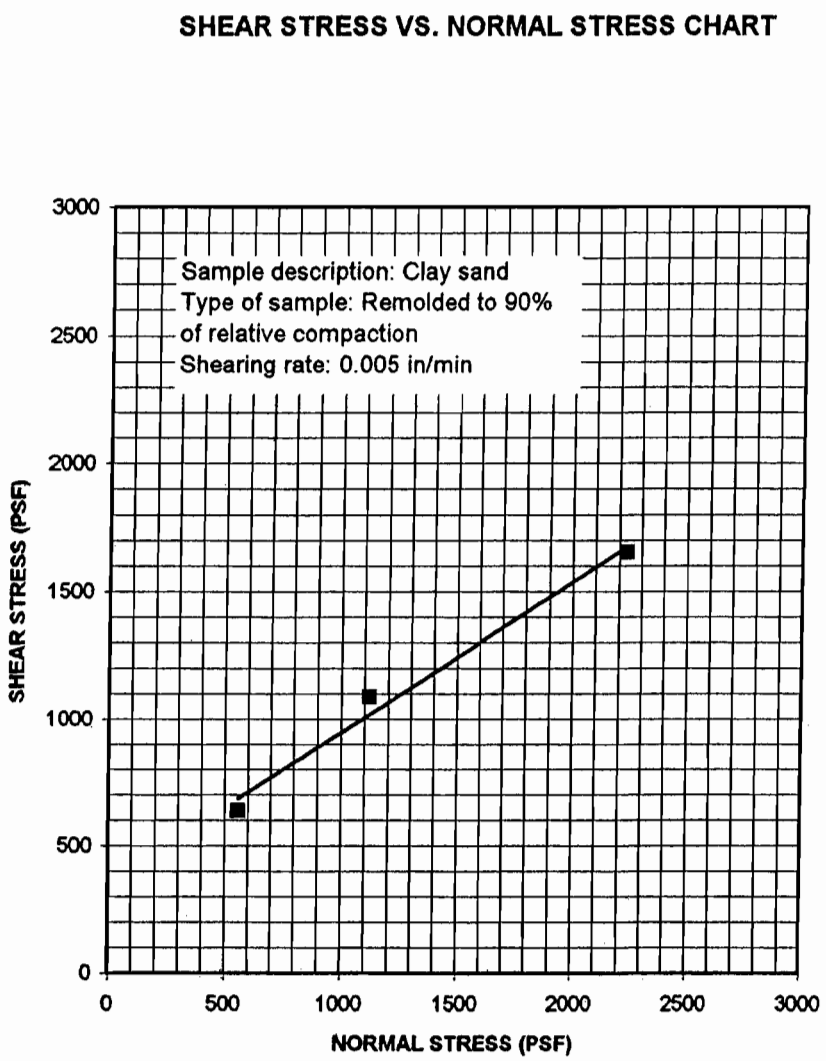


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
B-3 @ 1'	SM-SC	8.2 %	13.4 %	33.9	261.0 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

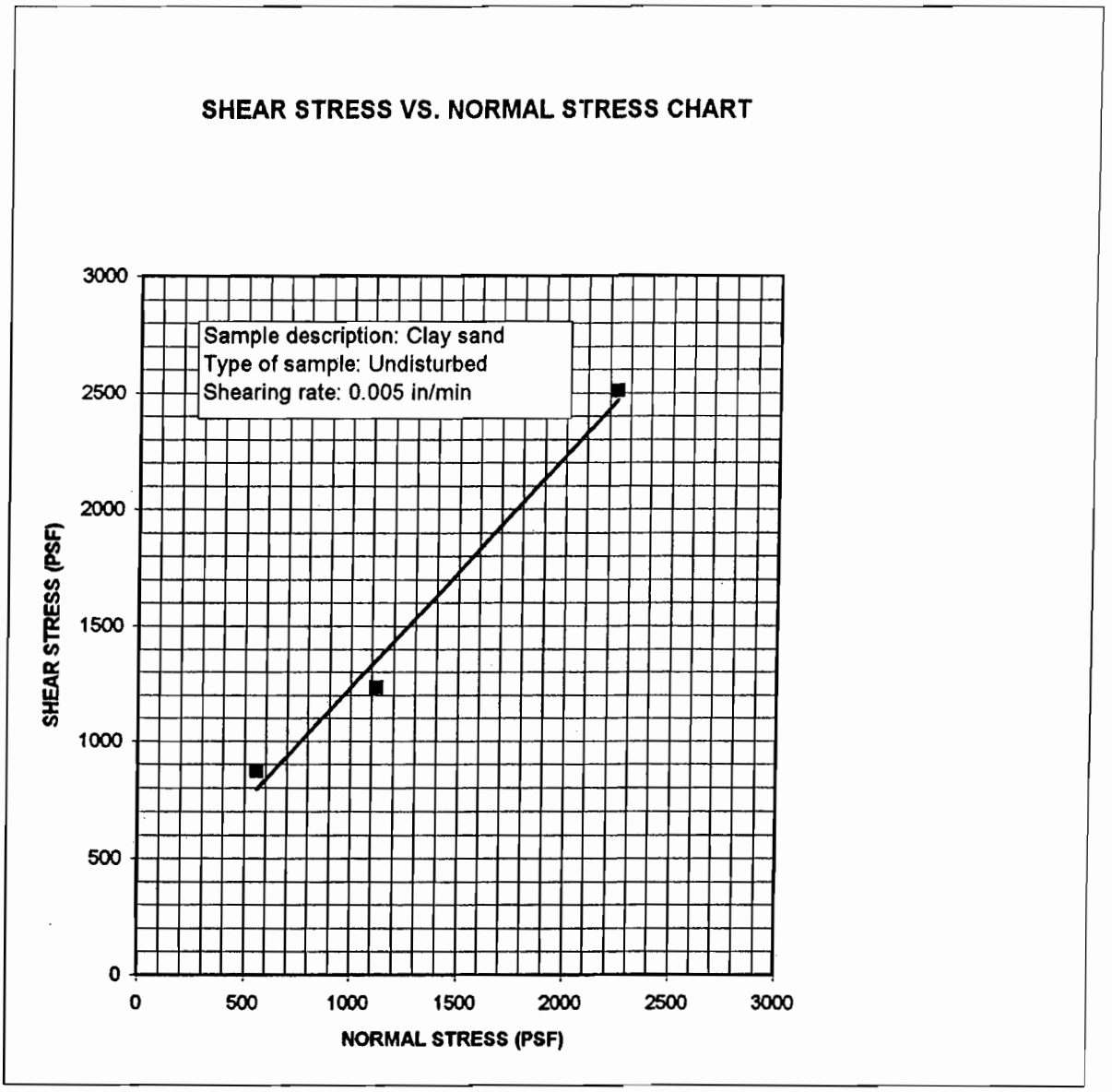


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
B-5 @ 1'	SM-SC	9.2 %	12.3 %	30.5	355.3 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

