GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE & APPALOOSA DRIVE
TENTATIVE TRACT MAP 38468
APN 436-280-006 & 007
SAN JACINTO, CALIFORNIA

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Project No. 644-22032
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Subject: Geotechnical Investigation

Project: Proposed Residential Development
NWC Lyon Avenue & Appaloosa Drive
Tentative Tract Map 38468
APN 436-280-006 & 007
San Jacinto, California

Sladden Engineering is pleased to present the results of the geotechnical investigation performed for the residential development proposed for the property (APN 436-280-006 & 007) located on the northwest corner of Lyon Avenue and Appaloosa Drive in the City of San Jacinto, California. Our services were completed in accordance with our proposal for geotechnical engineering services dated April 6, 2022 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site to provide recommendations for foundation design and for the design of the various site improvements. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.

The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project should be feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented in design and carried out through construction.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,
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INTRODUCTION

This report presents the results of the geotechnical investigation performed for the new residential development proposed for the subject property (APN 436-280-006 & 007) located on the northwest corner of Lyon Avenue and Appaloosa Drive in the City of San Jacinto, California. The subject site is located at approximately 33.7923 degrees north latitude and 116.9914 degrees west longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in-situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

PROJECT DESCRIPTION

It is our understanding that the proposed project will consist of constructing a new residential development on the subject site. Retention basins, open spaces, paved roadways, concrete flatwork and various other associated site improvements are also anticipated for the project. For our analyses, we expect that the proposed structures will consist of relatively light weight wood-frame structures supported on conventional shallow spread footings and concrete slabs-on-grade or post tensioned slabs.

Sladden expects that grading will be limited to minor cuts and fills in order to accomplish the desired elevations and to provide adequate gradients for site drainage. This does not include the removal and re-compaction of the loose surface soil and primary foundation bearing soil within the proposed building pad areas. Upon completion of precise grading plans, Sladden should be retained in order to verify that the recommendations presented within in this report are properly incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight structures, we expect that isolated column loads will be less than 20 kips and continuous wall loads will be less than 2.0 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Exploration of the site was achieved by advancing four (4) exploratory boreholes to depths ranging from approximately 21 and 51 feet below the existing ground surface (bgs). Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site.
- Advancing four (4) exploratory boreholes to depths ranging from approximately 21 and 51 feet bgs in order to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses.
- Performing laboratory testing on selected samples to evaluate their engineering characteristics.
- Reviewing geologic literature and discussing geologic hazards.
- Reviewing previous geotechnical and geologic reports conducted for the subject property.
- Performing site-specific ground motion analyses for the subject property.
- Performing engineering analyses to develop recommendations for foundation design and site preparation.
- The preparation of this report summarizing our work at the site.

SITE CONDITIONS

The project site is located on the northwest corner of Lyon Avenue and Appaloosa Drive in the City of San Jacinto, California. The site consists of two parcels that are formally identified by the County of Riverside as APN 436-280-006 & 436-280-007. The parcels occupy a combined area of approximately 42.18 acres. At the time of our investigation, the property was undeveloped and covered in scattered vegetation, refuse piles and foundation elements. It is our understanding that the southern portion of the property was previously utilized for agricultural purposes and the northern portion of the site was used for equestrian purposes (Hideaway Farms horse ranch). The site is bounded by San Jacinto Reservoir to the north, a residential development to the south, Lyon Avenue to the east and a stormwater conveyance channel to the immediate west.

Based on our review of the San Jacinto 7.5-Minute Quadrangle Map (USGS, 2015) and Google Earth (2022), the site is situated at an approximate elevation of 1,500 feet above mean sea level (MSL).

No natural ponding of water or surface seeps were observed at or near the site during our field investigation conducted on June 13, 2022. Site drainage appears to be controlled via sheet flow and surface infiltration.

GEOLOGIC SETTING

The project site is located in the Peninsular Ranges Physiographic Province of California. The Peninsular Ranges are mountainous areas that extend from the western edge of the continental borderland to the Salton Trough and from the Transverse Ranges Physiographic Province in the north to the tip of Baja California in the south. The Peninsular Ranges Physiographic Province is characterized by northwest-trending topographic and structural features that locally include the San Jacinto Structural Block. The San Jacinto Structural Block is a northwest-southeast trending elongated structural block bounded on the southwest by the San Jacinto Fault and by the San Andreas Fault Zone to the northeast. The province is characterized by elongated, northwest-southeast trending mountain ranges and valleys and is truncated at its northern margin by the east-west grain of the Transverse Ranges. Mountainous areas of the Peninsular Ranges Physiographic Province generally consist of Igneous, metasedimentary and metavolcanic rocks. However, plutonic rocks of the Southern California Batholith are the dominant basement rock exposed.

The site has been mapped by Dibblee (2003) to be immediately underlain by Quaternary-age alluvium (Qa). The geologic setting for the site and site vicinity is illustrated on the Regional Geologic Map (Figure 2).

SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by four (4) exploratory boreholes to depths ranging from approximately 21 and 51 feet bgs. The approximate locations of the boreholes are illustrated on the Exploration Location Photograph (Figure 3). The boreholes were advanced using a truck-mounted Mobile B-61 drill-rig equipped with 8-inch outside diameter hollow stem augers. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analysis.

During our field investigation, a thin mantle of artificial fill/disturbed soil was encountered to a depth of approximately two (2) to three (3) feet below the existing ground surface. Underlying the fill soil and extending to the maximum depths explored, native alluvium was encountered. The site soil consists primarily of sand (SW/SP), silty sand (SM) near the surface and sandy clay (CL) and sandy silt (ML) at depth. Generally, the native granular materials appeared grayish brown to olive brown, dry to moist, loose to very dense and fine-to-coarse grained. Cohesive layers appeared grayish brown to olive brown, slightly moist to moist, medium stiff to hard and exhibited characteristics indicative of low plasticity soil.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in Appendix A of this report. The stratification lines represent the approximate boundaries between soil types although the transitions may be gradual and variable across the site.

Groundwater was not encountered within our exploratory bore or test holes that extended to a maximum explored depth of approximately 51 feet bgs. Information regarding the approximate depth to groundwater provided by the California Department of Water Resources (CDWR, 2022) online database suggests that the depth to groundwater should be in excess of 50 feet below the existing ground surface in the vicinity of the site. The following table provides a summary of the recorded groundwater depths in the project vicinity.

TABLE 1
GROUNDWATER DEPTHS

STATE WELL (SITE CODE)	LAT/LONG	DISTANCE (KM)	DATE	DEPTH (FT)
04S01W28G001S	33.7975/-116.9898	0.55	02/21/1992	80.4
04S01W28N003S	33.7878/-116.987	0.70	12/24/1991	169.9
04S01W32H004S	33.7828/-116.9993	1.30	03/07/1991	184.9
(338002N1170122W001)	33.8002/-117.0121	2.10	04/01/2014	161.9
(337963N1170066W001)	33.7963/-117.0066	1.45	03/24/2014	162.1
(338048N1170093W001)	33.8047/-117.0092	2.10	12/10/2012	291.6
(338082N1169983W001)	33.8081/-116.9983	1.80	04/21/2021	178.3
(338056N1169869W001)	33.8055/-116.9869	1.50	03/28/2017	236.39

SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults which splay or step from main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

The subject site is located within a State of California Delineated fault zone (Figure 4). Table 2 lists the closest known active faults that was generated in part using the EQFAULT computer program (Blake, 2000), as modified using the fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al, 2003), Southern Earthquake Data Center (SCEDC, 2022), Riverside County (RCMMC, 2022), and the Quaternary Fault and Fold Database of the United States (USGS, 2022). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

TABLE 2
CLOSEST KNOWN ACTIVE FAULTS

Fault Name	Distance (Km)	Maximum Event
San Jacinto – San Jacinto Valley (Casa Loma Fault)	0.0	7.38
San Jacinto – Anza	9.0	7.2
San Andreas – Southern	26.6	7.2
San Andreas – San Bernardino	26.6	7.5
Elsinore – Temecula	34.8	6.8

BACKGROUND INFORMATION RELATIVE TO THE ALQUIST-PRIOLO ACT

The objective of the Alquist-Priolo Act (Act) is to regulate development near active faults so as to mitigate the hazard of surface fault rupture (CGS, 2018). Current law prohibits construction of habitable structures across active fault traces. Therefore, the evaluation of the potential ground rupture hazard to establish building setbacks is required by reviewing agencies. In addition, the Act mandates that structures intended for human occupancy of over 2,000 person hours per year not be built over known active faults. An active fault is defined by the California Geological Survey as a sufficiently active and well-defined fault that exhibits surface displacement within the Holocene Epoch (approximately the last 11,000 years). In areas of known or suspected active or potentially active faults, and prior to site development, the actual location of an active fault(s) needs to be ascertained, such that appropriate setbacks from the fault(s) can be determined and Restricted Use Zones (RUZs) or no building areas established. Not only is it important to identify the fault location, it is equally important to verify areas where no faults exist.

In order to evaluate on-site fault hazards, subsurface exploration by excavation of trenches is performed to expose the soil and rock profiles and to allow for the direct observation of existing shallow/near-surface faults. Trenches are oriented generally perpendicular to the regional fault trends and are logged in detail by Geologists experienced in fault rupture hazard studies. Trench depths are controlled by the age of the surficial sediments or rocks exposed within the trench. In general, it is desirable to have exposed soil profiles spanning at least the last 11,000 years, or Holocene Epoch. Soil profiles with Holocene and older profiles can then allow for the determination of the relative age of the encountered fault. If the fault disrupts Holocene sediments, then the fault is determined active and building setbacks are established accordingly.

Conversely, if the fault is buried by pre-Holocene sediments or rock, then the fault can be deemed inactive or potentially active, with construction of non-critical structures allowed over or immediately adjacent to the fault. In many cases, the sediments exposed may only cover a portion of the Holocene, such that judgment and risk assessments are professed relative to the age of the faults and suitability of the site for development. The success of the risk assessments is dependent upon the quality of the data collected, local agency requirements, and the experience of the Professional Geologists performing the work.

Building setback distances from the fault, generally mandated by the Act to be approximately 50 feet, are dependent upon the confidence or degree of accuracy of the fault location across the site: the higher the degree of confidence, the lesser the setback requirements. The size of the property, number of faults, number of exploration trenches defining the fault location(s), survey quality, and local regulatory agency requirements, affect the setback distance requirements.

The Alquist-Priolo Site Investigation Reports (AP 3352) for subject property were acquired for our review from the California Geological Survey (CGS) and the County of Riverside and are included within Appendix E of this report. Based on our review AP 3352, a 575-foot-long exploratory fault trench was previously excavated on the subject property by Geocon (2005) to a depth of up to 22 feet below existing grade. The fault investigation identified three fault ruptures and established a fault zone between field stations 325 to 395. The main rupture within the fault zone was identified as field station 344. The main fault rupture was surveyed and structural setbacks zones were established. The setbacks in Geocon (2005) were defined as:

"... the surveyed location of the main fault at station 344 should be used as a point of reference to establish the exact location of the structural setbacks. Measuring from that point one set back is located 70 feet to the southwest (20 feet for the fault zone and 50 feet for the structural setback) and, the other setback is 95 feet to the northeast (45 feet for the fault zone and 50 feet for the structural setback)."

SITE SPECIFIC GROUND MOTION PARAMETERS

Sladden has reviewed the 2019 California Building Code (CBC) and ASCE7-16 and developed site specific ground motion parameters for the subject site. The project Seismic Design Maps and site-specific ground motion parameters are summarized in the following table and included within Appendix C. The project Structural Engineer should verify that all design parameters provided are applicable for the subject project.

TABLE 2
GROUND MOTION PARAMETERS

Latitude / Longitude	33.7923/-116.9914
Risk Category	II
Site Class	D
Code Reference Documents	ASCE 7-16; Chapter 11 & 21

Description	Type	Map Based	Site-Specific
MCE$_R$ Ground Motion (0.2 second period)	S_S	2.192	---
MCE$_R$ Ground Motion (1.0 second period)	S_1	0.891	---
Site-Modified Spectral Acceleration Value	S_{MS}	2.192	**2.432**
Site-Modified Spectral Acceleration Value	S_{M1}	null	**2.577**
Numeric Seismic Design Value at 0.2 second SA	S_{DS}	1.461	**1.621**
Numeric Seismic Design Value at 1.0 second SA	S_{D1}	null	**1.718**
Site Amplification Factor at 0.2 second	F_a	1	**1**
Site Amplification Factor at 1.0 second	F_v	null	**2.5**
Site Peak Ground Acceleration	PGA$_M$	1.094	**0.961**

GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below.

I. Surface Rupture. Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on our research, the site is transected by the San Jacinto – San Jacinto Valley (Casa Loma Fault). Previous investigations identified the fault and established structural setback zones. In accordance with current guidelines, structures intended for habitable use should not be constructed within the established structural setback zone.

II. Ground Shaking. The site has been subjected to past ground shaking by faults that traverse the region. Strong seismic shaking from nearby active faults is expected to produce strong seismic shaking during the design life of the proposed project. Based on site-specific ground motion parameters developed for the property (Appendix C), the site modified peak ground acceleration (PGAm) is estimated to be 0.961g.

III. Liquefaction/Seismic Settlement. Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular sand volume and a positive increase in pore pressures. Generally, liquefaction can occur if all of the following conditions apply; liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking. The site is located within a "moderate" liquefaction potential zone (RCMMC, 2022). Based on the depth to groundwater within the site vicinity the risks associated with liquefaction are considered "low".

We have performed seismic settlement calculations (dry sand) utilizing a magnitude of 7.38 (BSSC, 2014)) and peak ground acceleration of 0.961g. Aanticipated high groundwater depths were determined to be greater than 50 feet bgs (CDWR, 2022). The seismic settlement calculations are included within Appendix D. Calculations indicate potential total seismic settlements of up to 2.52 inches. Based on the similarity between bores, we expect that differential settlement should be less than 1.25 inches over a horizontal distance of approximately 200 feet.

IV. Tsunamis and Seiches. The San Jacinto Reservoir is located to the immediate north of the project site. Generally, the reservoir is utilized for stormwater control following periods of heavy rainfall. Based on the proximity to the site, risks associated seiches should evaluated by the design Civil Engineer.

V. Slope Failure, Landsliding, Rock Falls. The site is located on relatively flat ground and not immediately adjacent to any slopes or hillsides. Therefore, it is our professional opinion that risks associated with slope instability should be considered "negligible".

VI. Expansive Soil. Generally, the near surface soil consists of silty sand (SM) and sand (SP/SW). Based on the results of our laboratory testing (EI = 0), the materials underlying the site are considered to have a "very low" expansion potential. The expansion potential of the surface soil should be reevaluated after grading.

VII. Static Settlement. Static settlement resulting from the anticipated foundation loads should be tolerable provided that the recommendations included in this report are considered in foundation design and construction. The ultimate static settlement is expected to be less than 1 inch when using the recommended allowable bearing pressures. As a practical matter, differential static settlement between footings can be assumed as one-half of the total settlement.

VIII. Subsidence. Land subsidence can occur in valleys where aquifer systems have been subjected to extensive groundwater pumping, such that groundwater pumping exceeds groundwater recharge. Generally, pore water reduction can result in a rearrangement of skeletal grains and could result in elastic (recoverable) or inelastic (unrecoverable) deformation of an aquifer system.

Documented land subsidence of the San Jacinto basin has been attributed to aquifer-system compaction related to groundwater withdrawal. The subsidence has been estimated to be on the order of 2.5 – 3 cm/yr. Earth fissuring presumable related to groundwater withdrawal has been evident since the early 1950's. (Morton, 1994). According, risks associated with subsidence and earth fissuring should be considered "high".

IX. Debris Flows. Debris flows are viscous flows consisting of poorly sorted mixtures of sediment and water and are generally initiated on slopes steeper than approximately six horizontal to one vertical (6H:1V)(Boggs, 2001). Based on the flat nature of the site and the composition of the surface soil, we judge that risks associated with debris flows should be considered remote.

X. Flooding and Erosion. No signs of flooding or erosion were observed during our field investigation. However, risks associated with flooding and erosion should be evaluated and mitigated by the project design Civil Engineer.

CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations included in this report are incorporated into design and carried out through construction. The main geotechnical concerns are the presence of the San Jacinto – San Jacinto Valley (Casa Loma Fault) transecting the site, undocumented fill in previously backfilled exploratory trenches and the potential for seismic settlements impacting the site.

As previously stated, the site is located within a State of California delineated fault zone. Structural setbacks were established and approved by the County of Riverside based on the Geocon (2005) investigation. **Project planners should ensure that structures intended for habitable use are not constructed with the approved structural setback zone.**

Based on our review of the AP 3352 documents, it is our understanding that the trench excavated as part of the Geocon (2005) investigation was not backfilled as compacted engineered fill. In accordance with the County of Riverside Conditions of Approval, the trench should be re-excavated during grading and replaced as engineered fill.

Seismic settlement calculations indicate potential total seismic settlements of up to 2.52 inches. Based on the similarity between bores, we expect that differential settlement should be less than 1.25 inches over a horizontal distance of approximately 200 feet.

We recommend remedial grading work within the proposed new building areas including over-excavation and re-compaction of the artificial fill soil and the primary foundation bearing soil. Specific recommendations for foundation area preparation are presented in the Earthwork and Grading section of this report.

Caving did occur to varying degrees within each of our exploratory bores and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOSHA excavation criteria. Based on our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOSHA as Type C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

The following recommendations present more detailed design criteria that have been developed based on our field and laboratory investigation.

EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the primary foundation and/or slab bearing soil should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earthwork should be performed under the observation and testing of a qualified geotechnical consultant. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing and geotechnical engineering analyses.

a. Site Clearing. Areas to be graded should be cleared of any existing vegetation and associated root systems, manure and/or organic matter, foundation elements, utilities, and debris. All areas scheduled to receive fill should be cleared of old fills and any irreducible matter. The unsuitable material should be removed off site. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.

b. Preparation of Building Areas: In order to provide firm and uniform foundation bearing conditions and mitigate differential seismic settlement, we recommend over-excavation and re-compaction throughout the proposed new building areas. All low density near surface soil should be removed to a depth of at least 8 feet below existing grade or 7 feet below the bottom of the footings, whichever is deeper. Remedial grading should extend laterally a minimum of five feet beyond the building perimeters. The native soil exposed by over-excavation should be scarified, moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction prior to fill placement. The previously removed soil may then be replaced as engineered fill as recommended below.

c. Compaction: Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in a loose condition. If import fill is required, the material should be of a non-expansive nature and should meet the following criteria:

Plastic Index	Less than 12
Liquid Limit	Less than 35
Percent Soil Passing #200 Sieve	Between 15% and 35%
Maximum Aggregate Size	3 inches

The subgrade and all fill soil should be compacted with acceptable compaction equipment, to at least 90 percent relative compaction. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed on all lifts in order to ensure proper placement of the fill materials. Table 3 provides a summary of the excavation and compaction recommendations.

TABLE 3
SUMMARY OF RECOMMENDATIONS

*Remedial Grading	Over-excavation and re-compaction within the building envelopes and extending laterally 5 feet beyond the building limits and to a minimum depth of 8 feet below existing grade or 3 feet below the bottom of the footings, whichever is deeper.
Native / Import Engineered Fill	Place in thin lifts not exceeding 6 inches in a loose condition, at near optimum moisture content and compact to a minimum of 90 percent relative compaction.
Asphalt Concrete Sections	Compact the top 12 inches to at least 95 percent compaction at near optimum moisture content.

*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.

d. Shrinkage and Subsidence: Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage should be between 10 and 15 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 tenth and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

CONVENTIONAL SHALLOW SPREAD FOOTINGS

Conventional shallow spread footings may be utilized if the estimated differential seismic settlements of 1.25 inches over a horizontal distance of 200 feet can be adequately addressed in design. All footings should be founded upon properly compacted engineered fill soil and should have a minimum embedment depth of 12 inches measured from the lowest adjacent finished grade. Continuous and isolated footings should have minimum widths of 12 inches and 24 inches, respectively. Continuous and isolated footings supported upon properly compacted engineered fill soil may be designed using allowable (net) bearing pressures of 1800 and 2000 pounds per square foot (psf), respectively. Allowable increases of 200 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth may be used if desired. The maximum allowable bearing pressure should be 2500 psf. The allowable bearing pressures apply to combined dead and sustained live loads. The allowable bearing pressures may be increased by one-third when considering transient live loads, including seismic and wind forces.

Based on the recommended allowable bearing pressures, the total static settlement of the shallow spread footings is anticipated to be less than one-inch provided foundation area preparation conforms to the recommendations included in this report. Static differential settlement is anticipated to be approximately one-half of the total static settlement for similarly loaded footings spaced up to approximately 40 feet apart.

Lateral load resistance for the shallow spread footings will be developed by passive pressure against the sides of the footings below grade and by friction acting at the base of the footings. An allowable passive pressure of 250 psf per foot of depth may be used for design purposes. An allowable coefficient of friction 0.40 may be used for dead and sustained live loads to compute the frictional resistance of the footing placed directly on compacted fill. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork. All footings should be reinforced in accordance with the project Structural Engineer's recommendations.

POST-TENSIONED SLABS

Post-tensioned slabs may be used for the proposed structures in order to mitigate potential seismic related differential settlements. We have evaluated the on-site soil for construction of post-tensioned foundation systems in general accordance with design specifications of the Post Tensioning Institute. Post-tensioned slabs should be designed to be rigid and capable of spanning areas of non-uniform support and meet the following criteria:

1. Bearing Capacity = 1500 psf
2. Potential Liquefaction Induced Differential Settlement = 1.25 inches (over a horizontal distance of 100 feet)
3. Coefficient of Friction = 0.40

SLABS-ON-GRADE

In order to provide uniform and adequate support, concrete slabs-on-grade must be placed on properly compacted engineered fill soil as outlined in the previous sections of this report. The slab subgrade should remain near optimum moisture content and should not be permitted to dry prior to concrete placement. Slab subgrade should be firm and unyielding. Disturbed soil should be removed and replaced with engineered fill soil compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the Structural Engineer. We recommend a minimum slab thickness of 4.0 inches and minimum reinforcement of #3 bars at 18 inches on center in both directions. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height. Final floor slab design and reinforcement should be determined by the Structural Engineer based upon post-grading expansion index test results.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10-mil visqueen, or equivalent. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface can not be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

RETAINING WALLS

Minor retaining walls may be required to accomplish the proposed construction. Cantilever retaining walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 35 pcf for level native backfill soil acting in a triangular pressure distribution with drained backfill conditions. "At Rest" pressures should be utilized for restrained walls. "At rest" pressures may be estimated using an equivalent fluid weight of 55 pcf for native backfill soil with level drained backfill conditions.

CORROSION SERIES

The soluble sulfate concentrations of the surface soil were determined to be 20 parts per million (ppm) The soil is considered to have a "negligible" corrosion potential with respect to concrete. The use of Type V cement and special sulfate resistant concrete mixes should not be necessary. The soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

The pH levels of the surface soil was 9.2. Based on soluble chloride concentration testing (50 ppm) the soil is considered to have a "negligible" corrosion potential with respect to normal grade steel. The minimum resistivity of the surface soil was found to be 9,000 ohm-cm, that suggests the site soil is considered to have a "low" corrosion potential with respect to ferrous metal installations.

UTILITY TRENCH BACKFILL

All utility trench backfill should be compacted to a minimum of 90 percent relative compaction. Trench backfill materials should be placed in lifts no greater than six inches in a loose condition, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture content, and mechanically compacted to a minimum of 90 percent relative compaction. A representative of the project soil engineer should test the backfill to verify adequate compaction.

EXTERIOR CONCRETE FLATWORK

In order to provide uniform support and minimize settlement related cracking of concrete flatwork, the subgrade soil within concrete flatwork areas should be compacted to a minimum of 90 percent relative compaction. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soil prior to concrete placement.

DRAINAGE

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.

LIMITATIONS

The findings and recommendations presented in this report are based upon an interpolation of the soil conditions between the exploratory bore locations and extrapolation of these conditions throughout the proposed building areas. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to ensure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded on/or extend into the properly compacted soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for engineered fill soil and 95 percent for Class II aggregate base as obtained by ASTM Test Method D1557. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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FIGURES

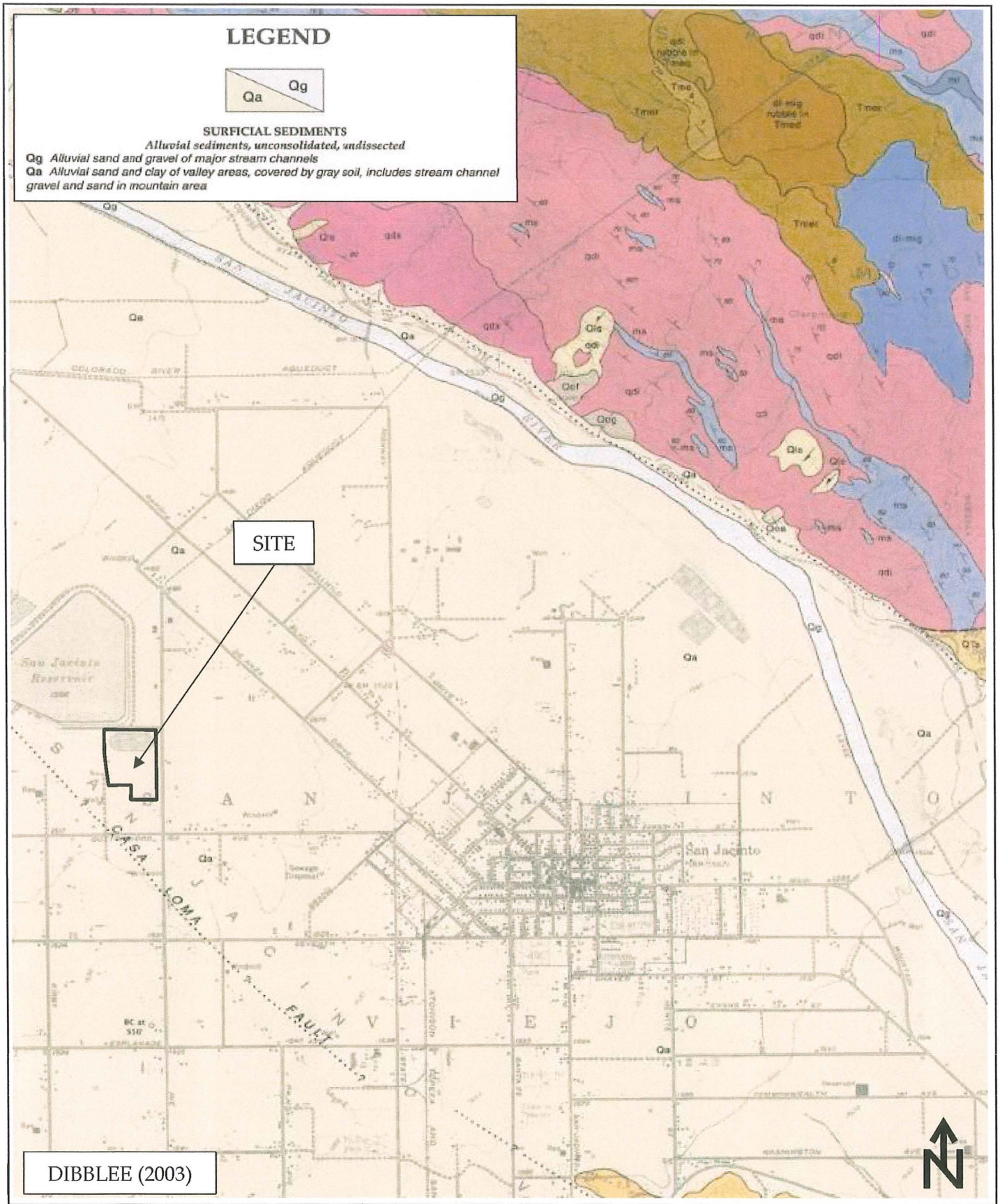
SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
EXPLORATION LOCATION PLAN
FAULT ZONE MAP

SITE LOCATION MAP

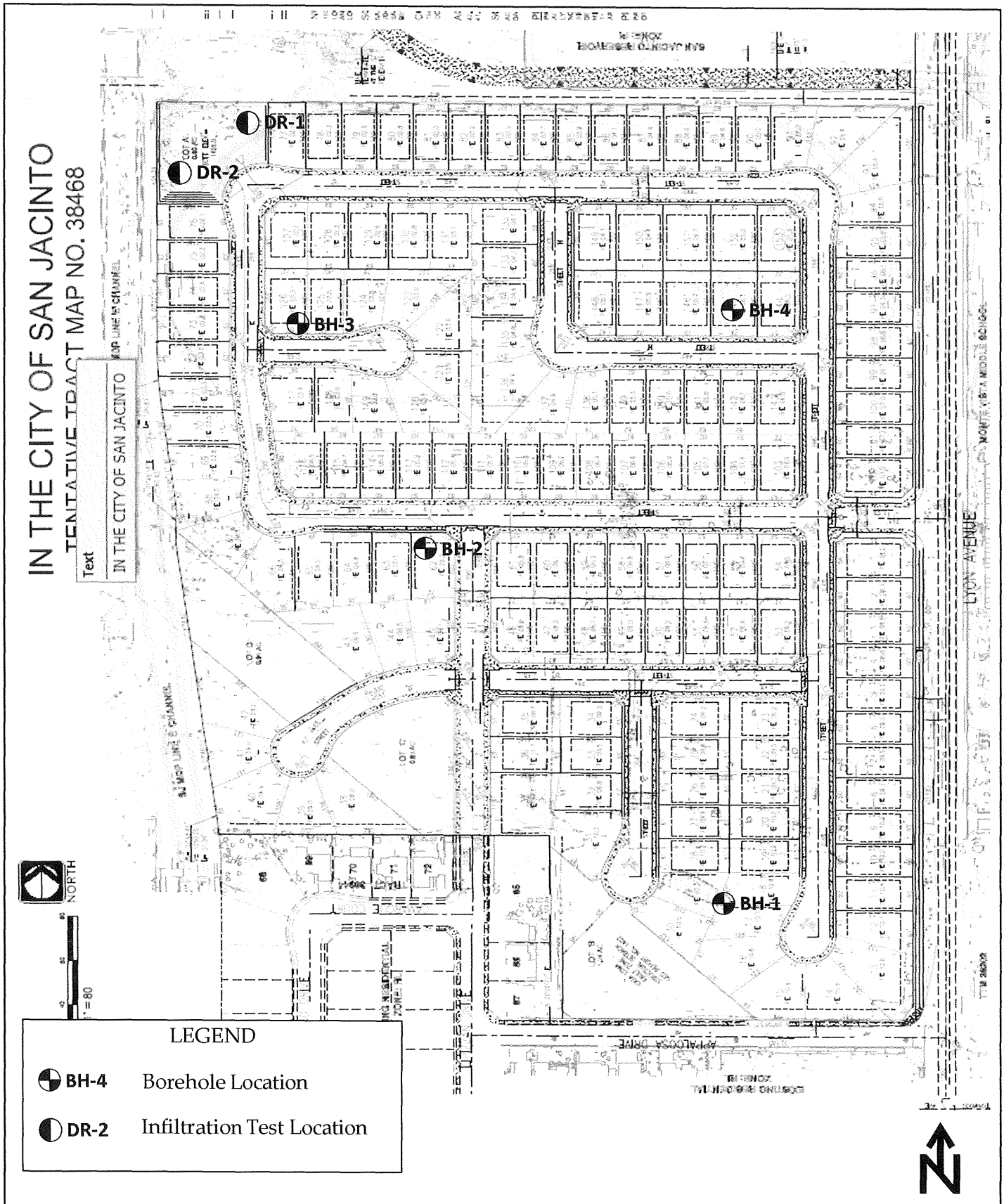
FIGURE 1

Sladden Engineering

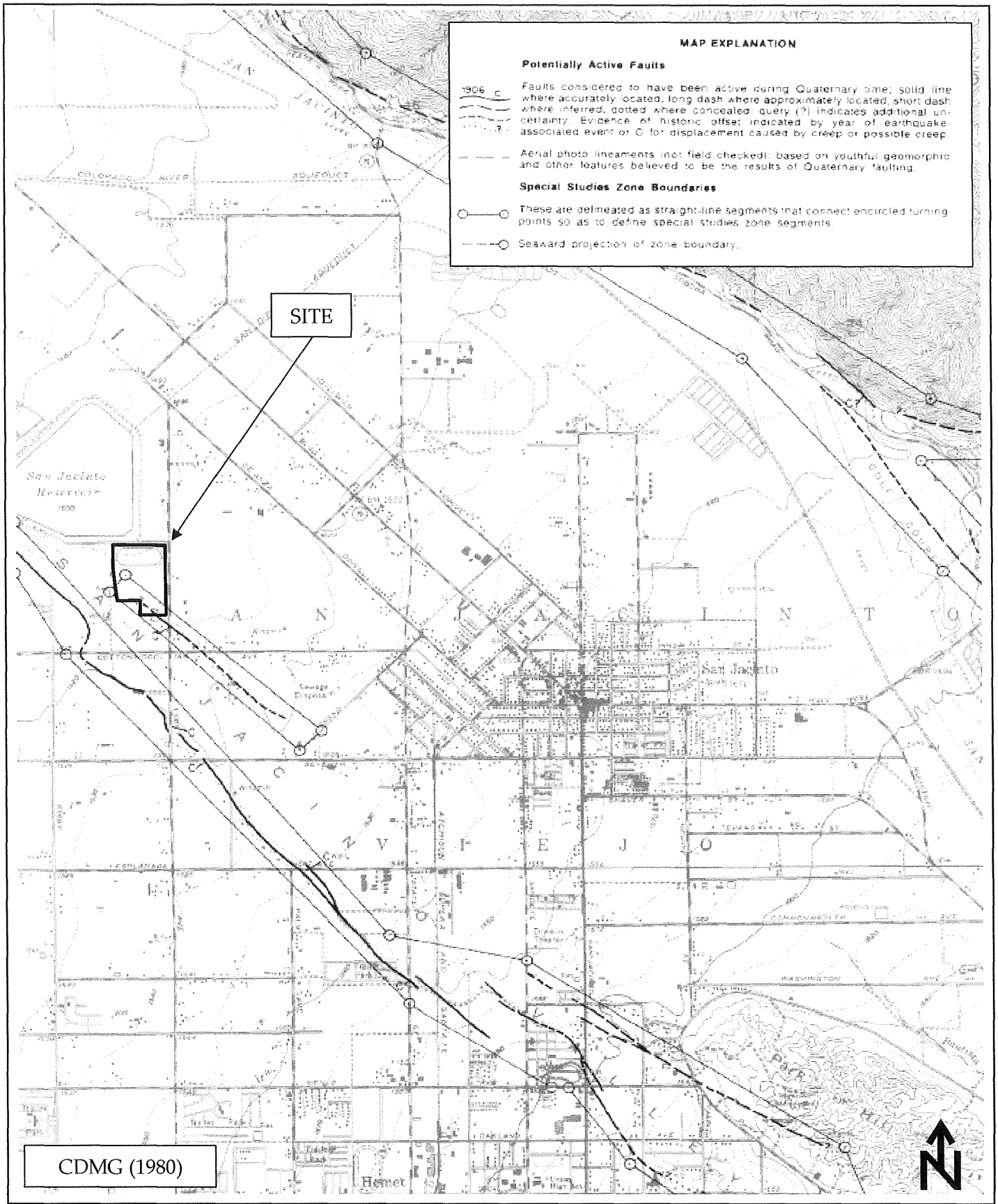
Project Number	644-22032
Report Number:	22-08-114
Date:	August 22, 2022



Sladden Engineering	REGIONAL GEOLOGIC MAP	FIGURE 2
	Project Number: 644-22032	
	Report Number: 22-08-114	
	Date: August 22, 2022	



Sladden Engineering	EXPLORATION LOCATION PLAN	FIGURE 3
	Project Number: 644-22032	
	Report Number: 22-08-114	
	Date: August 22, 2022	



Sladden Engineering	FAULT ZONE MAP	FIGURE 4
	Project Number:	644-22032
	Report Number:	22-08-114
	Date:	August 22, 2022

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

For our field investigation four (4) exploratory boreholes were excavated June 13, 2022 utilizing a truck mounted hollow stem auger rig (Mobile B-61). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our borings by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observations and testing.