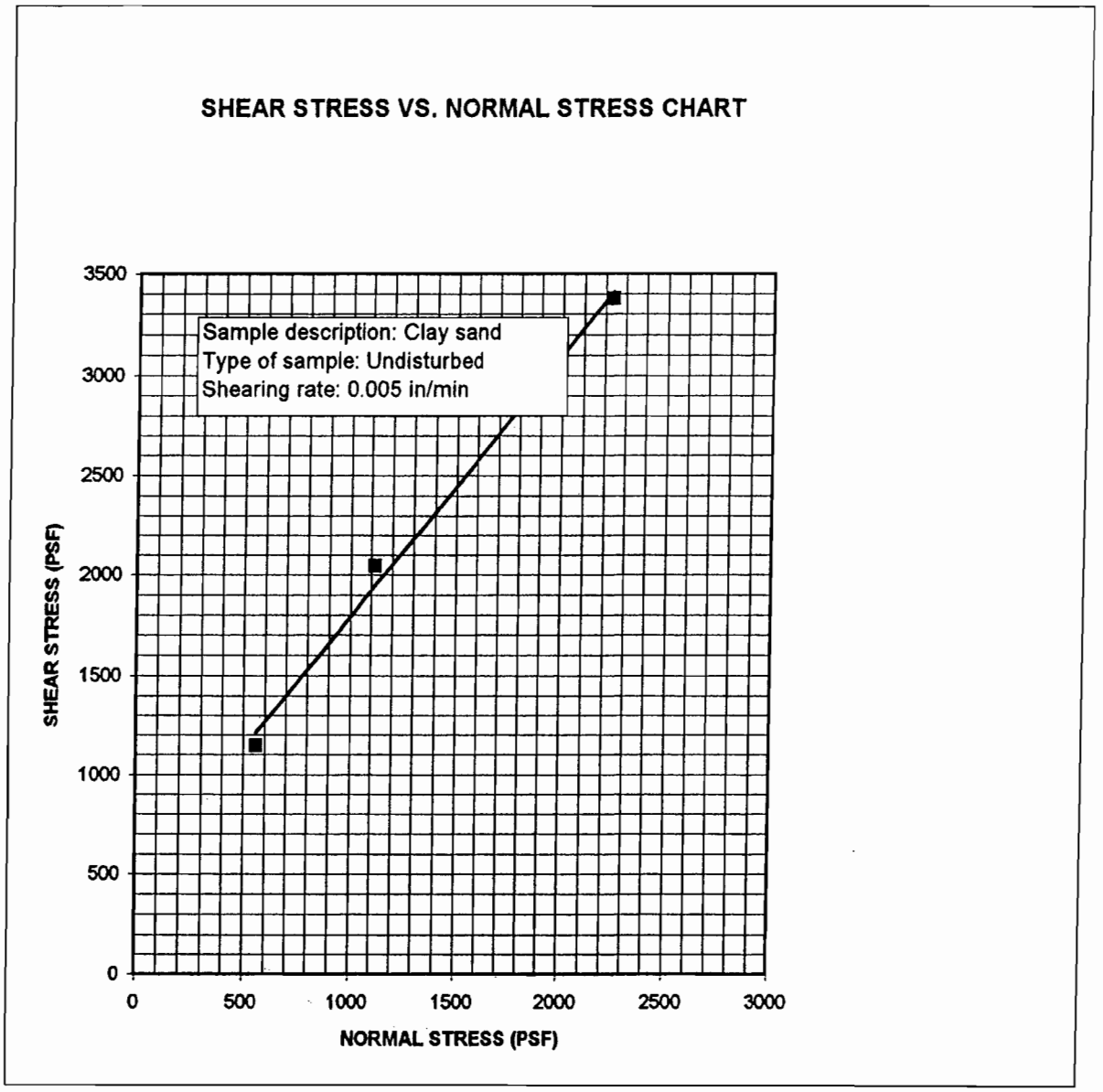


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
B-8 @ 5'	SM-SC	6.7 %	14.7 %	45.0	232.0 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

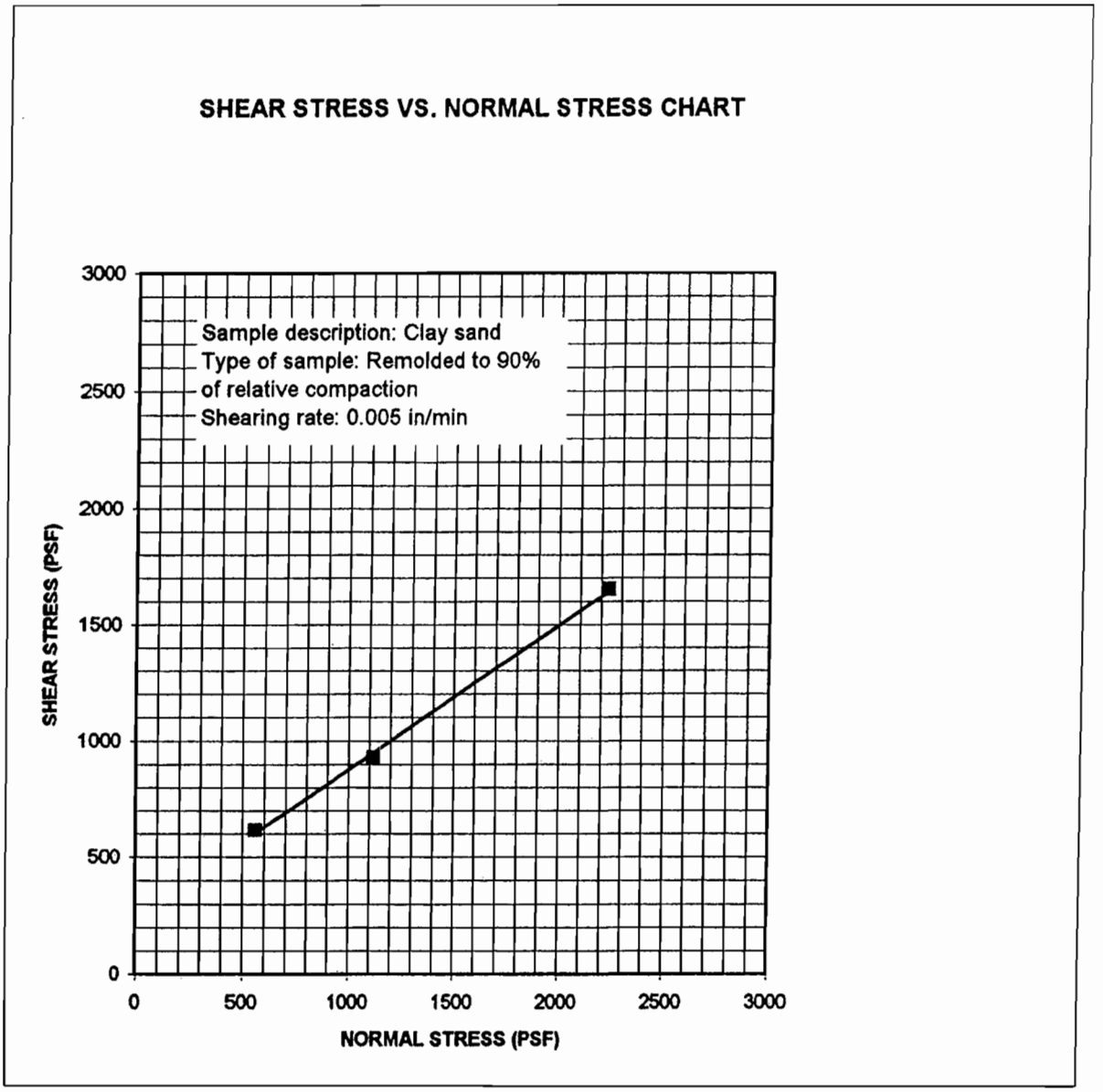


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
B-10 @ 2'	SM	7.4 %	14.7 %	52.6	478.5 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

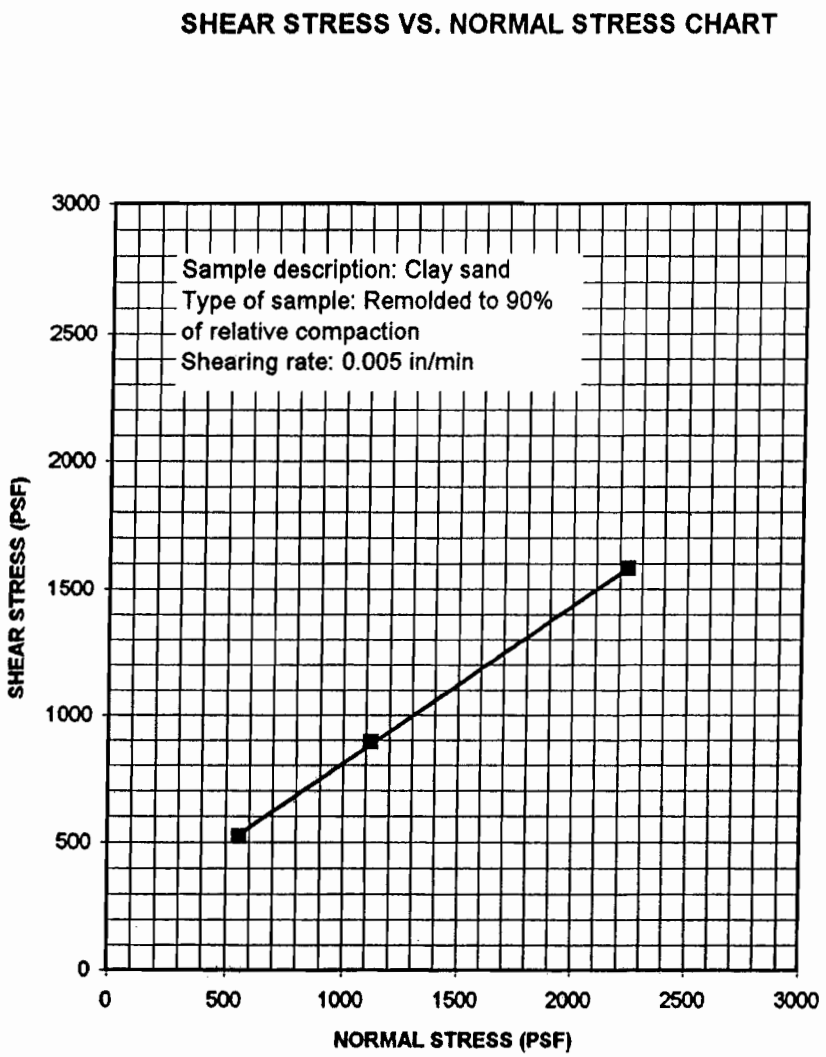


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
T-15 @ 5'	SM-SC	9.3 %	14.7 %	31.9	253.8 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS

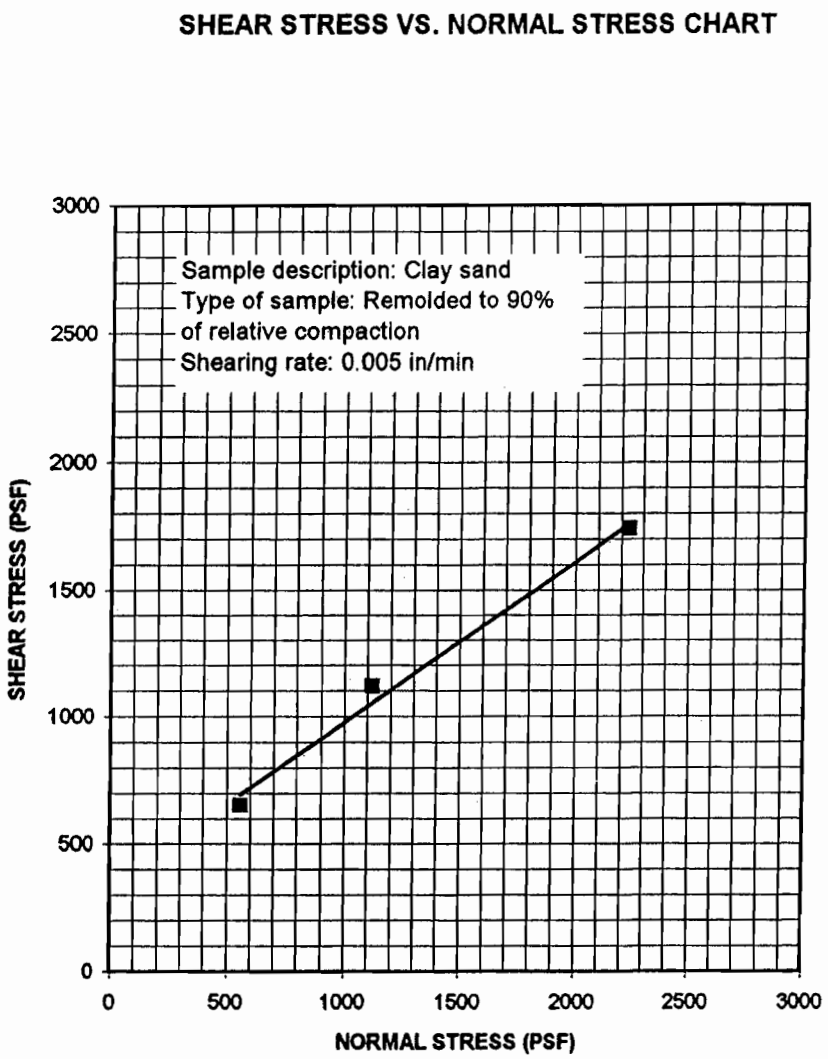


Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
T-29 @ 2'	SM-SC	8.6 %	12.3 %	32.1	177.6 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

DIRECT SHEAR TEST RESULTS



Boring No.	Symbol	Moisture Content		Friction Angle	Cohesion
		Before	After		
T-29 @ 5'	SM-SC	6.7 %	14.7 %	32.4	340.8 psf

Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Date: 3/16/98

Teratest Labs, Inc.
Premier Geotechnical testing

EXPANSION INDEX & SULFATE CONTENT TEST RESULTS

Sample No.	Soil Type	Sulfate Content	% of Saturation	Dry Density	EI	EI_{50}	Expansion Potential
B-3, @ 1'-4'	Reddish brown med. SM	N/A	52.6	119.5	0	1	VERY LOW
T-28, 1 @ 2'-5'	Brown med. to coarse SM	N/A	49.6	115.1	3	3	VERY LOW

Project No.: 980052-001
Project Name: RogersDale / Murrieta
Date: 3/16/98
Tested By: HNH

Teratest Labs Inc.
Premier Geotechnical Testing

Laboratory Testing Procedures and Test Results

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
1	Dark brown, silty SAND	9.0	130.0
2	Red-brown, clayey, fine to medium SAND	9.0	131.0
3	Brown, clayey, silty SAND	7.5	134.0
4	Red-brown, silty SAND	8.0	131.5
5	Gray to red-brown, silty SAND	8.0	131.5
6	Light brown, silty, fine SAND	13.0	119.5
7	Red-brown, silty SAND	9.0	130.0

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, U.B.C. Standard No. 29-2. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Compacted Dry Density (pcf)	Expansion Index	Expansion Potential
Building F	Brown, fine, silty SAND	115.0	8	Very Low
Building H	Brown, silty SAND	115.8	5	Very Low
Building C	Brown, silty SAND	114.0	11	Very Low
Celebrity Theater	Brown, silty SAND	117.6	8	Very Low

Laboratory Testing Procedures (continued.)

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

Sample Location	Sample Description	Sulfate (ppm) Content	Potential Degree of Sulfate Attack*
Building F	Brown, fine silty SAND	<.015	Negligible
Building H	Brown, silty SAND	<.015	Negligible
Building C	Brown, silty SAND	<.015	Negligible
Celebrity Theater	Brown, silty SAND	<.015	Negligible

* Based on the 1997 edition of the Uniform Building Code, Table No. 19-A-4, prepared by the International Conference of Building Officials (ICBO).

R-VALUE TEST DATA
(California Test 301)

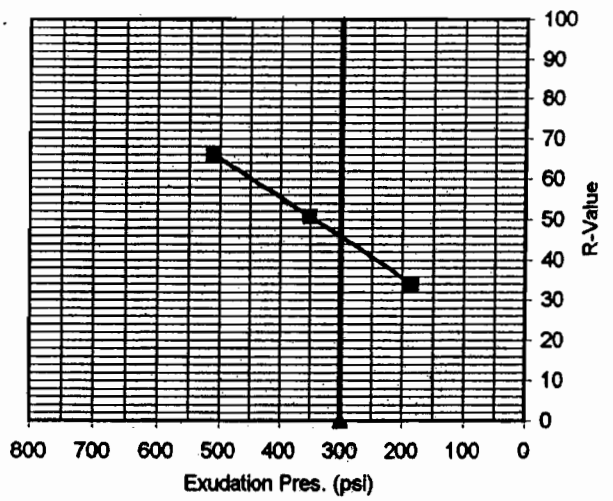
Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Sample Location: *T-12 @ 1'-1.5'*
Sample No.: *1*
Sample Description: *dark-brown, fine silty-sand*