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	BH-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
	5 7 10			3.3	0.4		6		Gravelly Sand (SP); grayish brown, dry, medium dense, fine- to coarse-grained (Qa).
	5 16 16			1.8	1.8		10		Sand (SP); grayish brown, dry, dense, fine- to coarse-grained (Qa).
	6 10 11			25.5	12.6	115.9	16		Silty Sand (SM); dark grayish brown, moist, medium dense, fine- to coarse-grained (Qa).
	6 8 9			13.7	7.6		20		Silty Sand (SM); grayish brown, moist, medium dense, fine-grained (Qa).
							22		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

Project No:	644-22032	Page	1
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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	BH-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
	3 7 10			3.7	1.1	107.9	4		Sand (SP); grayish brown, dry, medium dense, fine- to coarse-grained (Qa).
	3 4 9			2.0	0.8	105.1	6		Sand (SP); grayish brown, dry, loose, fine- to coarse-grained (Qa).
	5 6 5			2.2	1.4		10		Sand (SP); grayish brown, dry, medium dense, fine- to coarse-grained (Qa).
	9 8 21			14.4	8.7	118.9	16		Silty Sand (SM); grayish brown, dry to slightly moist, medium dense, fine- to coarse-grained (Qa).
	8 16 24			3.1	1.7		20		Sand (SP); grayish brown, dry, dense, fine- to coarse-grained (Qa).
	14 36 50			7.0	2.8	101.2	26		Sand (SP); grayish brown, dry, very dense, fine- to coarse-grained (Qa).
	4 3 4			72.3	28.9		30		Sandy Clay (CL); olive brown, moist, medium stiff, low plasticity with gravel (Qa).
	8 26 50			64.8	20.1	105.8	36		Sandy Silt (ML); olive brown, moist, hard, low plasticity, micaceous (Qa).
	2 3 5			73.2	27.3		40		Sandy Clay (CL); olive brown, moist, medium stiff, low plasticity (Qa).
	10 22 50			61.9	23.0	102.3	46		Sandy Silt (ML); dark grayish brown, moist , hard, low plastictiy, micaceous (Qa).
	5 6 9			81.2	30.8		50		Sandy Silt (ML); dark grayish brown, moist , stiff, low plastictiy, micaceous (Qa).

Completion Notes:
Terminated at ~51.5 Feet bgs.
No Bedrock Encountered.
No Grondwater or Seepage Encountered.

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

Project No:	644-22032	Page	2
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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	BH-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
							2		
							4		
	4 8 9			64.3	11.1		6		Sandy Silt (ML); grayish brown, slighlty moist, very stiff, low plasticity, micaceous (Qa).
							8		
	8 17 27			29.3	3.8	118.6	10		Silty Sand (SM); grayish brown, dry, medium dense, fine-grained (Qa).
							12		
							14		
	2 7 7			29.2	7.6		16		Silty Sand (SM); grayish brown, dry, medium dense, fine- to coarse-grained (Qa).
							18		
	12 14 30			11.9	1.8	103.7	20		Sand (SP); grayish brown, dry, medium dense, fine- to coarse-grained with gravel (Qa).
							22		
							24		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

Project No:	644-22032	Page	3
Report No:	22-08-114		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	BH-4

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
							2		
							4		
■	8 11 16			5.4	1.4	107.3	6		Gravelly Sand (SP); grayish brown, dry, medium dense, fine- to coarse-grained (Qa).
							8		
■	4 6 5			43.7	8.5		10		Silty Sand (SM); grayish brown, dry to slightly moist, medium dense, fine- to coarse-grained (Qa).
							12		
							14		
■	11 17 16			41.5	4.7	104.3	16		Silty Sand (SM); grayish brown, dry, medium dense, fine-grained with gravel (Qa).
							18		
■	5 7 12			36.3	5.5		20		Silty Sand (SM); grayish brown, dry to slightly moist, medium dense, fine-grained (Qa).
							22		
							24		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

Project No:	644-22032	Page	4
Report No:	22-08-114		

Sladden Engineering

TEST PIT LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	TP-1 (DR-1)

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
							4		Gravelly Sand (SP); grayish brown, dry, fine- to coarse-grained (Qa).
							6		Terminated at ~5.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							8		
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

Project No:	644-22032	Page	5
Report No:	22-08-114		

Sladden Engineering

TEST PIT LOG

Equipment:	MOBILE B-61	Date Drilled:	6/13/2022
Elevation:	1,500 FT MSL	Boring No:	TP-2 (DR-2)

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained (Disturbed/Fill).
							4		Gravelly Sand (SP); grayish brown, dry, fine- to coarse-grained (Qa).
							6		Terminated at ~5.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							8		
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
NWC LYON AVENUE AND APPALOOSA DRIVE, SAN JACINTO

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APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

CLASSIFICATION AND COMPACTION TESTING

Unit Weight and Moisture Content Determinations: Each undisturbed sample was weighed and measured in order to determine its unit weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Boring Logs.

Maximum Density-Optimum Moisture Determinations: Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557-91, Test Method A. Graphic representations of the results of this testing are presented in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

Classification Testing: Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soil and in selecting samples for further testing.

SOIL MECHANIC'S TESTING

Expansion Testing: One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 18-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete.

Direct Shear Testing: One (1) bulk sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 800 to 2300 pounds per square foot.

Consolidation/Hydro-Collapse Testing: One (1) relatively undisturbed samples was selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 11520 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load.

Corrosion Series Testing: The soluble sulfate concentrations of the surface soil were determined in accordance with California Test Method Number (CA) 417. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 422.

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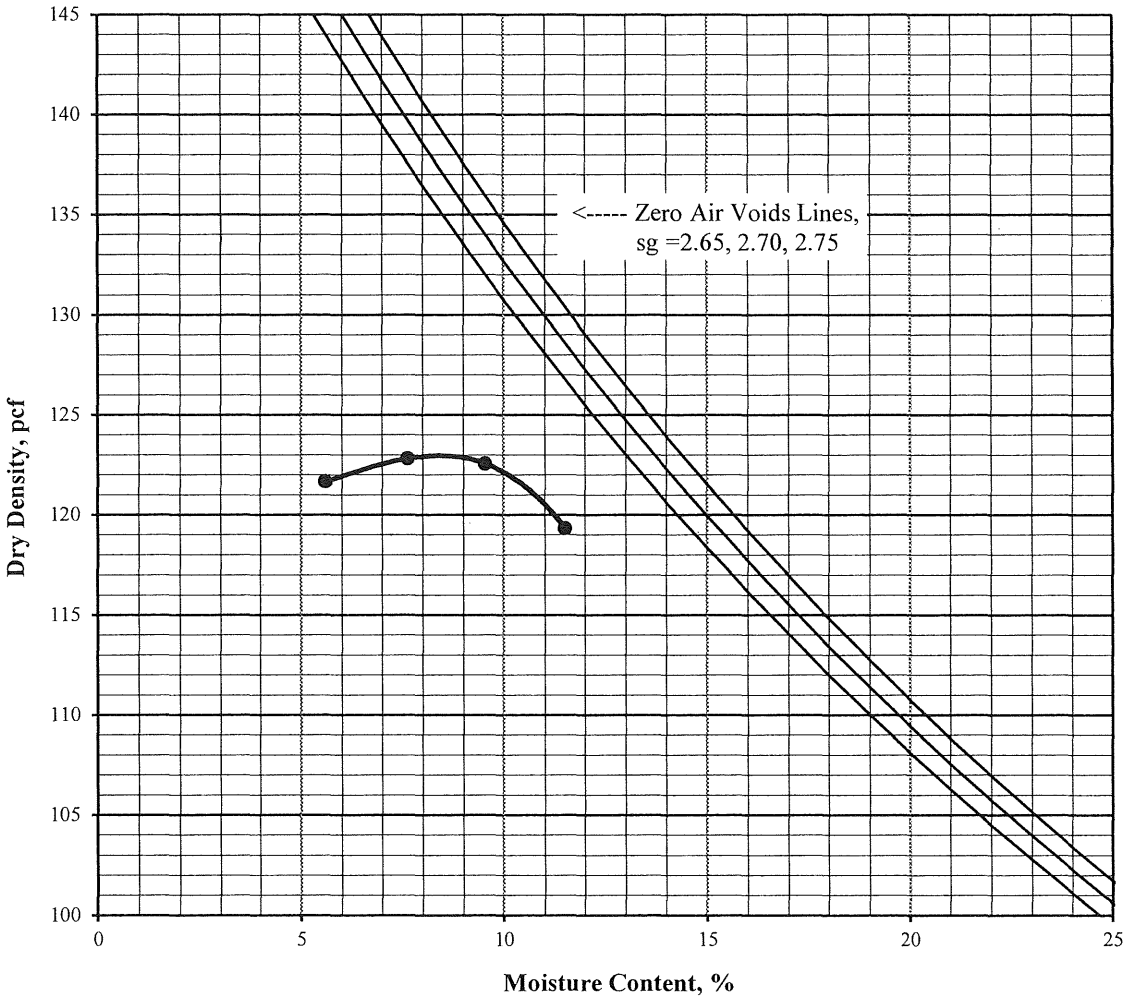
Maximum Density/Optimum Moisture

ASTM D698/D1557

Project Number:	644-22032	July 27, 2022
Project Name:	Lyon Avenue & Appaloosa Drive	
Lab ID Number:	LN6-22327	ASTM D-1557 A
Sample Location:	BH-2 Bulk 1 @ 0-5'	Rammer Type: Machine
Description:	Dark Brown Sand w/Silt (SW-SM)	

Maximum Density: **123 pcf**
Optimum Moisture: **8.5%**

Sieve Size	% Retained
3/4"	
3/8"	
#4	0.8



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Expansion Index

ASTM D 4829

Job Number: 644-22032

July 27, 2022

Job Name: Lyon Avenue & Appaloosa Drive

Lab ID Number: LN6-22327

Sample ID: BH-2 Bulk 1 @ 0-5'

Soil Description: Dark Brown Sand w/Silt (SW-SM)

Wt of Soil + Ring:	590.0
Weight of Ring:	188.6
Wt of Wet Soil:	401.4
Percent Moisture:	7.8%
Sample Height, in	0.95
Wet Density, pcf:	128.4
Dry Denstiy, pcf:	119.2

% Saturation:	50.9

Expansion **Rack # 2**

Date/Time	7/25/2022	3:15 PM
Initial Reading	0.0000	
Final Reading	0.0000	

Expansion Index **0**

(Final - Initial) x 1000

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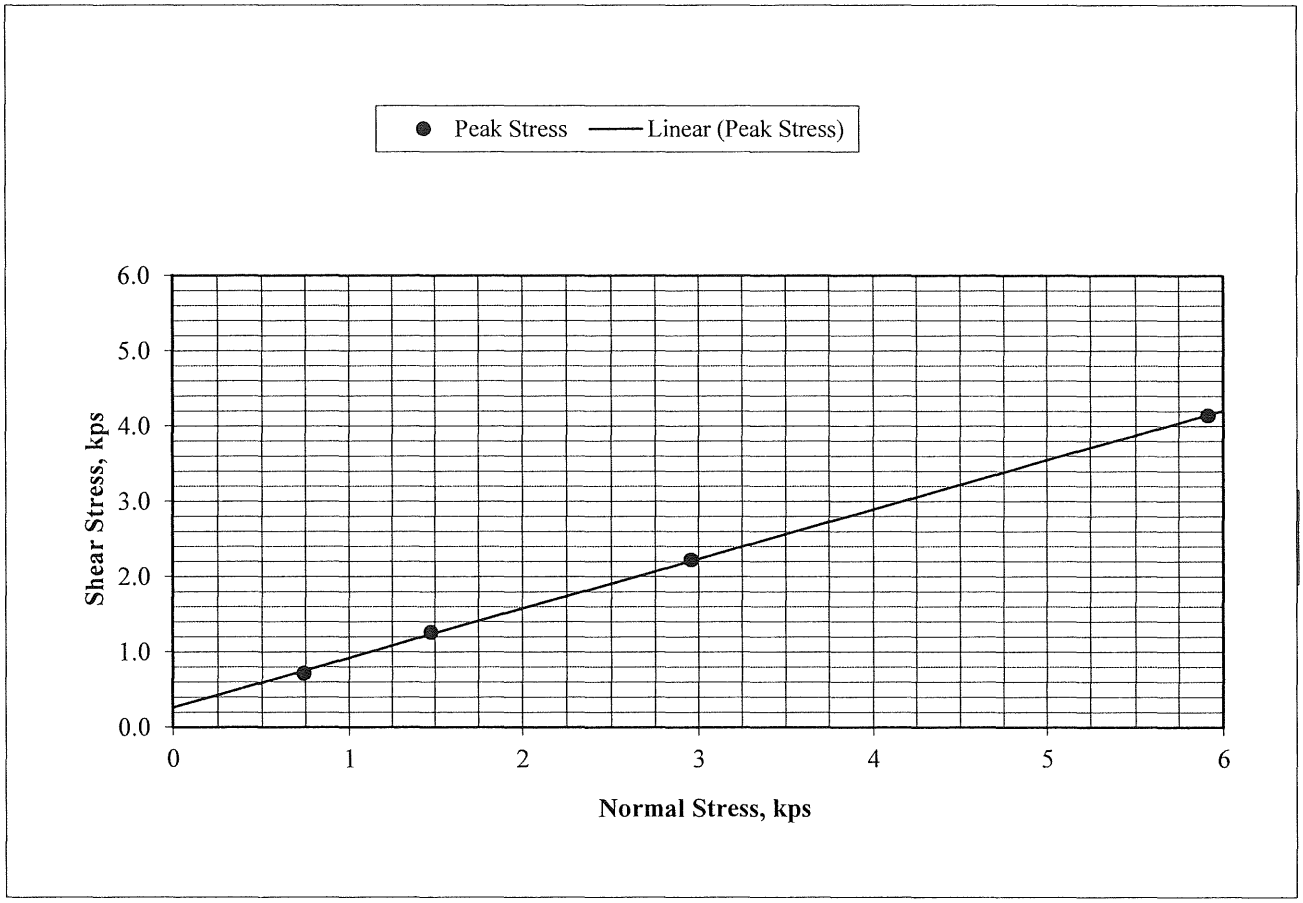
Direct Shear ASTM D 3080-04
(modified for unconsolidated condition)

Job Number:	644-22032		July 27, 2022
Job Name	Lyon Avenue & Appaloosa Drive	Initial Dry Density:	110.7 pcf
Lab ID No.	LN6-22327	Initial Mosture Content:	8.6 %
Sample ID	BH-2 Bulk 1 @ 0-5'	Peak Friction Angle (Ø):	33°
Classification	Dark Brown Sand w/Silt (SW-SM)	Cohesion (c):	270 psf
Sample Type	Remolded @ 90% of Maximum Density		

Test Results	1	2	3	4	Average
Moisture Content, %	14.6	14.6	14.6	14.6	14.6
Saturation, %	75.6	75.6	75.6	75.6	75.6
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.719	1.264	2.224	4.142	



Job Number: 644-22032
Job Name: Lyon Avenue & Appaloosa Drive
Date: 7/27/2022

Moisture Adjustment		Remolded Shear Weight	
Wt of Soil:	1,000	Max Dry Density:	123.0
Moist As Is:	1.6	Optimum Moisture:	8.5
Moist Wanted:	8.5		
ml of Water to Add:	67.9	Wt Soil per Ring, g:	144.4