Date: *3-12-98*
Tested by : *HNH*

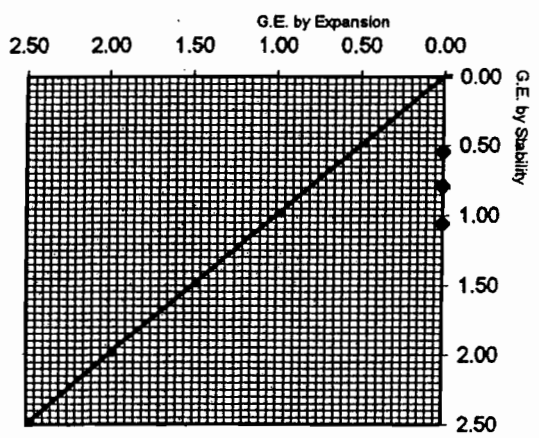
Mold No.	B	O	B
Mold Weight (g)	2093.2	2098.7	2116.5
Initial Moisture (%)	8.4	8.4	8.4
Water Added (ml)	10.0	0.0	5.0
Compactor Gage Pressure (psi)	150	350	200
Gross Weight (g)	3183.6	3282.5	3292
Height of Sample (in)	2.37	2.55	2.53
Moisture at Compaction (%)	9.3	8.4	8.9
Dry Density (psf)	127.5	129.8	129.3
Exudation Load (lbf)	2300	6400	4400
Exudation Pressure (psi)	183	509	350
Expansion (dial reading x 10^4)	0	0	0
Stabilometer Ph @ 1000 lbs.	36	18	27
@ 2000 lbs.	76	34	54
Displacement	4.43	4.79	4.77
R-value: Uncorrect	38	66	51
Corrected	34	66	51
G.E. by Stability	1.06	0.55	0.79
G.E. by Expansion	0.00	0.00	0.00

R-VALUE BY :
EXPANSION = 100
STABILITY = 46
DESIGN R = 46
TRAFFIC INDEX = 5

EXUDATION PRESSURE CHART



EXUDATION PRESSURE CHART



Teratest Labs Inc.
Premier Geotechnical Testing

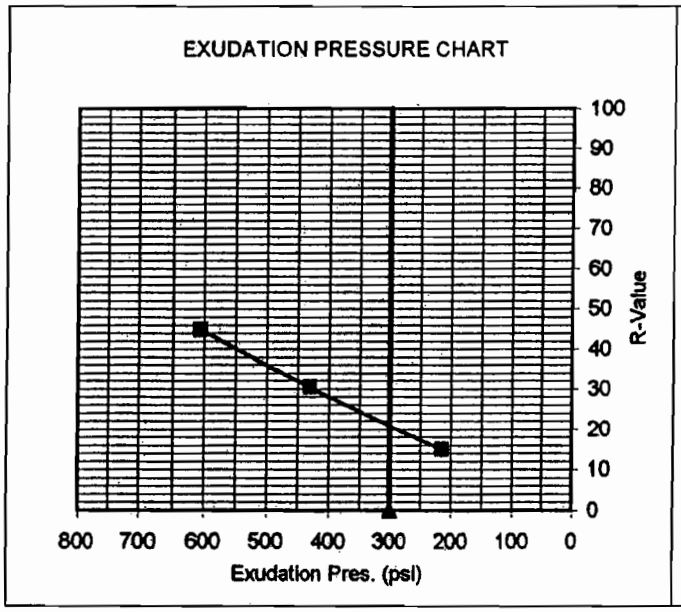
R-VALUE TEST DATA
(California Test 301)

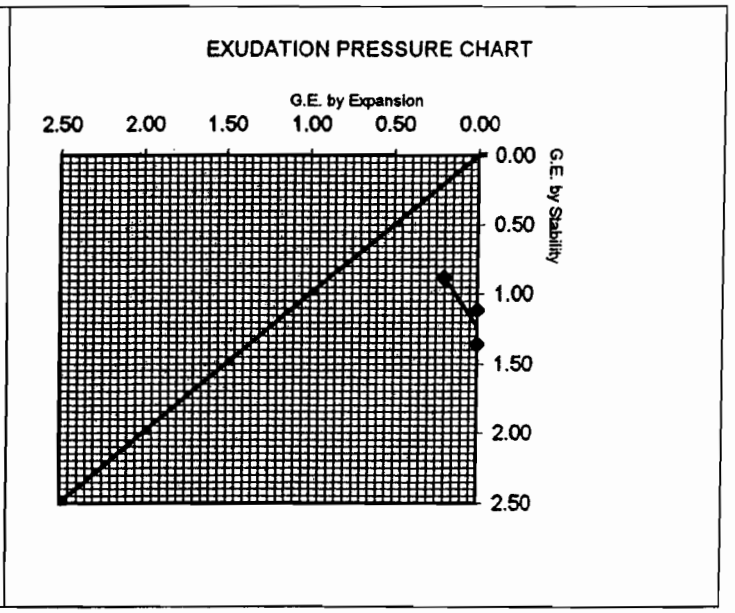
Project No.: *980052-001*
Project Name: *RogersDale / Murrieta*
Sample Location: *T-28 @ 2'-5'*
Sample No.: *1*
Sample Description: *dark-brown, fine silty-sand*

Date: *3-12-98*
Tested by : *HNH*

Mold No.	B	O	B
Mold Weight (g)	2096.8	2101.8	2101.9
Initial Moisture (%)	10.1	10.1	10.1
Water Added (ml)	15.0	5.0	10.0
Compactor Gage Pressure (psi)	60	150	100
Gross Weight (g)	3263.8	3276.1	3281.5
Height of Sample (in)	2.54	2.53	2.55
Moisture at Compaction (%)	11.5	10.6	11.0
Dry Density (psf)	124.9	127.2	126.3
Exudation Load (lbf)	2700	7600	5400
Exudation Pressure (psi)	215	605	430
Expansion (dial reading x 10^4)	0	6	0
Stabilometer Ph @ 1000 lbs.	56	32	42
@ 2000 lbs.	124	71	94
Displacement	4.02	3.85	4.02
R-value: Uncorrect	15	45	30
Corrected	15	45	30
G.E. by Stability	1.36	0.88	1.11
G.E. by Expansion	0.00	0.20	0.00

R-VALUE BY :
EXPANSION = 100
STABILITY = 21
DESIGN R = 21
TRAFFIC INDEX = 5





Teratest Labs Inc.
Premier Geotechnical Testing

APPENDIX D

LEIGHTON CONSULTING, INC

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

1.0 General

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

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

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

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

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

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.
The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of

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

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

2.0 Preparation of Areas to be Filled

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

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

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

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

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

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

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

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

3.0 Fill Material

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

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

3.3 Import: If importing of fill material is required for grading, proposed import material shall

meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed. Import fill should be free of all deleterious material and hazardous waste. Testing for hazardous waste typically takes between 7 and 14 working days.

4.0 Fill Placement and Compaction

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

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

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

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

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

5.0 Subdrain Installation

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

6.0 Excavation

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

7.0 Trench Backfills

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

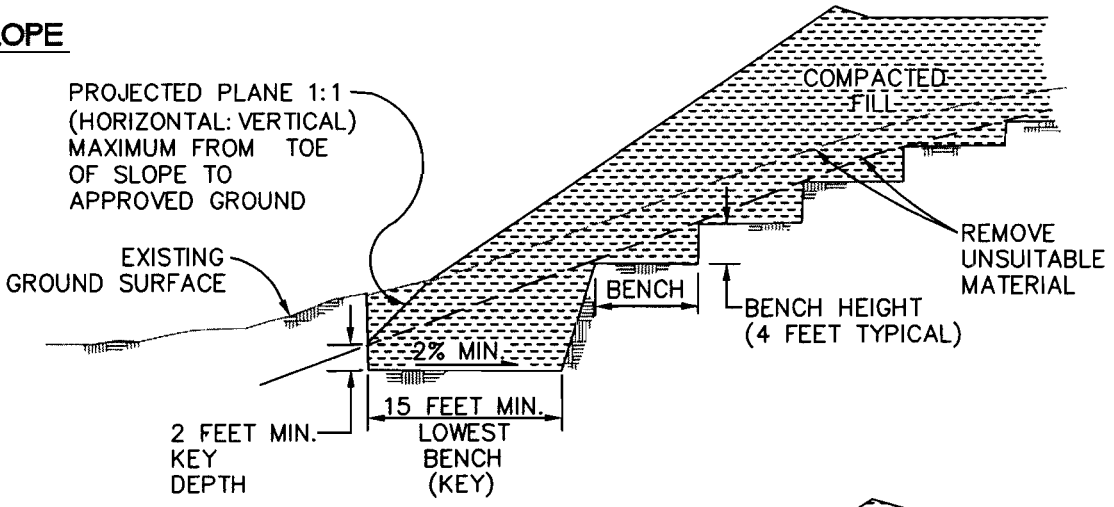
7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit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

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

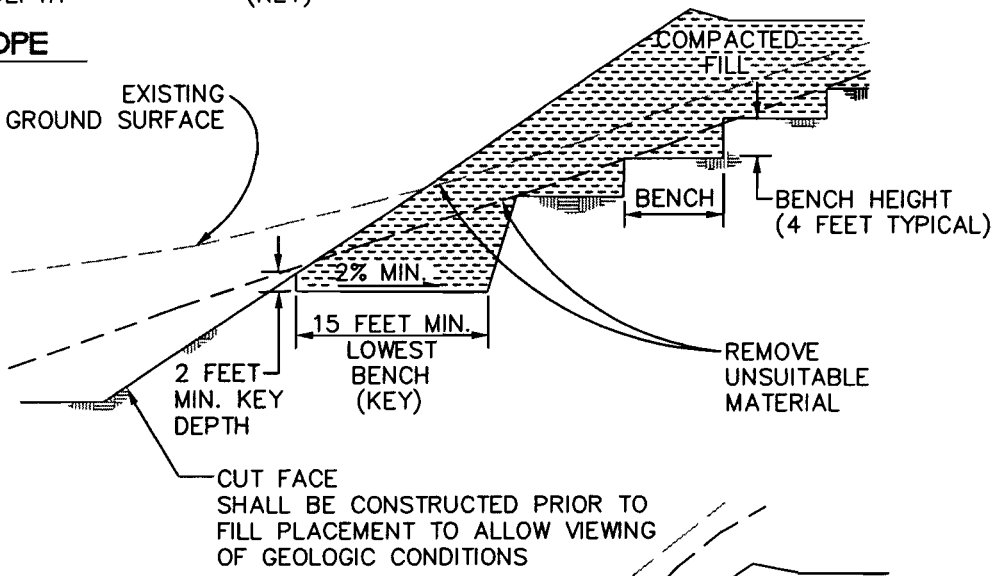
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