UBC

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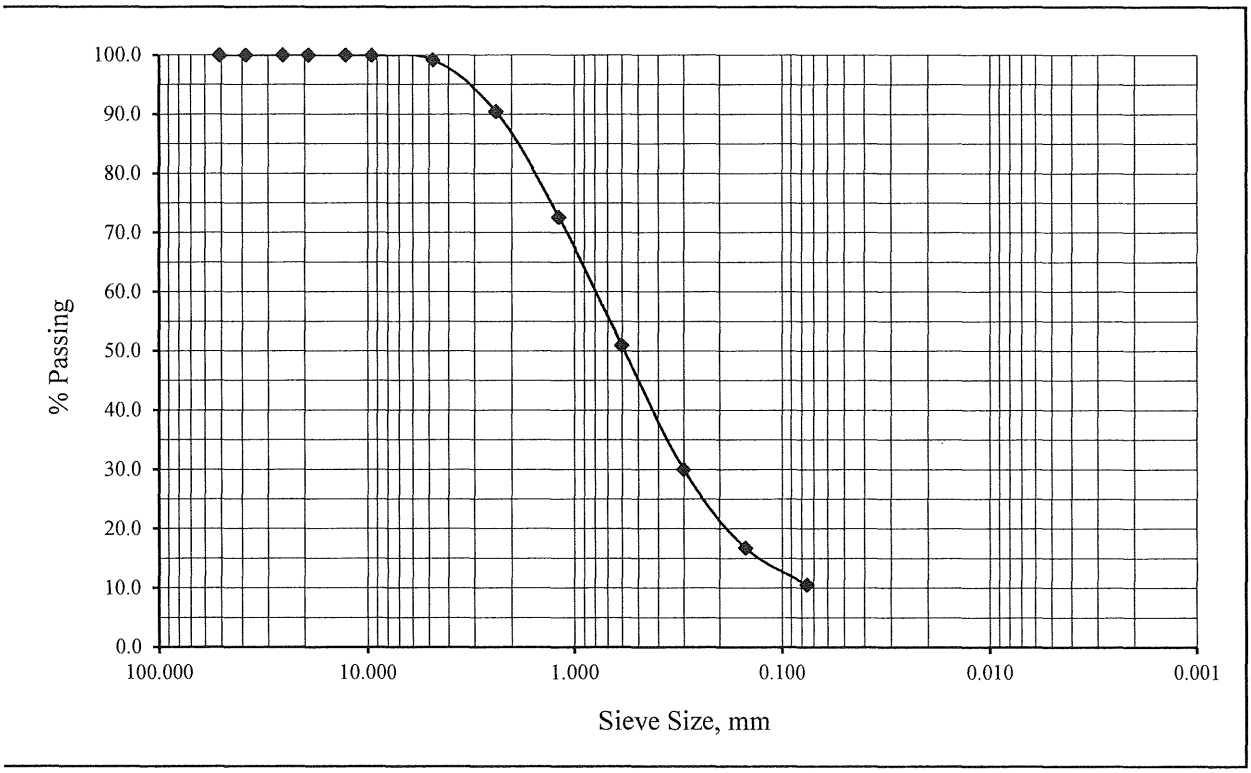
Gradation

ASTM C117 & C136

Project Number: 644-22032 July 27, 2022
Project Name: Lyon Avenue & Appaloosa Drive
Lab ID Number: LN6-22327
Sample ID: BH-2 Bulk 1 @ 0-5' Soil Classification: SW-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.2
#8	2.36	90.5
#16	1.18	72.6
#30	0.60	51.0
#50	0.30	30.0
#100	0.15	16.8
#200	0.075	10.6



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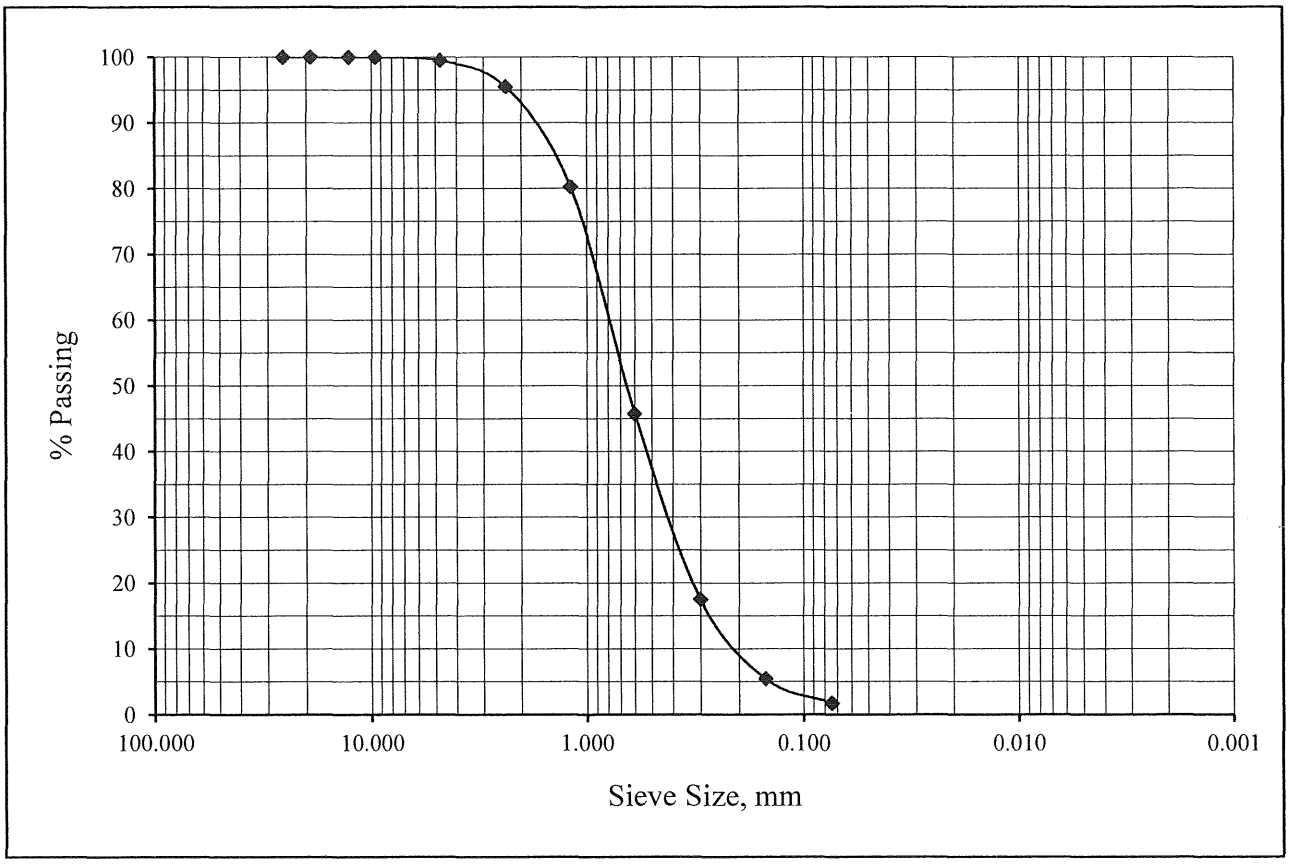
Gradation

ASTM C117 & C136

Project Number: 644-22032 July 27, 2022
Project Name: Lyon Avenue & Appaloosa Drive
Lab ID Number: LN6-22327
Sample ID: BH-1 S-2 @ 10' Soil Classification: SP

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.5
#8	2.36	95.5
#16	1.18	80.3
#30	0.60	45.8
#50	0.30	17.5
#100	0.15	5.4
#200	0.074	1.8



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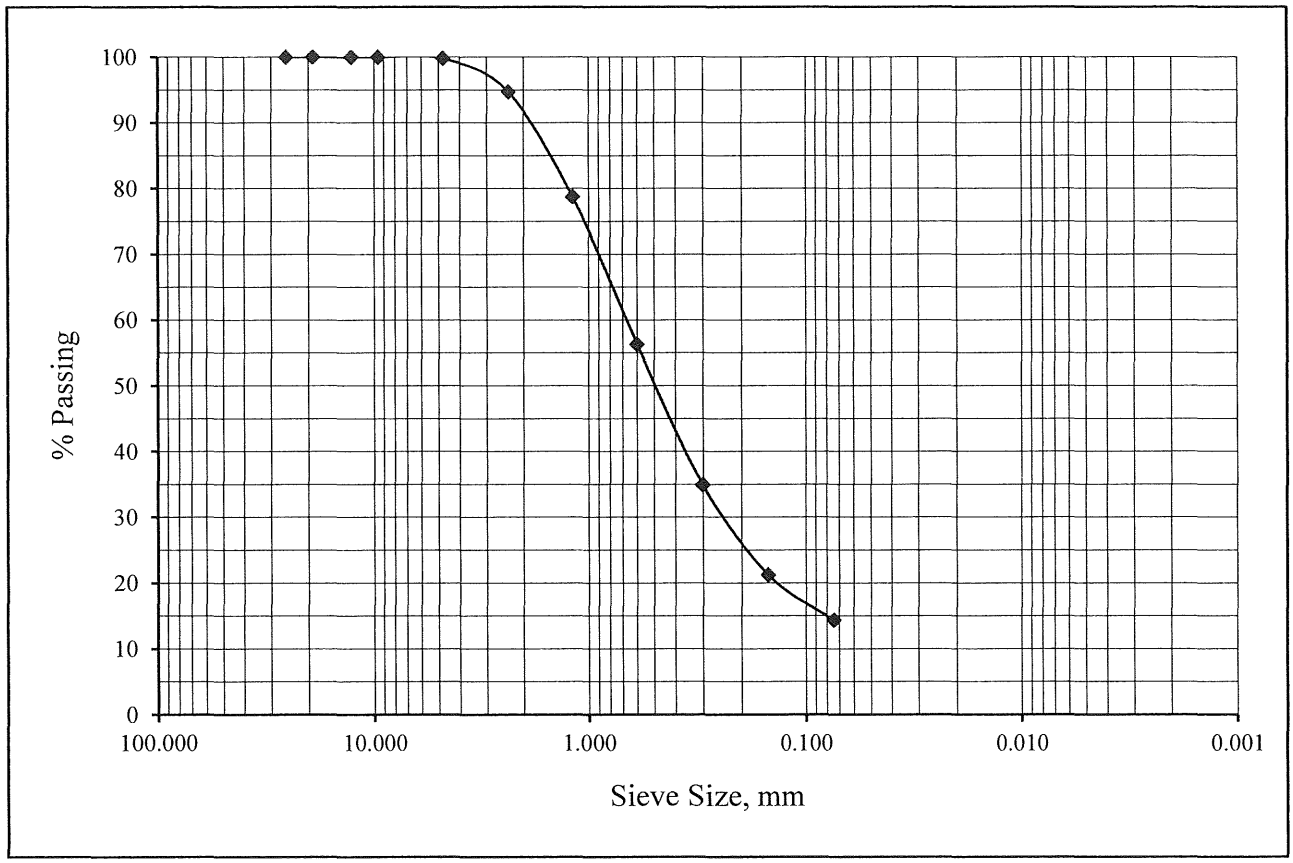
Gradation

ASTM C117 & C136

Project Number: 644-22032 July 27, 2022
Project Name: Lyon Avenue & Appaloosa Drive
Lab ID Number: LN6-22327
Sample ID: BH-2 R-4 @ 15' Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.8
#8	2.36	94.7
#16	1.18	78.8
#30	0.60	56.3
#50	0.30	34.9
#100	0.15	21.2
#200	0.074	14.4



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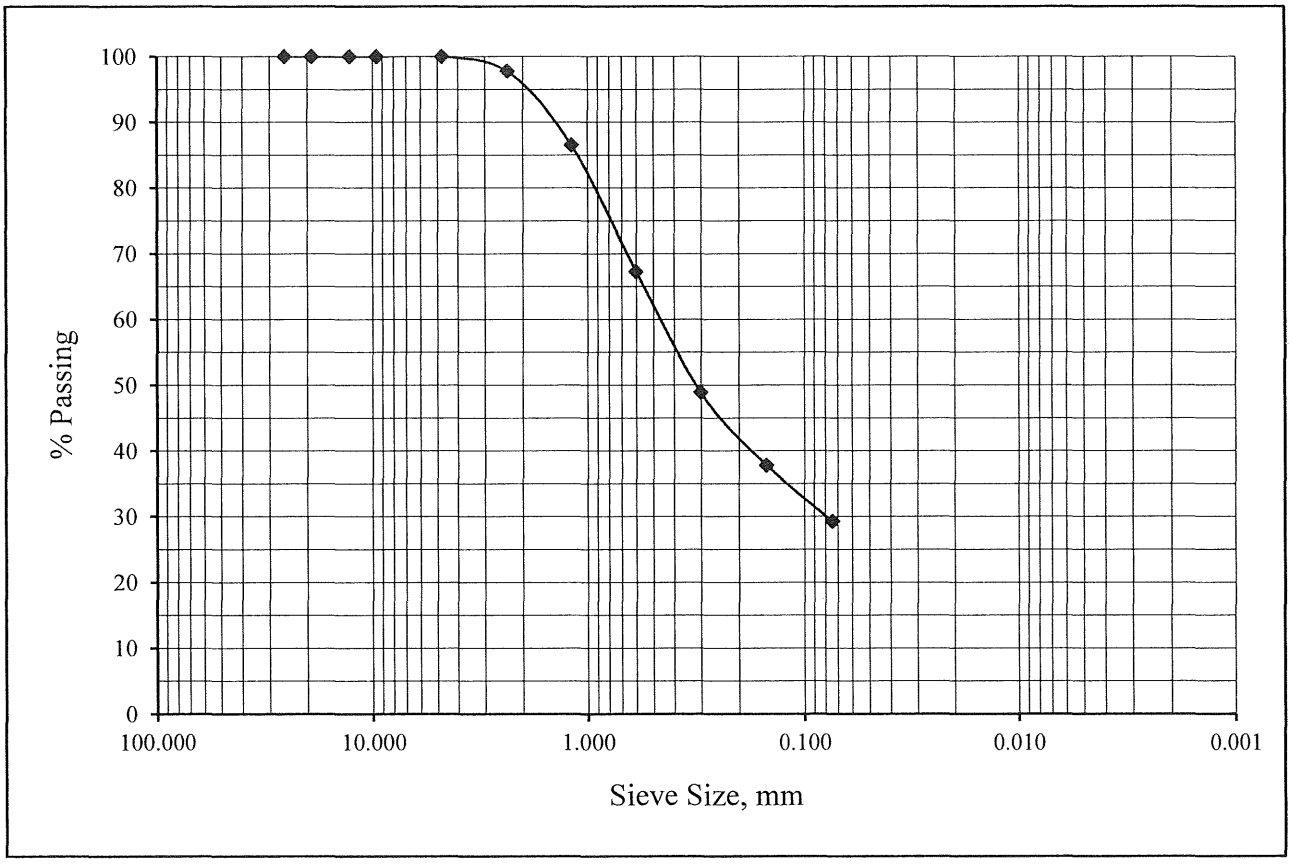
Gradation

ASTM C117 & C136

Project Number: 644-22032 July 27, 2022
Project Name: Lyon Avenue & Appaloosa Drive
Lab ID Number: LN6-22327
Sample ID: BH-3 R-2 @ 10' Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	100.0
#8	2.36	97.8
#16	1.18	86.6
#30	0.60	67.3
#50	0.30	48.9
#100	0.15	37.8
#200	0.074	29.3



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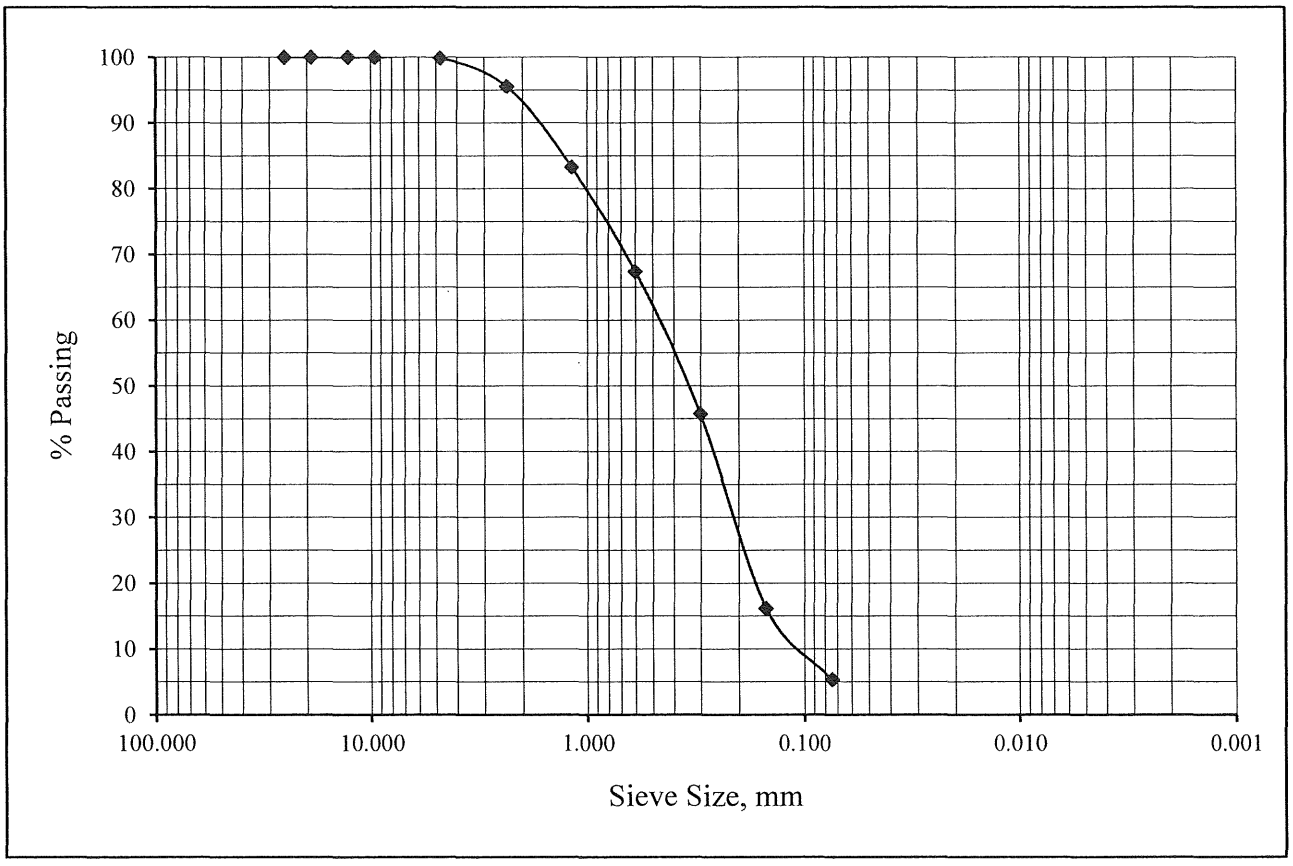
Gradation