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

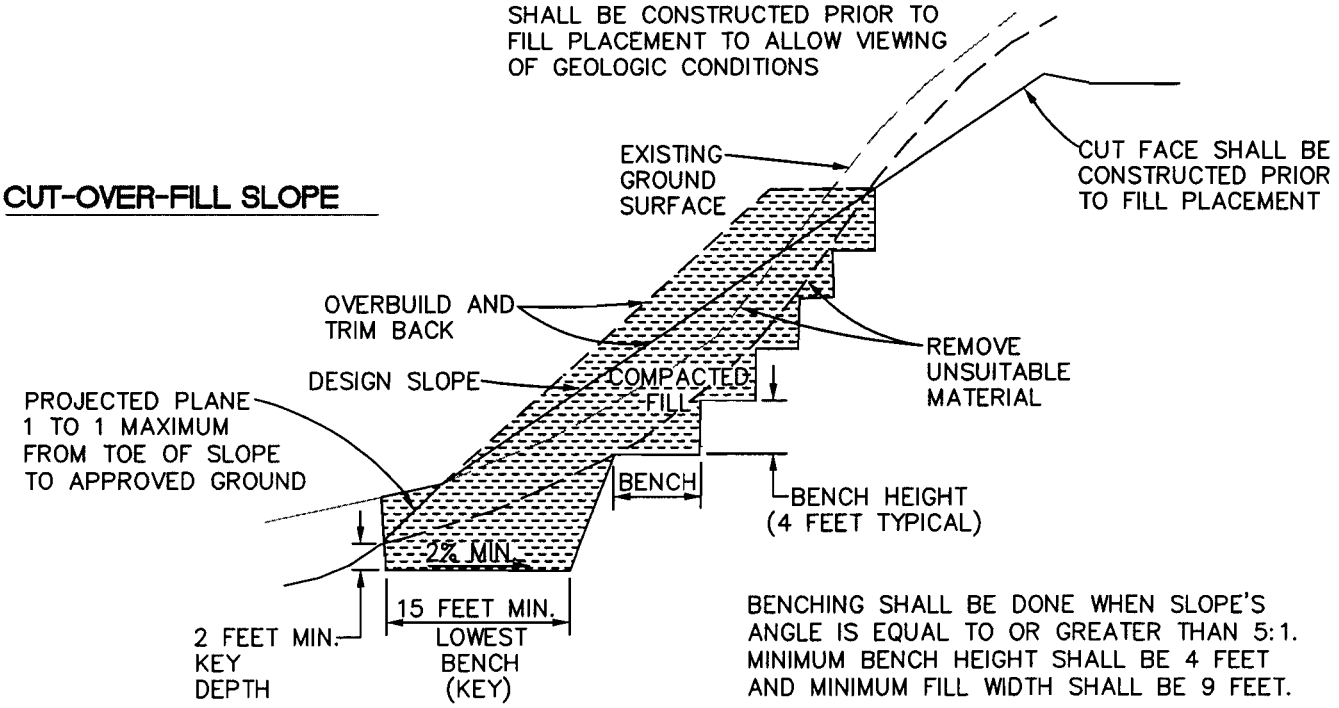
FILL SLOPE



FILL-OVER-CUT SLOPE

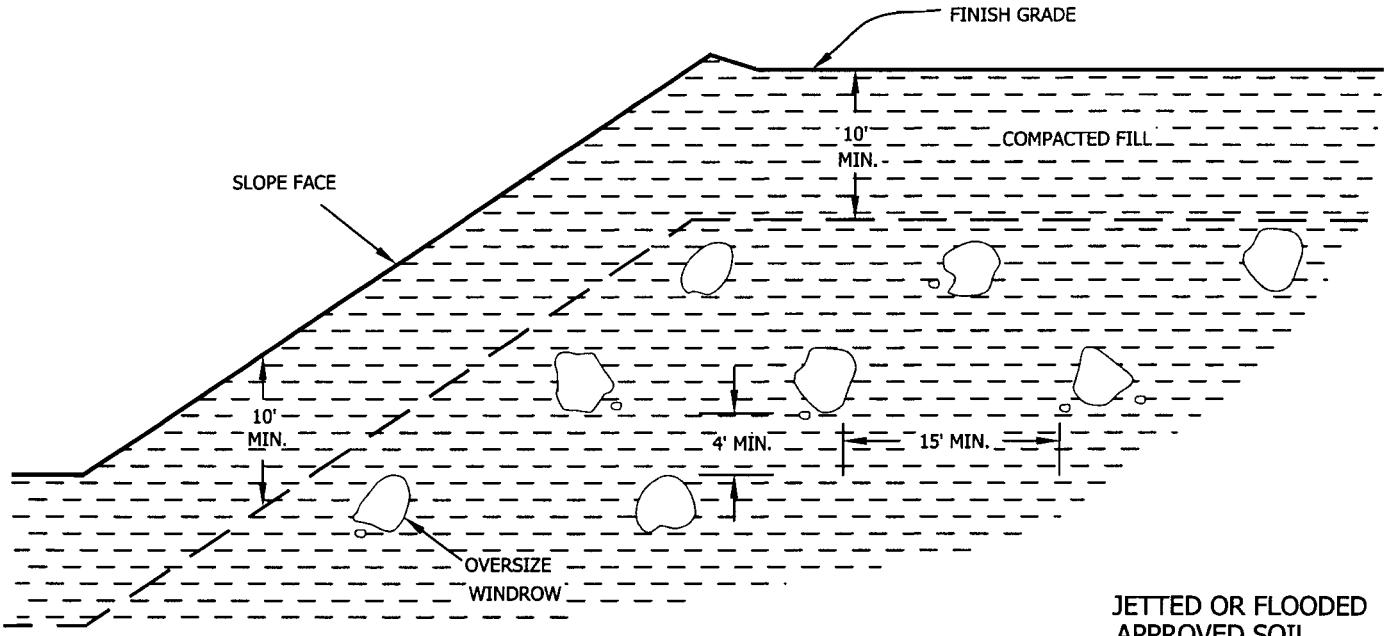


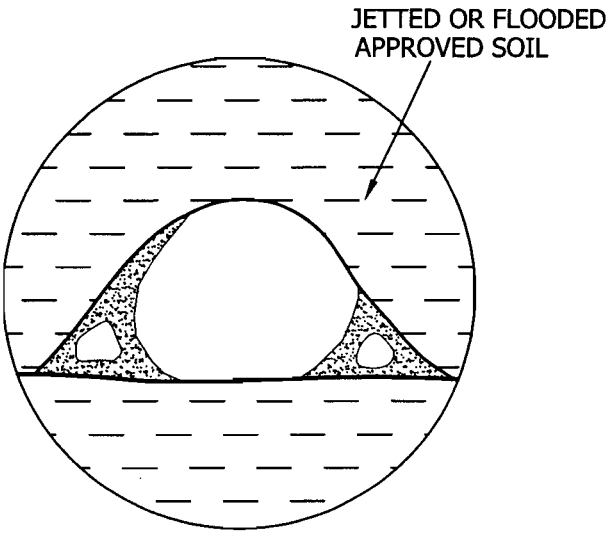
CUT-OVER-FILL SLOPE



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

KEYING AND BENCHING	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS A	Leighton

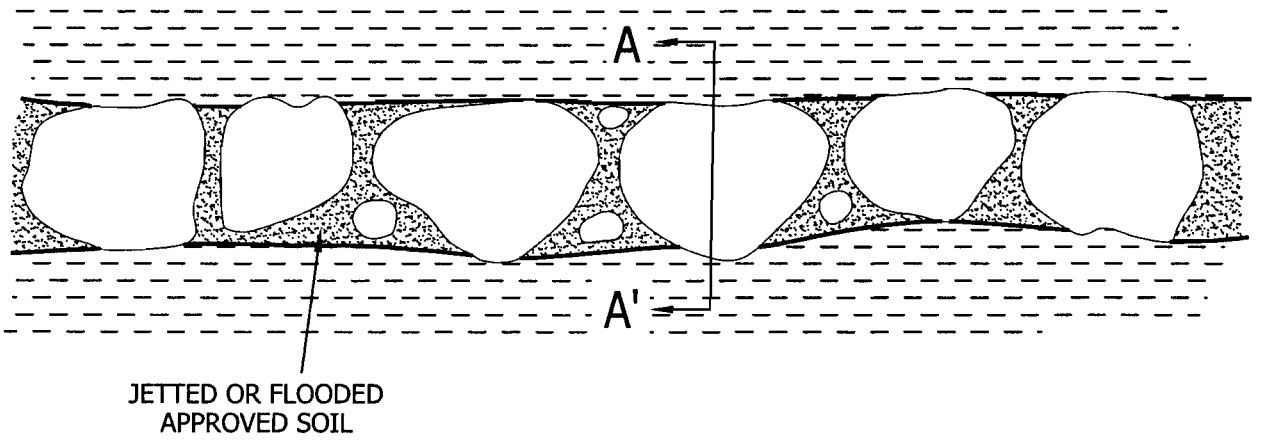




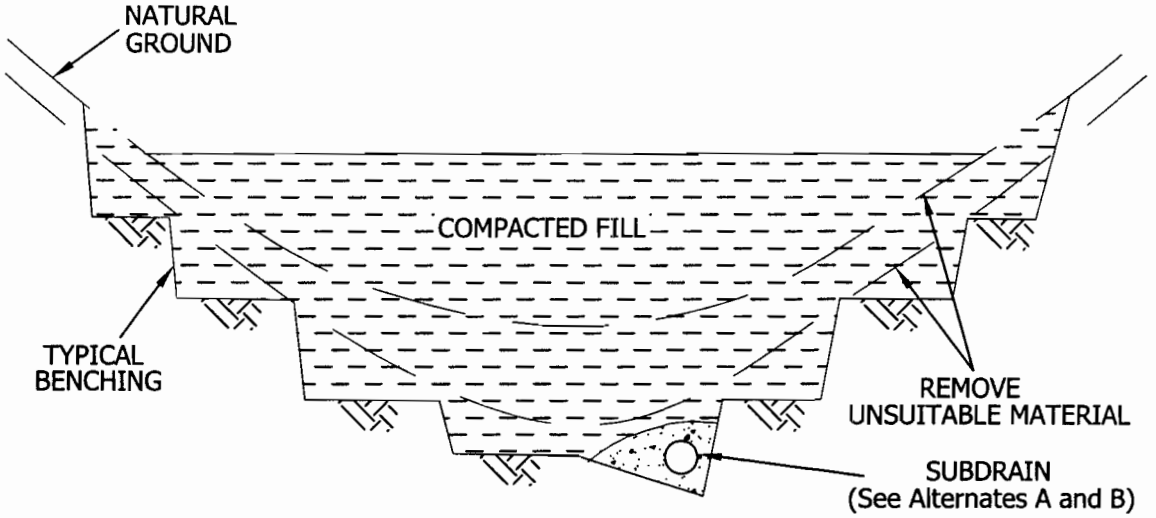
SECTION A-A'

- Oversize rock is larger than 8 inches in largest dimension.
- Backfill with approved soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope face.

PROFILE ALONG WINDROW

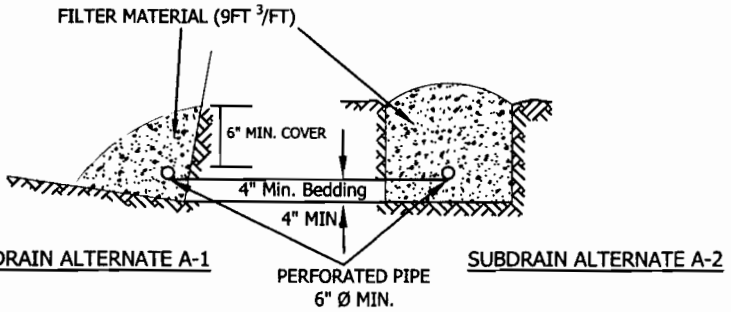


OVERSIZE ROCK DISPOSAL	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS B	Leighton



SUBDRAIN ALTERNATE A

PERFORATED PIPE SURROUNDED WITH FILTER MATERIAL

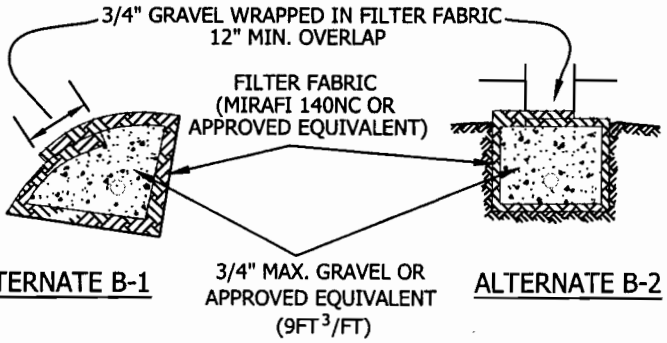


FILTER MATERIAL

FILTER MATERIAL SHALL BE CLASS 2 PERMEABLE MATERIAL PER STATE OF CALIFORNIA STANDARD SPECIFICATION, OR APPROVED ALTERNATE. CLASS 2 GRADING AS FOLLOWS:

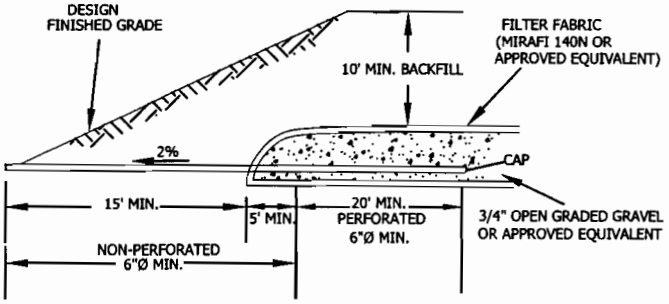
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

SUBDRAIN ALTERNATE B

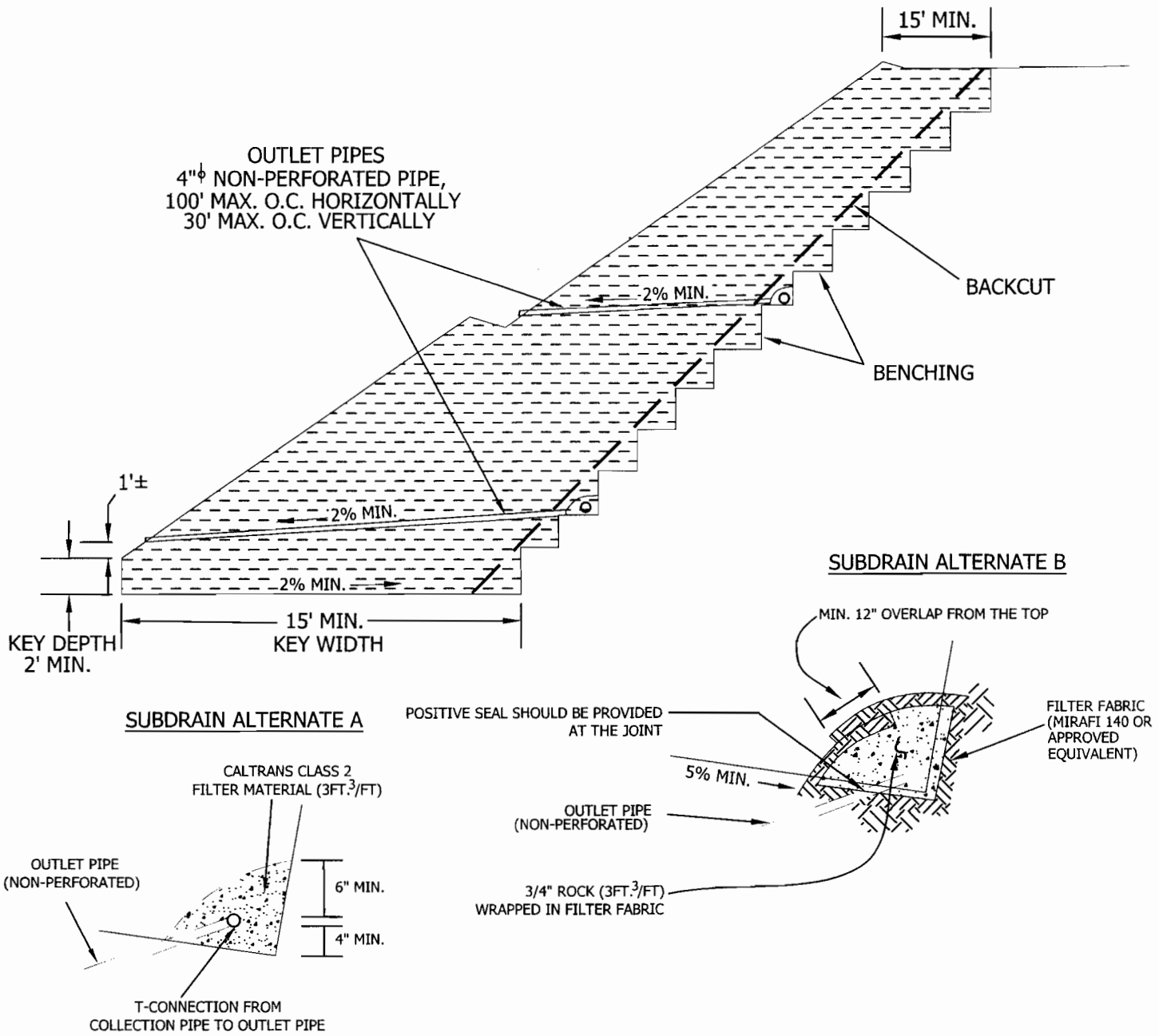


◌ PERFORATED PIPE IS OPTIONAL PER GOVERNING AGENCY'S REQUIREMENTS

DETAIL OF CANYON SUBDRAIN TERMINAL



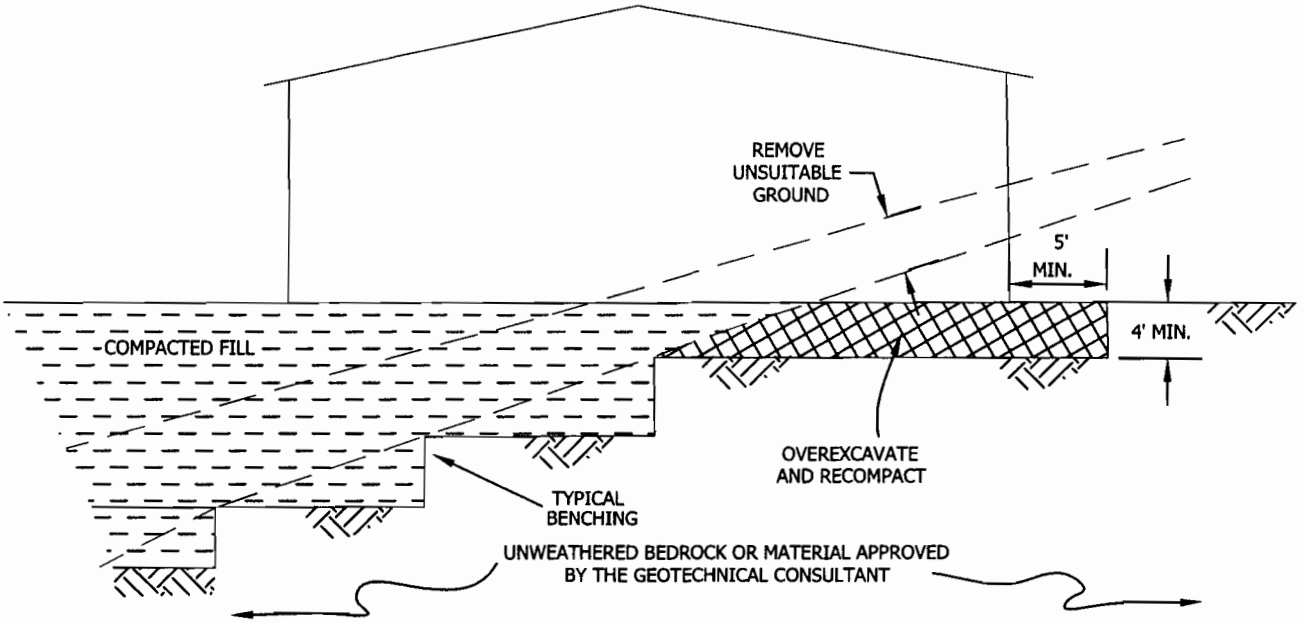
CANYON SUBDRAIN	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS C	Leighton