ASTM C117 & C136

Project Number: 644-22032 July 27, 2022
Project Name: Lyon Avenue & Appaloosa Drive
Lab ID Number: LN6-22327
Sample ID: BH-4 R-1 @ 5' Soil Classification: SP-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.9
#8	2.36	95.6
#16	1.18	83.3
#30	0.60	67.4
#50	0.30	45.8
#100	0.15	16.2
#200	0.074	5.4



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One Dimensional Consolidation

ASTM D2435 & D5333

Job Number: 644-22032
Job Name: Lyon Avenue & Appaloosa Drive

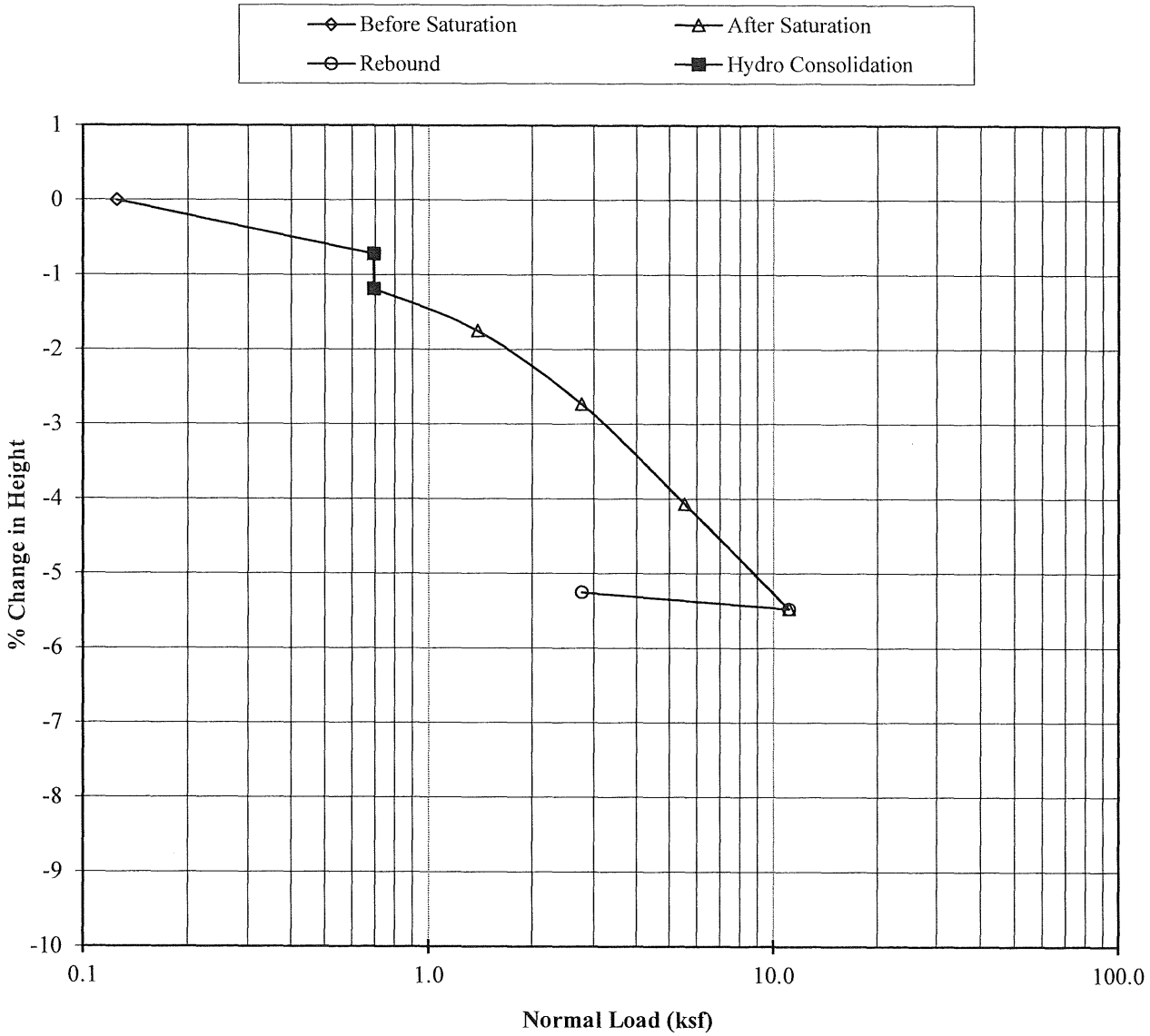
July 27, 2022

Lab ID Number: LN6-22327
Sample ID: BH-3 R-2 @ 10'
Soil Description: Gray Brown Silty Sand (SM)

Initial Dry Density, pcf:	114.8
Initial Moisture, %:	3.8
Initial Void Ratio:	0.452
Specific Gravity:	2.67

Hydrocollapse: 0.5% @ 0.694 ksf

% Change in Height vs Normal Presssure Diagram



Sladden Engineering

6782 Stanton Ave., Suite A, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369
45090 Golf Center Pkwy, Suite F, Indio CA 92201 (760) 863-0713 Fax (760) 863-0847
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Date: July 27, 2022

Account No.: 644-22032

Customer: Mr. Jordan Bursch

Location: APNs 436-280-006 & 007, NWC Lyon Avenue & Appaloosa Drive,
San Jacinto Area

Analytical Report

Corrosion Series

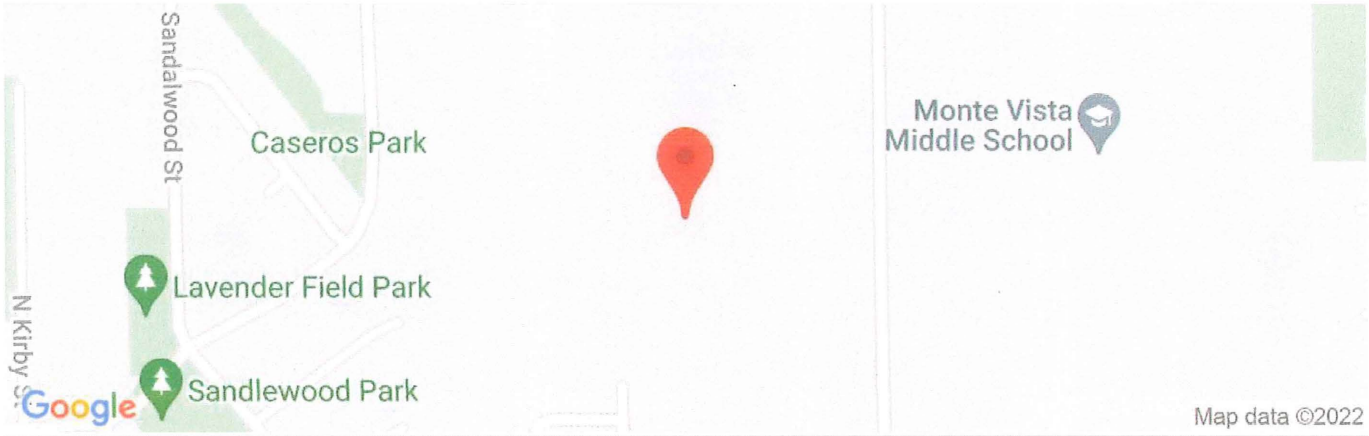
	pH per CA 643	Soluble Sulfates per CA 417 ppm	Soluble Chloride per CA 422 ppm	Min. Resistivity per CA 643 ohm-cm
BH-2 @ 0-5'	9.2	20	50	9000

APPENDIX C

SEISMIC DESIGN MAP AND REPORT
SITE-SPECIFIC SEISMIC DESIGN PARAMETERS

APN 436-280-006 & 007

Latitude, Longitude: 33.7923, -116.9914



Date	8/22/2022, 11:23:33 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.192	MCE_R ground motion. (for 0.2 second period)
S_1	0.891	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.192	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.461	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.994	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	1.094	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.192	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.465	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.367	Factored deterministic acceleration value. (0.2 second)
S1RT	0.891	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.017	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.948	Factored deterministic acceleration value. (1.0 second)
PGAd	0.997	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.994	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration

Type	Value	Description
C_{RS}	0.889	Mapped value of the risk coefficient at short periods
C_{R1}	0.877	Mapped value of the risk coefficient at a period of 1 s
C_V	1.5	Vertical coefficient

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Project: APN 436-280-006 & 007
Project Number: 644-22032
Client: Corman Leigh Companies
Site Lat/Long: 33.7923/-116.9914
Controlling Seismic Source: San Jacinto

REFERENCE	NOTATION	VALUE
Site Class	C, D, D default, or E	D measured
Site Class D - Table 11.4-1	F_a	1.0
Site Class D - 21.3(ii)	F_v	2.5
$0.2*(S_{D1}/S_{DS})$	T_0	0.138
S_{D1}/S_{DS}	T_S	0.691
Fundamental Period (12.8.2)	T	Period
Seismic Design Maps or Fig 22-14	T_L	8
Equation 11.4-4 - $2/3*S_{M1}$	S_{D1}	1.0098*
Equation 11.4-2 - F_V*S_1	S_{M1}	1.5147*

REFERENCE	NOTATION	VALUE
Fv (Table 11.4-2)[Used for General Spectrum]	F_v	1.7
Design Maps	S_s	2.192
Design Maps	S_1	0.891
Equation 11.4-1 - F_A*S_S	S_{MS}	2.192*
Equation 11.4-3 - $2/3*S_{MS}$	S_{DS}	1.461*
Design Maps	PGA	0.994
Table 11.8-1	F_{PGA}	1.1
Equation 11.8-1 - $F_{PGA}*PGA$	PGA_M	1.093*
Section 21.5.3	80% of PGA_M	0.875
Design Maps	C_{RS}	0.889
Design Maps	C_{R1}	0.877

RISK COEFFICIENT

Cr - At Perods <=0.2, Cr=C_{RS}	C_{RS}	0.889
Cr - At Periods >=1.0, Cr=C_{R1}	C_{R1}	0.877

Cr - At Periods between 0.2 and 1.0 use trendline formula to complete

Period	Cr
0.200	0.889
0.300	0.888
0.400	0.886
0.500	0.885
0.600	0.883
0.680	0.882
1.000	0.877

* **Code based design value.** See accompanying data for Site Specific Design values.

Mapped values from https://seismicmaps.org/

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PROBABILISTIC SPECTRA[1]
2% in 50 year Exceedence

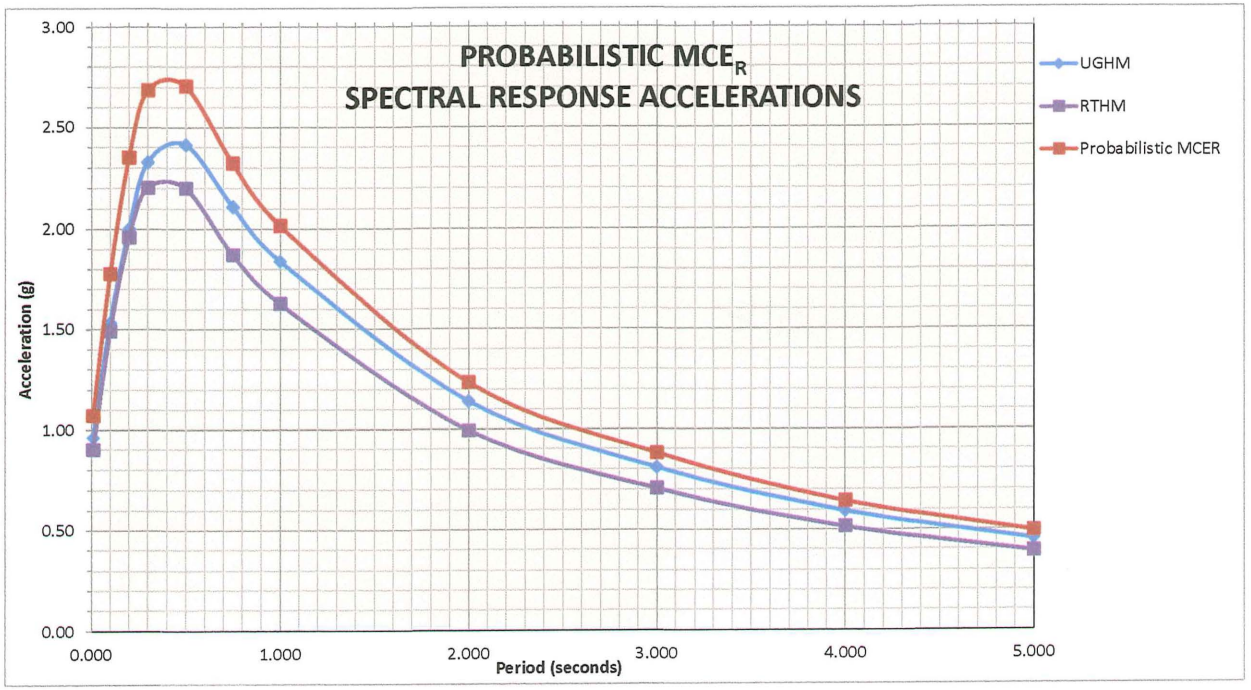
Project No: 644-22032

Period	UGHM	RTHM	Max Directional Scale Factor[2]	Probabilistic MCE
0.010	0.961	0.900	1.19	1.071
0.100	1.533	1.492	1.19	1.775
0.200	2.002	1.959	1.20	2.351
0.300	2.328	2.200	1.22	2.684
0.500	2.412	2.197	1.23	2.702
0.750	2.107	1.871	1.24	2.320
1.000	1.839	1.626	1.24	2.016
2.000	1.139	0.993	1.24	1.231
3.000	0.808	0.703	1.25	0.879
4.000	0.592	0.513	1.25	0.641
5.000	0.452	0.391	1.26	0.493

Probabilistic PGA: 0.961
Is Probabilistic $Sa_{(max)}$<1.2F_a? NO

[1] Data Sources:
https://earthquake.usgs.gov/hazards/interactive/
https://earthquake.usgs.gov/designmaps/rtgm/

[2] Shahi-Baker RotD100/RotD50 Factors (2014)



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DETERMINISTIC SPECTRUM

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations[1]

Controlling Source: San Jacinto

Is Probabilistic $Sa_{(max)}$<1.2Fa? NO

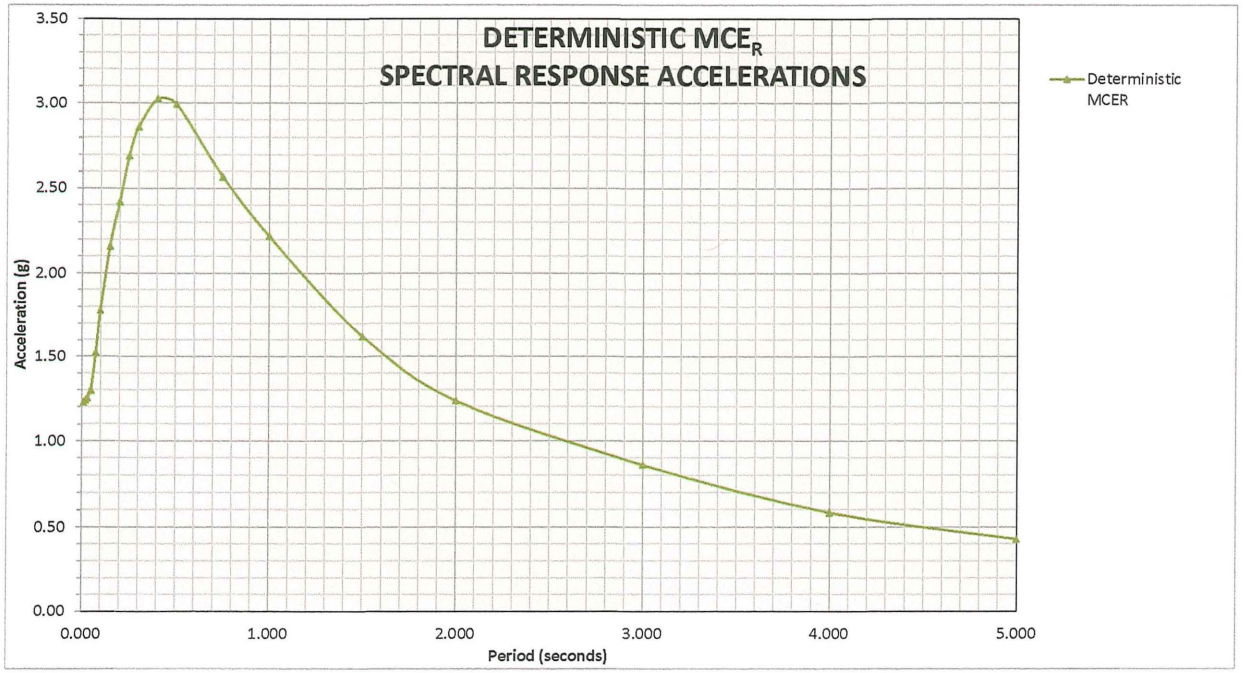
Period	Deterministic PSa Median + 1.σ for 5% Damping	Max Directional Scale Factor[2]	Deterministic MCE	Section 21.2.2 Scaling Factor Applied
0.010	1.034	1.19	1.230	1.230
0.020	1.042	1.19	1.240	1.240
0.030	1.053	1.19	1.253	1.253
0.050	1.091	1.19	1.299	1.299
0.075	1.279	1.19	1.522	1.522
0.100	1.496	1.19	1.780	1.780
0.150	1.799	1.20	2.158	2.158
0.200	2.017	1.20	2.421	2.421
0.250	2.226	1.21	2.693	2.693
0.300	2.345	1.22	2.861	2.861
0.400	2.457	1.23	3.023	3.023
0.500	2.433	1.23	2.992	2.992
0.750	2.071	1.24	2.568	2.568
1.000	1.789	1.24	2.219	2.219
1.500	1.307	1.24	1.620	1.620
2.000	0.996	1.24	1.236	1.236
3.000	0.687	1.25	0.859	0.859
4.000	0.467	1.25	0.583	0.583
5.000	0.340	1.26	0.428	0.428

Project No: 644-22032

Is Determinstic $Sa_{(max)}$<1.5*Fa?	NO
Section 21.2.2 Scaling Factor:	N/A
Deterministic PGA:	1.034
Is Deterministic PGA >=F_{PGA}*0.5?	YES

[1] NGAWest 2 GMPE worksheet and Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) - Time Dependent Model

[2] Shahi-Baker RotD100/RotD50 Factors (2014)



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SITE SPECIFIC SPECTRA

Period	Probabilistic MCE	Deterministic MCE	Site-Specific MCE	Design Response Spectrum (Sa)
0.010	1.071	1.230	1.071	0.714
0.100	1.775	1.780	1.775	1.184
0.200	2.351	2.421	2.351	1.567
0.300	2.684	2.861	2.684	1.789
0.500	2.702	2.992	2.702	1.802
0.750	2.320	2.568	2.320	1.547
1.000	2.016	2.219	2.016	1.344
2.000	1.231	1.236	1.231	0.821
3.000	0.879	0.859	0.859	0.573
4.000	0.641	0.583	0.583	0.389
5.000	0.493	0.428	0.428	0.285

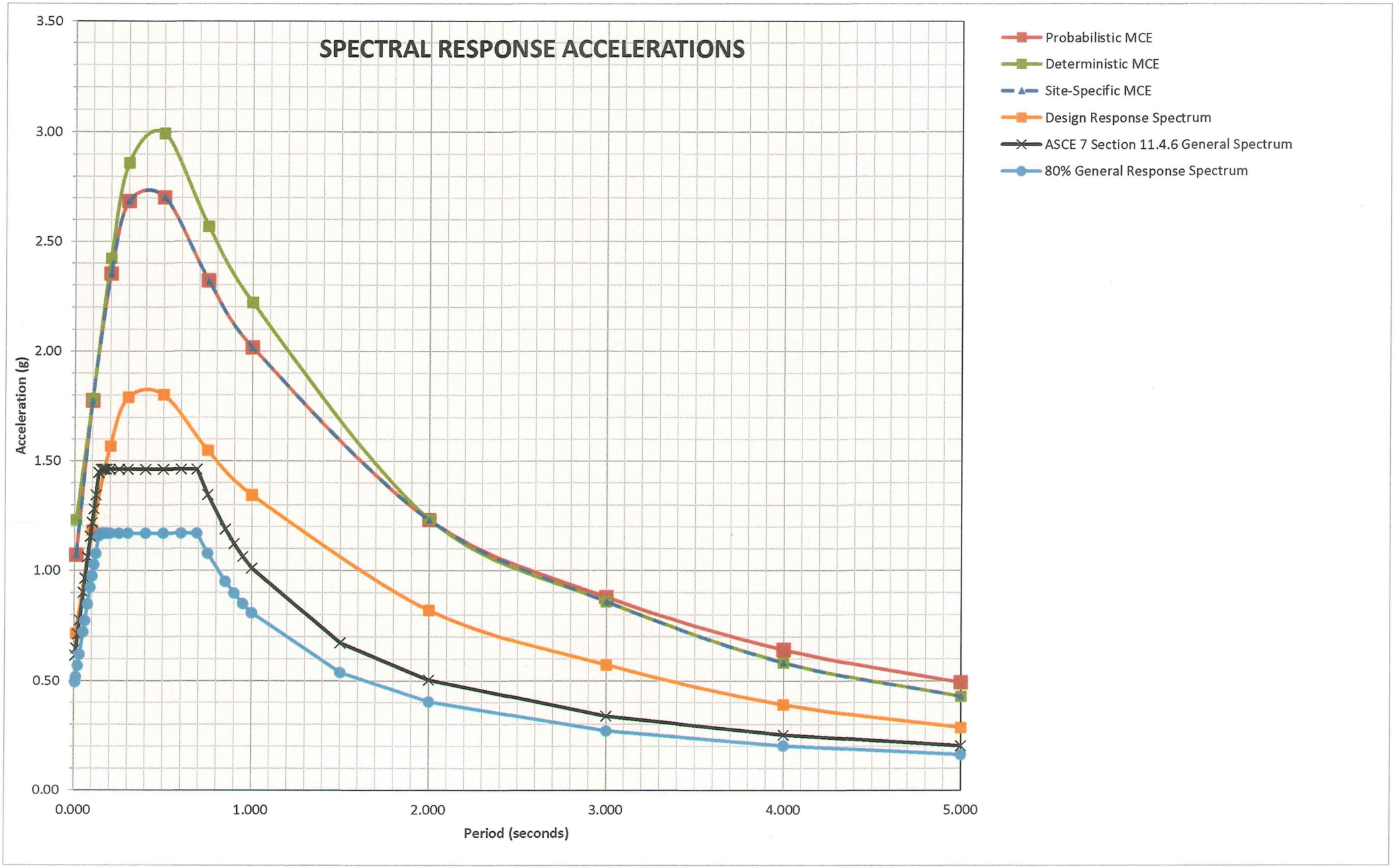
ASCE 7-16: Section 21.4
Site Specific

	Calculated Value	Design Value
SDS:	1.621	1.621
SD1:	1.718	1.718
SMS:	2.432	2.432
SM1:	2.577	2.577
Site Specific PGAm:	0.961	0.961
Site Class:	D measured	

Seismic Design Category - Short* E
Seismic Design Category - 1s* E
* Risk Categories I, II, or III

Period	ASCE 7 SECTION 11.4.6 General Spectrum	80% General Response Spectrum
0.005	0.616	0.493
0.010	0.648	0.518
0.020	0.711	0.569
0.030	0.775	0.620
0.050	0.902	0.721
0.060	0.965	0.772
0.075	1.060	0.848
0.090	1.156	0.924
0.100	1.219	0.975
0.110	1.282	1.026
0.120	1.346	1.077
0.136	1.447	1.158
0.150	1.461	1.169
0.160	1.461	1.169
0.170	1.461	1.169
0.180	1.461	1.169
0.200	1.461	1.169
0.250	1.461	1.169
0.300	1.461	1.169
0.400	1.461	1.169
0.500	1.461	1.169
0.600	1.461	1.169
0.690	1.461	1.169
0.750	1.346	1.077
0.850	1.188	0.950
0.900	1.122	0.898
0.950	1.063	0.850
1.000	1.010	0.808
1.500	0.673	0.539
2.000	0.505	0.404
3.000	0.337	0.269
4.000	0.252	0.202
5.000	0.202	0.162

Project No: 644-22032


SPECTRAL RESPONSE ACCELERATIONS
Acceleration (g)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.000
1.000
2.000
3.000
4.000
5.000
Period (seconds)
Probabilistic MCE
Deterministic MCE
Site-Specific MCE
Design Response Spectrum
ASCE 7 Section 11.4.6 General Spectrum
80% General Response Spectrum

APPENDIX D

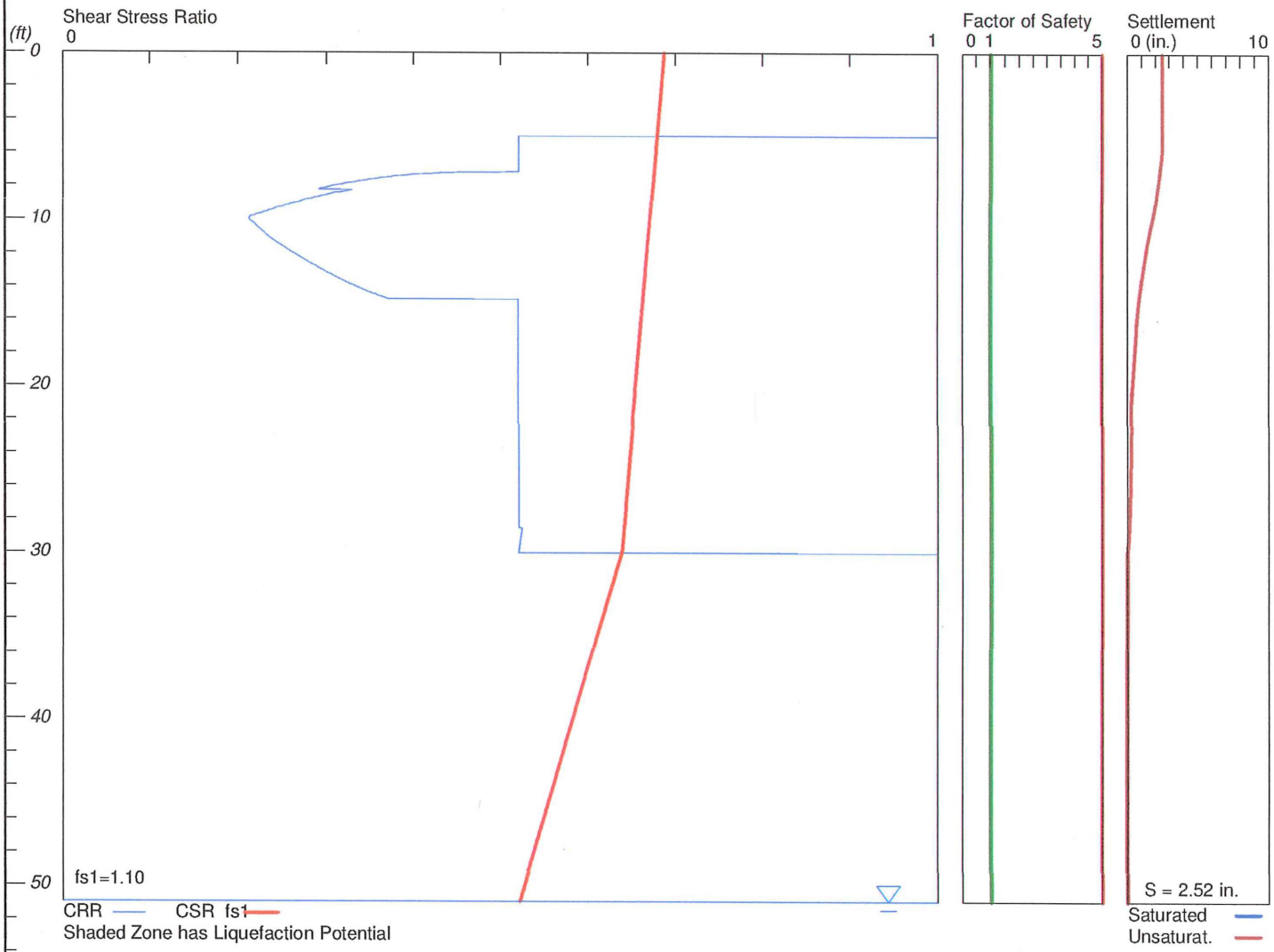
DYNAMIC SETTLEMENT ANALYSIS

SEISMIC SETTLEMENT ANALYSIS

NWC Lyon Avenue & Appaloosa Drive

Hole No.=BH-2 Water Depth=51 ft Surface Elev.=1,500

Magnitude=7.38
Acceleration=0.961g



LiquefyPro CivilTech Software USA www.civiltech.com

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LIQUEFACTION ANALYSIS SUMMARY

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Font: Courier New, Regular, Size 8 is recommended for this report.
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Input File Name: D:\Liquefy5\644-22032.liq
Title: NWC Lyon Avenue & Appaloosa Drive
Subtitle:

Surface Elev.=1,500
Hole No.=BH-2
Depth of Hole= 51.00 ft
Water Table during Earthquake= 51.00 ft
Water Table during In-Situ Testing= 51.00 ft
Max. Acceleration= 0.96 g
Earthquake Magnitude= 7.38

Input Data:
Surface Elev.=1,500
Hole No.=BH-2
Depth of Hole=51.00 ft
Water Table during Earthquake= 51.00 ft
Water Table during In-Situ Testing= 51.00 ft
Max. Acceleration=0.96 g
Earthquake Magnitude=7.38
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.15
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1.1
   Plot one CSR curve (fs1=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:
Depth SPT gamma Fines

ft		pcf	%
0.00	11.30	109.10	NoLiq
2.00	11.30	109.10	NoLiq
5.00	8.60	105.90	NoLiq
10.00	11.00	105.90	2.20
15.00	19.30	129.20	14.40
20.00	40.00	129.20	3.10
25.00	57.30	104.00	7.00
30.00	7.00	104.00	NoLiq
35.00	50.60	127.10	NoLiq
40.00	8.00	127.10	NoLiq
45.00	48.00	125.80	NoLiq
50.00	15.00	125.80	NoLiq

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=2.52 in.
Total Settlement of Saturated and Unsaturated Sands=2.52 in.
Differential Settlement=1.258 to 1.661 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.00	0.69	5.00	0.00	2.52	2.52
0.05	2.00	0.69	5.00	0.00	2.52	2.52
0.10	2.00	0.69	5.00	0.00	2.52	2.52
0.15	2.00	0.69	5.00	0.00	2.52	2.52
0.20	2.00	0.69	5.00	0.00	2.52	2.52
0.25	2.00	0.69	5.00	0.00	2.52	2.52
0.30	2.00	0.69	5.00	0.00	2.52	2.52
0.35	2.00	0.69	5.00	0.00	2.52	2.52
0.40	2.00	0.69	5.00	0.00	2.52	2.52
0.45	2.00	0.69	5.00	0.00	2.52	2.52
0.50	2.00	0.69	5.00	0.00	2.52	2.52
0.55	2.00	0.69	5.00	0.00	2.52	2.52
0.60	2.00	0.69	5.00	0.00	2.52	2.52
0.65	2.00	0.69	5.00	0.00	2.52	2.52
0.70	2.00	0.69	5.00	0.00	2.52	2.52
0.75	2.00	0.69	5.00	0.00	2.52	2.52
0.80	2.00	0.69	5.00	0.00	2.52	2.52
0.85	2.00	0.69	5.00	0.00	2.52	2.52
0.90	2.00	0.69	5.00	0.00	2.52	2.52
0.95	2.00	0.69	5.00	0.00	2.52	2.52
1.00	2.00	0.69	5.00	0.00	2.52	2.52
1.05	2.00	0.69	5.00	0.00	2.52	2.52
1.10	2.00	0.69	5.00	0.00	2.52	2.52
1.15	2.00	0.69	5.00	0.00	2.52	2.52
1.20	2.00	0.69	5.00	0.00	2.52	2.52

1.25	2.00	0.69	5.00	0.00	2.52	2.52
1.30	2.00	0.69	5.00	0.00	2.52	2.52
1.35	2.00	0.68	5.00	0.00	2.52	2.52
1.40	2.00	0.68	5.00	0.00	2.52	2.52
1.45	2.00	0.68	5.00	0.00	2.52	2.52
1.50	2.00	0.68	5.00	0.00	2.52	2.52
1.55	2.00	0.68	5.00	0.00	2.52	2.52
1.60	2.00	0.68	5.00	0.00	2.52	2.52
1.65	2.00	0.68	5.00	0.00	2.52	2.52
1.70	2.00	0.68	5.00	0.00	2.52	2.52
1.75	2.00	0.68	5.00	0.00	2.52	2.52
1.80	2.00	0.68	5.00	0.00	2.52	2.52
1.85	2.00	0.68	5.00	0.00	2.52	2.52
1.90	2.00	0.68	5.00	0.00	2.52	2.52
1.95	2.00	0.68	5.00	0.00	2.52	2.52
2.00	2.00	0.68	5.00	0.00	2.52	2.52
2.05	2.00	0.68	5.00	0.00	2.52	2.52
2.10	2.00	0.68	5.00	0.00	2.52	2.52
2.15	2.00	0.68	5.00	0.00	2.52	2.52
2.20	2.00	0.68	5.00	0.00	2.52	2.52
2.25	2.00	0.68	5.00	0.00	2.52	2.52
2.30	2.00	0.68	5.00	0.00	2.52	2.52
2.35	2.00	0.68	5.00	0.00	2.52	2.52
2.40	2.00	0.68	5.00	0.00	2.52	2.52
2.45	2.00	0.68	5.00	0.00	2.52	2.52
2.50	2.00	0.68	5.00	0.00	2.52	2.52
2.55	2.00	0.68	5.00	0.00	2.52	2.52
2.60	2.00	0.68	5.00	0.00	2.52	2.52
2.65	2.00	0.68	5.00	0.00	2.52	2.52
2.70	2.00	0.68	5.00	0.00	2.52	2.52
2.75	2.00	0.68	5.00	0.00	2.52	2.52
2.80	2.00	0.68	5.00	0.00	2.52	2.52
2.85	2.00	0.68	5.00	0.00	2.52	2.52
2.90	2.00	0.68	5.00	0.00	2.52	2.52
2.95	2.00	0.68	5.00	0.00	2.52	2.52
3.00	2.00	0.68	5.00	0.00	2.52	2.52
3.05	2.00	0.68	5.00	0.00	2.52	2.52
3.10	2.00	0.68	5.00	0.00	2.52	2.52
3.15	2.00	0.68	5.00	0.00	2.52	2.52
3.20	2.00	0.68	5.00	0.00	2.52	2.52
3.25	2.00	0.68	5.00	0.00	2.52	2.52
3.30	2.00	0.68	5.00	0.00	2.52	2.52
3.35	2.00	0.68	5.00	0.00	2.52	2.52
3.40	2.00	0.68	5.00	0.00	2.52	2.52
3.45	2.00	0.68	5.00	0.00	2.52	2.52
3.50	2.00	0.68	5.00	0.00	2.52	2.52
3.55	2.00	0.68	5.00	0.00	2.52	2.52
3.60	2.00	0.68	5.00	0.00	2.52	2.52
3.65	2.00	0.68	5.00	0.00	2.52	2.52
3.70	2.00	0.68	5.00	0.00	2.52	2.52