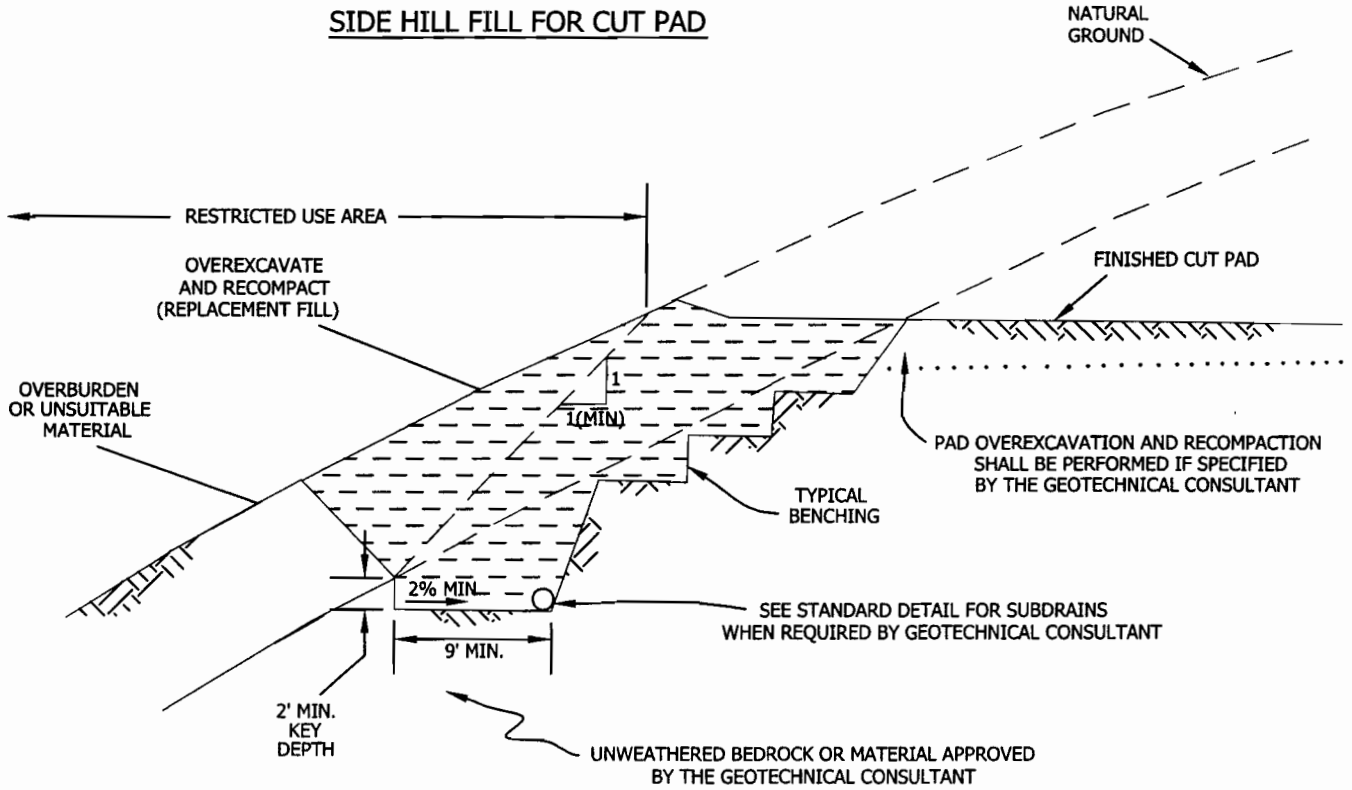
- SUBDRAIN INSTALLATION - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.
- SUBDRAIN PIPE - Subdrain pipe shall be ASTM D2751, ASTM D1527 (Schedule 40) or SDR 23.5 ABS pipe or ASTM D3034 (Schedule 40) or SDR 23.5 PVC pipe.
- All outlet pipe shall be placed in a trench and, after fill is placed above it, rodded to verify integrity.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS D	Leighton

CUT-FILL TRANSITION LOT OVEREXCAVATION



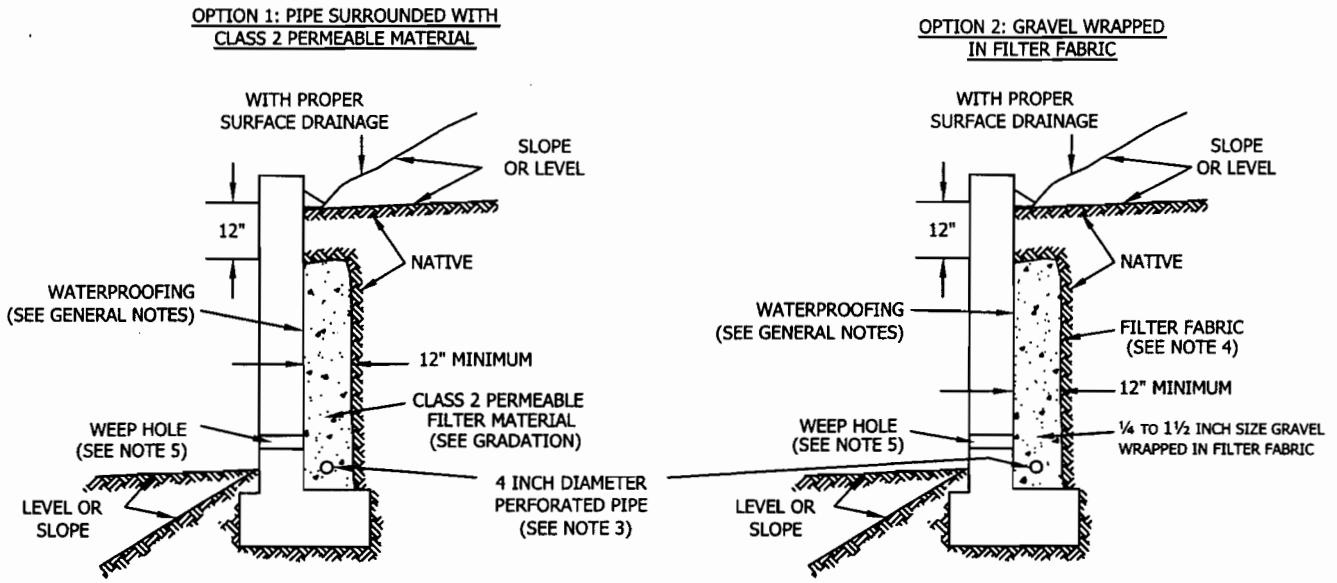
SIDE HILL FILL FOR CUT PAD



TRANSITION LOT FILLS AND SIDE HILL FILLS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS E	Leighton

APPENDIX E

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER08041.0MRP

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

June 29, 2012

Proposal No. 603483-001

Domenigoni-Barton Properties
31851 Winchester Road
Winchester, California 92596

Attention: Mr. Andy Domenigoni

Subject: Geotechnical Feasibility Report
Proposed Below Grade Parking Structures
The Triangle Commercial Development
Murrieta, California

In accordance with your request, this report is to provide a geotechnical opinion regarding the feasibility of constructing the proposed parking structures at the subject site. In preparation of this report, we have reviewed our "Preliminary Geotechnical Report" for this site dated January 11, 2008 and the provided Overall Site Plan – Level One prepared by SGPA Architecture.

PROJECT AND SITE DESCRIPTION

We understand that multi-level parking structures/garages are proposed along both the east and west sides of the site fronting I-215 and I-15, respectively. We further understand the easterly (I-215) structures lowest level could be founded at 12 to 15 feet below existing ground surface (i.e. subterranean floors).

Based on our previous site investigations and geotechnical observations performed during past site grading, the subject property is entirely underlain by the Pauba Formation with alluvial materials locally within the natural drainages of the site. Past artificial fill materials are also mapped within portions of the site. The majority of these materials have been placed under the observation and testing services of Leighton.

The east side of the site where the proposed subterranean structures are planned is underlain alluvial deposits and/or dense Pauba formation. The alluvial deposits are relatively loose to medium dense and extend to a maximum depth of 15 feet below ground surface along the existing drainage channel.

41715 Enterprise Circle N., Suite 103 ▪ Temecula, CA 92590-5661
951.296.0530 ▪ Fax 951.296.0534

This site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. However, the site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act nor is it in any Riverside County delineated special studies fault zones.

GEOTECHNICAL OPINION

Based on the above, it is our opinion that the design and construction of the proposed parking structures on this site is feasible from a geotechnical perspective. Deep foundation type (piles) may be required to support certain structures depending on required bearing pressures or allowable differential settlement criteria. In addition, due to existing natural drainage within the south side of the site, water proofing measures along with installation of underground sumps may be needed to prevent seepage or moisture in the subterranean levels during rainy seasons or depending on final site drainage design.

CLOSURE

We appreciate the opportunity to be of continued service on this project. If you have any questions, please call us at your convenience.

Respectfully submitted,
LEIGHTON CONSULTING, INC.

Simon I. Saiid, PE, GE
Principle Engineer

Robert F. Riha, CEG
Senior Principal Geologist

Distribution: (1) Addressee