3.75	2.00	0.68	5.00	0.00	2.52	2.52
3.80	2.00	0.68	5.00	0.00	2.52	2.52
3.85	2.00	0.68	5.00	0.00	2.52	2.52
3.90	2.00	0.68	5.00	0.00	2.52	2.52
3.95	2.00	0.68	5.00	0.00	2.52	2.52
4.00	2.00	0.68	5.00	0.00	2.52	2.52
4.05	2.00	0.68	5.00	0.00	2.52	2.52
4.10	2.00	0.68	5.00	0.00	2.52	2.52
4.15	2.00	0.68	5.00	0.00	2.52	2.52
4.20	2.00	0.68	5.00	0.00	2.52	2.52
4.25	2.00	0.68	5.00	0.00	2.52	2.52
4.30	2.00	0.68	5.00	0.00	2.52	2.52
4.35	2.00	0.68	5.00	0.00	2.52	2.52
4.40	2.00	0.68	5.00	0.00	2.52	2.52
4.45	2.00	0.68	5.00	0.00	2.52	2.52
4.50	2.00	0.68	5.00	0.00	2.52	2.52
4.55	2.00	0.68	5.00	0.00	2.52	2.52
4.60	2.00	0.68	5.00	0.00	2.52	2.52
4.65	2.00	0.68	5.00	0.00	2.52	2.52
4.70	2.00	0.68	5.00	0.00	2.52	2.52
4.75	2.00	0.68	5.00	0.00	2.52	2.52
4.80	2.00	0.68	5.00	0.00	2.52	2.52
4.85	2.00	0.68	5.00	0.00	2.52	2.52
4.90	2.00	0.68	5.00	0.00	2.52	2.52
4.95	2.00	0.68	5.00	0.00	2.52	2.52
5.00	0.52	0.68	5.00	0.00	2.52	2.52
5.05	0.52	0.68	5.00	0.00	2.52	2.52
5.10	0.52	0.68	5.00	0.00	2.52	2.52
5.15	0.52	0.68	5.00	0.00	2.52	2.52
5.20	0.52	0.68	5.00	0.00	2.51	2.51
5.25	0.52	0.68	5.00	0.00	2.51	2.51
5.30	0.52	0.68	5.00	0.00	2.51	2.51
5.35	0.52	0.68	5.00	0.00	2.51	2.51
5.40	0.52	0.68	5.00	0.00	2.51	2.51
5.45	0.52	0.68	5.00	0.00	2.51	2.51
5.50	0.52	0.68	5.00	0.00	2.51	2.51
5.55	0.52	0.68	5.00	0.00	2.51	2.51
5.60	0.52	0.68	5.00	0.00	2.50	2.50
5.65	0.52	0.68	5.00	0.00	2.50	2.50
5.70	0.52	0.68	5.00	0.00	2.50	2.50
5.75	0.52	0.68	5.00	0.00	2.50	2.50
5.80	0.52	0.68	5.00	0.00	2.49	2.49
5.85	0.52	0.68	5.00	0.00	2.49	2.49
5.90	0.52	0.68	5.00	0.00	2.49	2.49
5.95	0.52	0.68	5.00	0.00	2.48	2.48
6.00	0.52	0.68	5.00	0.00	2.48	2.48
6.05	0.52	0.68	5.00	0.00	2.48	2.48
6.10	0.52	0.68	5.00	0.00	2.47	2.47
6.15	0.52	0.68	5.00	0.00	2.47	2.47
6.20	0.52	0.68	5.00	0.00	2.46	2.46

6.25	0.52	0.68	5.00	0.00	2.45	2.45
6.30	0.52	0.68	5.00	0.00	2.45	2.45
6.35	0.52	0.68	5.00	0.00	2.44	2.44
6.40	0.52	0.68	5.00	0.00	2.44	2.44
6.45	0.52	0.68	5.00	0.00	2.43	2.43
6.50	0.52	0.68	5.00	0.00	2.43	2.43
6.55	0.52	0.68	5.00	0.00	2.42	2.42
6.60	0.52	0.68	5.00	0.00	2.41	2.41
6.65	0.52	0.68	5.00	0.00	2.41	2.41
6.70	0.52	0.68	5.00	0.00	2.40	2.40
6.75	0.52	0.68	5.00	0.00	2.39	2.39
6.80	0.52	0.68	5.00	0.00	2.39	2.39
6.85	0.52	0.68	5.00	0.00	2.38	2.38
6.90	0.52	0.68	5.00	0.00	2.38	2.38
6.95	0.52	0.68	5.00	0.00	2.37	2.37
7.00	0.52	0.68	5.00	0.00	2.36	2.36
7.05	0.52	0.68	5.00	0.00	2.36	2.36
7.10	0.52	0.68	5.00	0.00	2.35	2.35
7.15	0.50	0.68	5.00	0.00	2.34	2.34
7.20	0.45	0.68	5.00	0.00	2.34	2.34
7.25	0.42	0.68	5.00	0.00	2.33	2.33
7.30	0.41	0.68	5.00	0.00	2.32	2.32
7.35	0.39	0.68	5.00	0.00	2.31	2.31
7.40	0.38	0.68	5.00	0.00	2.31	2.31
7.45	0.37	0.68	5.00	0.00	2.30	2.30
7.50	0.37	0.68	5.00	0.00	2.29	2.29
7.55	0.36	0.68	5.00	0.00	2.28	2.28
7.60	0.35	0.67	5.00	0.00	2.28	2.28
7.65	0.35	0.67	5.00	0.00	2.27	2.27
7.70	0.34	0.67	5.00	0.00	2.26	2.26
7.75	0.33	0.67	5.00	0.00	2.25	2.25
7.80	0.33	0.67	5.00	0.00	2.24	2.24
7.85	0.32	0.67	5.00	0.00	2.24	2.24
7.90	0.32	0.67	5.00	0.00	2.23	2.23
7.95	0.31	0.67	5.00	0.00	2.22	2.22
8.00	0.31	0.67	5.00	0.00	2.21	2.21
8.05	0.30	0.67	5.00	0.00	2.20	2.20
8.10	0.30	0.67	5.00	0.00	2.19	2.19
8.15	0.30	0.67	5.00	0.00	2.18	2.18
8.20	0.29	0.67	5.00	0.00	2.17	2.17
8.25	0.33	0.67	5.00	0.00	2.17	2.17
8.30	0.32	0.67	5.00	0.00	2.16	2.16
8.35	0.32	0.67	5.00	0.00	2.15	2.15
8.40	0.31	0.67	5.00	0.00	2.14	2.14
8.45	0.31	0.67	5.00	0.00	2.13	2.13
8.50	0.30	0.67	5.00	0.00	2.12	2.12
8.55	0.30	0.67	5.00	0.00	2.11	2.11
8.60	0.30	0.67	5.00	0.00	2.11	2.11
8.65	0.29	0.67	5.00	0.00	2.10	2.10
8.70	0.29	0.67	5.00	0.00	2.09	2.09

8.75	0.28	0.67	5.00	0.00	2.08	2.08
8.80	0.28	0.67	5.00	0.00	2.07	2.07
8.85	0.28	0.67	5.00	0.00	2.06	2.06
8.90	0.27	0.67	5.00	0.00	2.05	2.05
8.95	0.27	0.67	5.00	0.00	2.04	2.04
9.00	0.27	0.67	5.00	0.00	2.03	2.03
9.05	0.26	0.67	5.00	0.00	2.02	2.02
9.10	0.26	0.67	5.00	0.00	2.01	2.01
9.15	0.26	0.67	5.00	0.00	2.00	2.00
9.20	0.25	0.67	5.00	0.00	1.99	1.99
9.25	0.25	0.67	5.00	0.00	1.98	1.98
9.30	0.25	0.67	5.00	0.00	1.97	1.97
9.35	0.24	0.67	5.00	0.00	1.96	1.96
9.40	0.24	0.67	5.00	0.00	1.94	1.94
9.45	0.24	0.67	5.00	0.00	1.93	1.93
9.50	0.23	0.67	5.00	0.00	1.92	1.92
9.55	0.23	0.67	5.00	0.00	1.91	1.91
9.60	0.23	0.67	5.00	0.00	1.90	1.90
9.65	0.22	0.67	5.00	0.00	1.89	1.89
9.70	0.22	0.67	5.00	0.00	1.87	1.87
9.75	0.22	0.67	5.00	0.00	1.86	1.86
9.80	0.22	0.67	5.00	0.00	1.85	1.85
9.85	0.21	0.67	5.00	0.00	1.84	1.84
9.90	0.21	0.67	5.00	0.00	1.82	1.82
9.95	0.21	0.67	5.00	0.00	1.81	1.81
10.00	0.21	0.67	5.00	0.00	1.80	1.80
10.05	0.21	0.67	5.00	0.00	1.78	1.78
10.10	0.21	0.67	5.00	0.00	1.77	1.77
10.15	0.22	0.67	5.00	0.00	1.76	1.76
10.20	0.22	0.67	5.00	0.00	1.75	1.75
10.25	0.22	0.67	5.00	0.00	1.73	1.73
10.30	0.22	0.67	5.00	0.00	1.72	1.72
10.35	0.22	0.67	5.00	0.00	1.71	1.71
10.40	0.22	0.67	5.00	0.00	1.70	1.70
10.45	0.22	0.67	5.00	0.00	1.68	1.68
10.50	0.22	0.67	5.00	0.00	1.67	1.67
10.55	0.22	0.67	5.00	0.00	1.66	1.66
10.60	0.23	0.67	5.00	0.00	1.65	1.65
10.65	0.23	0.67	5.00	0.00	1.63	1.63
10.70	0.23	0.67	5.00	0.00	1.62	1.62
10.75	0.23	0.67	5.00	0.00	1.61	1.61
10.80	0.23	0.67	5.00	0.00	1.60	1.60
10.85	0.23	0.67	5.00	0.00	1.59	1.59
10.90	0.23	0.67	5.00	0.00	1.57	1.57
10.95	0.23	0.67	5.00	0.00	1.56	1.56
11.00	0.23	0.67	5.00	0.00	1.55	1.55
11.05	0.24	0.67	5.00	0.00	1.54	1.54
11.10	0.24	0.67	5.00	0.00	1.53	1.53
11.15	0.24	0.67	5.00	0.00	1.52	1.52
11.20	0.24	0.67	5.00	0.00	1.50	1.50

11.25	0.24	0.67	5.00	0.00	1.49	1.49
11.30	0.24	0.67	5.00	0.00	1.48	1.48
11.35	0.24	0.67	5.00	0.00	1.47	1.47
11.40	0.24	0.67	5.00	0.00	1.46	1.46
11.45	0.25	0.67	5.00	0.00	1.45	1.45
11.50	0.25	0.67	5.00	0.00	1.44	1.44
11.55	0.25	0.67	5.00	0.00	1.43	1.43
11.60	0.25	0.67	5.00	0.00	1.42	1.42
11.65	0.25	0.67	5.00	0.00	1.41	1.41
11.70	0.25	0.67	5.00	0.00	1.40	1.40
11.75	0.25	0.67	5.00	0.00	1.38	1.38
11.80	0.26	0.67	5.00	0.00	1.37	1.37
11.85	0.26	0.67	5.00	0.00	1.36	1.36
11.90	0.26	0.67	5.00	0.00	1.35	1.35
11.95	0.26	0.67	5.00	0.00	1.34	1.34
12.00	0.26	0.67	5.00	0.00	1.33	1.33
12.05	0.26	0.67	5.00	0.00	1.32	1.32
12.10	0.27	0.67	5.00	0.00	1.31	1.31
12.15	0.27	0.67	5.00	0.00	1.30	1.30
12.20	0.27	0.67	5.00	0.00	1.29	1.29
12.25	0.27	0.67	5.00	0.00	1.28	1.28
12.30	0.27	0.67	5.00	0.00	1.27	1.27
12.35	0.27	0.67	5.00	0.00	1.26	1.26
12.40	0.27	0.67	5.00	0.00	1.25	1.25
12.45	0.28	0.67	5.00	0.00	1.24	1.24
12.50	0.28	0.67	5.00	0.00	1.23	1.23
12.55	0.28	0.67	5.00	0.00	1.22	1.22
12.60	0.28	0.67	5.00	0.00	1.21	1.21
12.65	0.28	0.67	5.00	0.00	1.20	1.20
12.70	0.28	0.67	5.00	0.00	1.20	1.20
12.75	0.29	0.67	5.00	0.00	1.19	1.19
12.80	0.29	0.67	5.00	0.00	1.18	1.18
12.85	0.29	0.67	5.00	0.00	1.17	1.17
12.90	0.29	0.67	5.00	0.00	1.16	1.16
12.95	0.29	0.67	5.00	0.00	1.15	1.15
13.00	0.29	0.67	5.00	0.00	1.14	1.14
13.05	0.30	0.67	5.00	0.00	1.13	1.13
13.10	0.30	0.67	5.00	0.00	1.12	1.12
13.15	0.30	0.67	5.00	0.00	1.11	1.11
13.20	0.30	0.67	5.00	0.00	1.10	1.10
13.25	0.30	0.67	5.00	0.00	1.10	1.10
13.30	0.31	0.67	5.00	0.00	1.09	1.09
13.35	0.31	0.67	5.00	0.00	1.08	1.08
13.40	0.31	0.67	5.00	0.00	1.07	1.07
13.45	0.31	0.67	5.00	0.00	1.06	1.06
13.50	0.31	0.67	5.00	0.00	1.05	1.05
13.55	0.31	0.67	5.00	0.00	1.04	1.04
13.60	0.32	0.67	5.00	0.00	1.03	1.03
13.65	0.32	0.67	5.00	0.00	1.03	1.03
13.70	0.32	0.67	5.00	0.00	1.02	1.02

13.75	0.32	0.67	5.00	0.00	1.01	1.01
13.80	0.32	0.67	5.00	0.00	1.00	1.00
13.85	0.33	0.66	5.00	0.00	0.99	0.99
13.90	0.33	0.66	5.00	0.00	0.98	0.98
13.95	0.33	0.66	5.00	0.00	0.98	0.98
14.00	0.33	0.66	5.00	0.00	0.97	0.97
14.05	0.34	0.66	5.00	0.00	0.96	0.96
14.10	0.34	0.66	5.00	0.00	0.95	0.95
14.15	0.34	0.66	5.00	0.00	0.94	0.94
14.20	0.34	0.66	5.00	0.00	0.94	0.94
14.25	0.34	0.66	5.00	0.00	0.93	0.93
14.30	0.35	0.66	5.00	0.00	0.92	0.92
14.35	0.35	0.66	5.00	0.00	0.91	0.91
14.40	0.35	0.66	5.00	0.00	0.90	0.90
14.45	0.35	0.66	5.00	0.00	0.90	0.90
14.50	0.36	0.66	5.00	0.00	0.89	0.89
14.55	0.36	0.66	5.00	0.00	0.88	0.88
14.60	0.36	0.66	5.00	0.00	0.87	0.87
14.65	0.36	0.66	5.00	0.00	0.86	0.86
14.70	0.37	0.66	5.00	0.00	0.86	0.86
14.75	0.37	0.66	5.00	0.00	0.85	0.85
14.80	0.52	0.66	5.00	0.00	0.84	0.84
14.85	0.52	0.66	5.00	0.00	0.83	0.83
14.90	0.52	0.66	5.00	0.00	0.83	0.83
14.95	0.52	0.66	5.00	0.00	0.82	0.82
15.00	0.52	0.66	5.00	0.00	0.82	0.82
15.05	0.52	0.66	5.00	0.00	0.81	0.81
15.10	0.52	0.66	5.00	0.00	0.80	0.80
15.15	0.52	0.66	5.00	0.00	0.80	0.80
15.20	0.52	0.66	5.00	0.00	0.79	0.79
15.25	0.52	0.66	5.00	0.00	0.78	0.78
15.30	0.52	0.66	5.00	0.00	0.78	0.78
15.35	0.52	0.66	5.00	0.00	0.77	0.77
15.40	0.52	0.66	5.00	0.00	0.77	0.77
15.45	0.52	0.66	5.00	0.00	0.76	0.76
15.50	0.52	0.66	5.00	0.00	0.76	0.76
15.55	0.52	0.66	5.00	0.00	0.75	0.75
15.60	0.52	0.66	5.00	0.00	0.74	0.74
15.65	0.52	0.66	5.00	0.00	0.74	0.74
15.70	0.52	0.66	5.00	0.00	0.73	0.73
15.75	0.52	0.66	5.00	0.00	0.73	0.73
15.80	0.52	0.66	5.00	0.00	0.72	0.72
15.85	0.52	0.66	5.00	0.00	0.72	0.72
15.90	0.52	0.66	5.00	0.00	0.71	0.71
15.95	0.52	0.66	5.00	0.00	0.71	0.71
16.00	0.52	0.66	5.00	0.00	0.70	0.70
16.05	0.52	0.66	5.00	0.00	0.70	0.70
16.10	0.52	0.66	5.00	0.00	0.69	0.69
16.15	0.52	0.66	5.00	0.00	0.69	0.69
16.20	0.52	0.66	5.00	0.00	0.68	0.68

16.25	0.52	0.66	5.00	0.00	0.68	0.68
16.30	0.52	0.66	5.00	0.00	0.67	0.67
16.35	0.52	0.66	5.00	0.00	0.67	0.67
16.40	0.52	0.66	5.00	0.00	0.67	0.67
16.45	0.52	0.66	5.00	0.00	0.66	0.66
16.50	0.52	0.66	5.00	0.00	0.66	0.66
16.55	0.52	0.66	5.00	0.00	0.65	0.65
16.60	0.52	0.66	5.00	0.00	0.65	0.65
16.65	0.52	0.66	5.00	0.00	0.64	0.64
16.70	0.52	0.66	5.00	0.00	0.64	0.64
16.75	0.52	0.66	5.00	0.00	0.64	0.64
16.80	0.52	0.66	5.00	0.00	0.63	0.63
16.85	0.52	0.66	5.00	0.00	0.63	0.63
16.90	0.52	0.66	5.00	0.00	0.62	0.62
16.95	0.52	0.66	5.00	0.00	0.62	0.62
17.00	0.52	0.66	5.00	0.00	0.62	0.62
17.05	0.52	0.66	5.00	0.00	0.61	0.61
17.10	0.52	0.66	5.00	0.00	0.61	0.61
17.15	0.52	0.66	5.00	0.00	0.61	0.61
17.20	0.52	0.66	5.00	0.00	0.60	0.60
17.25	0.52	0.66	5.00	0.00	0.60	0.60
17.30	0.52	0.66	5.00	0.00	0.59	0.59
17.35	0.52	0.66	5.00	0.00	0.59	0.59
17.40	0.52	0.66	5.00	0.00	0.59	0.59
17.45	0.52	0.66	5.00	0.00	0.58	0.58
17.50	0.52	0.66	5.00	0.00	0.58	0.58
17.55	0.52	0.66	5.00	0.00	0.57	0.57
17.60	0.52	0.66	5.00	0.00	0.57	0.57
17.65	0.52	0.66	5.00	0.00	0.57	0.57
17.70	0.52	0.66	5.00	0.00	0.56	0.56
17.75	0.52	0.66	5.00	0.00	0.56	0.56
17.80	0.52	0.66	5.00	0.00	0.55	0.55
17.85	0.52	0.66	5.00	0.00	0.55	0.55
17.90	0.52	0.66	5.00	0.00	0.55	0.55
17.95	0.52	0.66	5.00	0.00	0.54	0.54
18.00	0.52	0.66	5.00	0.00	0.54	0.54
18.05	0.52	0.66	5.00	0.00	0.53	0.53
18.10	0.52	0.66	5.00	0.00	0.53	0.53
18.15	0.52	0.66	5.00	0.00	0.53	0.53
18.20	0.52	0.66	5.00	0.00	0.52	0.52
18.25	0.52	0.66	5.00	0.00	0.52	0.52
18.30	0.52	0.66	5.00	0.00	0.52	0.52
18.35	0.52	0.66	5.00	0.00	0.51	0.51
18.40	0.52	0.66	5.00	0.00	0.51	0.51
18.45	0.52	0.66	5.00	0.00	0.50	0.50
18.50	0.52	0.66	5.00	0.00	0.50	0.50
18.55	0.52	0.66	5.00	0.00	0.50	0.50
18.60	0.52	0.66	5.00	0.00	0.49	0.49
18.65	0.52	0.66	5.00	0.00	0.49	0.49
18.70	0.52	0.66	5.00	0.00	0.48	0.48

18.75	0.52	0.66	5.00	0.00	0.48	0.48
18.80	0.52	0.66	5.00	0.00	0.48	0.48
18.85	0.52	0.66	5.00	0.00	0.47	0.47
18.90	0.52	0.66	5.00	0.00	0.47	0.47
18.95	0.52	0.66	5.00	0.00	0.46	0.46
19.00	0.52	0.66	5.00	0.00	0.46	0.46
19.05	0.52	0.66	5.00	0.00	0.46	0.46
19.10	0.52	0.66	5.00	0.00	0.45	0.45
19.15	0.52	0.66	5.00	0.00	0.45	0.45
19.20	0.52	0.66	5.00	0.00	0.45	0.45
19.25	0.52	0.66	5.00	0.00	0.44	0.44
19.30	0.52	0.66	5.00	0.00	0.44	0.44
19.35	0.52	0.66	5.00	0.00	0.43	0.43
19.40	0.52	0.66	5.00	0.00	0.43	0.43
19.45	0.52	0.66	5.00	0.00	0.43	0.43
19.50	0.52	0.66	5.00	0.00	0.42	0.42
19.55	0.52	0.66	5.00	0.00	0.42	0.42
19.60	0.52	0.66	5.00	0.00	0.41	0.41
19.65	0.52	0.66	5.00	0.00	0.41	0.41
19.70	0.52	0.66	5.00	0.00	0.41	0.41
19.75	0.52	0.66	5.00	0.00	0.40	0.40
19.80	0.52	0.66	5.00	0.00	0.40	0.40
19.85	0.52	0.66	5.00	0.00	0.39	0.39
19.90	0.52	0.66	5.00	0.00	0.39	0.39
19.95	0.52	0.66	5.00	0.00	0.39	0.39
20.00	0.52	0.66	5.00	0.00	0.38	0.38
20.05	0.52	0.65	5.00	0.00	0.38	0.38
20.10	0.52	0.65	5.00	0.00	0.37	0.37
20.15	0.52	0.65	5.00	0.00	0.37	0.37
20.20	0.52	0.65	5.00	0.00	0.37	0.37
20.25	0.52	0.65	5.00	0.00	0.36	0.36
20.30	0.52	0.65	5.00	0.00	0.36	0.36
20.35	0.52	0.65	5.00	0.00	0.36	0.36
20.40	0.52	0.65	5.00	0.00	0.35	0.35
20.45	0.52	0.65	5.00	0.00	0.35	0.35
20.50	0.52	0.65	5.00	0.00	0.34	0.34
20.55	0.52	0.65	5.00	0.00	0.34	0.34
20.60	0.52	0.65	5.00	0.00	0.34	0.34
20.65	0.52	0.65	5.00	0.00	0.33	0.33
20.70	0.52	0.65	5.00	0.00	0.33	0.33
20.75	0.52	0.65	5.00	0.00	0.32	0.32
20.80	0.52	0.65	5.00	0.00	0.32	0.32
20.85	0.52	0.65	5.00	0.00	0.32	0.32
20.90	0.52	0.65	5.00	0.00	0.31	0.31
20.95	0.52	0.65	5.00	0.00	0.31	0.31
21.00	0.52	0.65	5.00	0.00	0.30	0.30
21.05	0.52	0.65	5.00	0.00	0.30	0.30
21.10	0.52	0.65	5.00	0.00	0.30	0.30
21.15	0.52	0.65	5.00	0.00	0.30	0.30
21.20	0.52	0.65	5.00	0.00	0.30	0.30

21.25	0.52	0.65	5.00	0.00	0.29	0.29
21.30	0.52	0.65	5.00	0.00	0.29	0.29
21.35	0.52	0.65	5.00	0.00	0.29	0.29
21.40	0.52	0.65	5.00	0.00	0.29	0.29
21.45	0.52	0.65	5.00	0.00	0.29	0.29
21.50	0.52	0.65	5.00	0.00	0.29	0.29
21.55	0.52	0.65	5.00	0.00	0.29	0.29
21.60	0.52	0.65	5.00	0.00	0.29	0.29
21.65	0.52	0.65	5.00	0.00	0.29	0.29
21.70	0.52	0.65	5.00	0.00	0.29	0.29
21.75	0.52	0.65	5.00	0.00	0.28	0.28
21.80	0.52	0.65	5.00	0.00	0.28	0.28
21.85	0.52	0.65	5.00	0.00	0.28	0.28
21.90	0.52	0.65	5.00	0.00	0.28	0.28
21.95	0.52	0.65	5.00	0.00	0.28	0.28
22.00	0.52	0.65	5.00	0.00	0.28	0.28
22.05	0.52	0.65	5.00	0.00	0.28	0.28
22.10	0.52	0.65	5.00	0.00	0.28	0.28
22.15	0.52	0.65	5.00	0.00	0.28	0.28
22.20	0.52	0.65	5.00	0.00	0.28	0.28
22.25	0.52	0.65	5.00	0.00	0.28	0.28
22.30	0.52	0.65	5.00	0.00	0.27	0.27
22.35	0.52	0.65	5.00	0.00	0.27	0.27
22.40	0.52	0.65	5.00	0.00	0.27	0.27
22.45	0.52	0.65	5.00	0.00	0.27	0.27
22.50	0.52	0.65	5.00	0.00	0.27	0.27
22.55	0.52	0.65	5.00	0.00	0.27	0.27
22.60	0.52	0.65	5.00	0.00	0.27	0.27
22.65	0.52	0.65	5.00	0.00	0.27	0.27
22.70	0.52	0.65	5.00	0.00	0.27	0.27
22.75	0.52	0.65	5.00	0.00	0.27	0.27
22.80	0.52	0.65	5.00	0.00	0.27	0.27
22.85	0.52	0.65	5.00	0.00	0.26	0.26
22.90	0.52	0.65	5.00	0.00	0.26	0.26
22.95	0.52	0.65	5.00	0.00	0.26	0.26
23.00	0.52	0.65	5.00	0.00	0.26	0.26
23.05	0.52	0.65	5.00	0.00	0.26	0.26
23.10	0.52	0.65	5.00	0.00	0.26	0.26
23.15	0.52	0.65	5.00	0.00	0.26	0.26
23.20	0.52	0.65	5.00	0.00	0.26	0.26
23.25	0.52	0.65	5.00	0.00	0.26	0.26
23.30	0.52	0.65	5.00	0.00	0.26	0.26
23.35	0.52	0.65	5.00	0.00	0.25	0.25
23.40	0.52	0.65	5.00	0.00	0.25	0.25
23.45	0.52	0.65	5.00	0.00	0.25	0.25
23.50	0.52	0.65	5.00	0.00	0.25	0.25
23.55	0.52	0.65	5.00	0.00	0.25	0.25
23.60	0.52	0.65	5.00	0.00	0.25	0.25
23.65	0.52	0.65	5.00	0.00	0.25	0.25
23.70	0.52	0.65	5.00	0.00	0.25	0.25

23.75	0.52	0.65	5.00	0.00	0.25	0.25
23.80	0.52	0.65	5.00	0.00	0.25	0.25
23.85	0.52	0.65	5.00	0.00	0.25	0.25
23.90	0.52	0.65	5.00	0.00	0.24	0.24
23.95	0.52	0.65	5.00	0.00	0.24	0.24
24.00	0.52	0.65	5.00	0.00	0.24	0.24
24.05	0.52	0.65	5.00	0.00	0.24	0.24
24.10	0.52	0.65	5.00	0.00	0.24	0.24
24.15	0.52	0.65	5.00	0.00	0.24	0.24
24.20	0.52	0.65	5.00	0.00	0.24	0.24
24.25	0.52	0.65	5.00	0.00	0.24	0.24
24.30	0.52	0.65	5.00	0.00	0.24	0.24
24.35	0.52	0.65	5.00	0.00	0.24	0.24
24.40	0.52	0.65	5.00	0.00	0.23	0.23
24.45	0.52	0.65	5.00	0.00	0.23	0.23
24.50	0.52	0.65	5.00	0.00	0.23	0.23
24.55	0.52	0.65	5.00	0.00	0.23	0.23
24.60	0.52	0.65	5.00	0.00	0.23	0.23
24.65	0.52	0.65	5.00	0.00	0.23	0.23
24.70	0.52	0.65	5.00	0.00	0.23	0.23
24.75	0.52	0.65	5.00	0.00	0.23	0.23
24.80	0.52	0.65	5.00	0.00	0.23	0.23
24.85	0.52	0.65	5.00	0.00	0.23	0.23
24.90	0.52	0.65	5.00	0.00	0.23	0.23
24.95	0.52	0.65	5.00	0.00	0.22	0.22
25.00	0.52	0.65	5.00	0.00	0.22	0.22
25.05	0.52	0.65	5.00	0.00	0.22	0.22
25.10	0.52	0.65	5.00	0.00	0.22	0.22
25.15	0.52	0.65	5.00	0.00	0.22	0.22
25.20	0.52	0.65	5.00	0.00	0.22	0.22
25.25	0.52	0.65	5.00	0.00	0.22	0.22
25.30	0.52	0.65	5.00	0.00	0.22	0.22
25.35	0.52	0.65	5.00	0.00	0.22	0.22
25.40	0.52	0.65	5.00	0.00	0.22	0.22
25.45	0.52	0.65	5.00	0.00	0.21	0.21
25.50	0.52	0.65	5.00	0.00	0.21	0.21
25.55	0.52	0.65	5.00	0.00	0.21	0.21
25.60	0.52	0.65	5.00	0.00	0.21	0.21
25.65	0.52	0.65	5.00	0.00	0.21	0.21
25.70	0.52	0.65	5.00	0.00	0.21	0.21
25.75	0.52	0.65	5.00	0.00	0.21	0.21
25.80	0.52	0.65	5.00	0.00	0.21	0.21
25.85	0.52	0.65	5.00	0.00	0.21	0.21
25.90	0.52	0.65	5.00	0.00	0.20	0.20
25.95	0.52	0.65	5.00	0.00	0.20	0.20
26.00	0.52	0.65	5.00	0.00	0.20	0.20
26.05	0.52	0.65	5.00	0.00	0.20	0.20
26.10	0.52	0.65	5.00	0.00	0.20	0.20
26.15	0.52	0.65	5.00	0.00	0.20	0.20
26.20	0.52	0.65	5.00	0.00	0.20	0.20

26.25	0.52	0.65	5.00	0.00	0.20	0.20
26.30	0.52	0.64	5.00	0.00	0.19	0.19
26.35	0.52	0.64	5.00	0.00	0.19	0.19
26.40	0.52	0.64	5.00	0.00	0.19	0.19
26.45	0.52	0.64	5.00	0.00	0.19	0.19
26.50	0.52	0.64	5.00	0.00	0.19	0.19
26.55	0.52	0.64	5.00	0.00	0.19	0.19
26.60	0.52	0.64	5.00	0.00	0.19	0.19
26.65	0.52	0.64	5.00	0.00	0.19	0.19
26.70	0.52	0.64	5.00	0.00	0.18	0.18
26.75	0.52	0.64	5.00	0.00	0.18	0.18
26.80	0.52	0.64	5.00	0.00	0.18	0.18
26.85	0.52	0.64	5.00	0.00	0.18	0.18
26.90	0.52	0.64	5.00	0.00	0.18	0.18
26.95	0.52	0.64	5.00	0.00	0.18	0.18
27.00	0.52	0.64	5.00	0.00	0.18	0.18
27.05	0.52	0.64	5.00	0.00	0.17	0.17
27.10	0.52	0.64	5.00	0.00	0.17	0.17
27.15	0.52	0.64	5.00	0.00	0.17	0.17
27.20	0.52	0.64	5.00	0.00	0.17	0.17
27.25	0.52	0.64	5.00	0.00	0.17	0.17
27.30	0.52	0.64	5.00	0.00	0.17	0.17
27.35	0.52	0.64	5.00	0.00	0.16	0.16
27.40	0.52	0.64	5.00	0.00	0.16	0.16
27.45	0.52	0.64	5.00	0.00	0.16	0.16
27.50	0.52	0.64	5.00	0.00	0.16	0.16
27.55	0.52	0.64	5.00	0.00	0.16	0.16
27.60	0.52	0.64	5.00	0.00	0.16	0.16
27.65	0.52	0.64	5.00	0.00	0.15	0.15
27.70	0.52	0.64	5.00	0.00	0.15	0.15
27.75	0.52	0.64	5.00	0.00	0.15	0.15
27.80	0.52	0.64	5.00	0.00	0.15	0.15
27.85	0.52	0.64	5.00	0.00	0.15	0.15
27.90	0.52	0.64	5.00	0.00	0.14	0.14
27.95	0.52	0.64	5.00	0.00	0.14	0.14
28.00	0.52	0.64	5.00	0.00	0.14	0.14
28.05	0.52	0.64	5.00	0.00	0.14	0.14
28.10	0.52	0.64	5.00	0.00	0.14	0.14
28.15	0.52	0.64	5.00	0.00	0.13	0.13
28.20	0.52	0.64	5.00	0.00	0.13	0.13
28.25	0.52	0.64	5.00	0.00	0.13	0.13
28.30	0.52	0.64	5.00	0.00	0.13	0.13
28.35	0.52	0.64	5.00	0.00	0.13	0.13
28.40	0.52	0.64	5.00	0.00	0.12	0.12
28.45	0.52	0.64	5.00	0.00	0.12	0.12
28.50	0.52	0.64	5.00	0.00	0.12	0.12
28.55	0.52	0.64	5.00	0.00	0.12	0.12
28.60	0.52	0.64	5.00	0.00	0.11	0.11
28.65	0.52	0.64	5.00	0.00	0.11	0.11
28.70	0.52	0.64	5.00	0.00	0.11	0.11

28.75	0.52	0.64	5.00	0.00	0.11	0.11
28.80	0.52	0.64	5.00	0.00	0.10	0.10
28.85	0.52	0.64	5.00	0.00	0.10	0.10
28.90	0.52	0.64	5.00	0.00	0.10	0.10
28.95	0.52	0.64	5.00	0.00	0.10	0.10
29.00	0.52	0.64	5.00	0.00	0.09	0.09
29.05	0.52	0.64	5.00	0.00	0.09	0.09
29.10	0.52	0.64	5.00	0.00	0.09	0.09
29.15	0.52	0.64	5.00	0.00	0.08	0.08
29.20	0.52	0.64	5.00	0.00	0.08	0.08
29.25	0.52	0.64	5.00	0.00	0.08	0.08
29.30	0.52	0.64	5.00	0.00	0.07	0.07
29.35	0.52	0.64	5.00	0.00	0.07	0.07
29.40	0.52	0.64	5.00	0.00	0.06	0.06
29.45	0.52	0.64	5.00	0.00	0.06	0.06
29.50	0.52	0.64	5.00	0.00	0.05	0.05
29.55	0.52	0.64	5.00	0.00	0.05	0.05
29.60	0.52	0.64	5.00	0.00	0.04	0.04
29.65	0.52	0.64	5.00	0.00	0.04	0.04
29.70	0.52	0.64	5.00	0.00	0.03	0.03
29.75	0.52	0.64	5.00	0.00	0.03	0.03
29.80	0.52	0.64	5.00	0.00	0.02	0.02
29.85	0.52	0.64	5.00	0.00	0.01	0.01
29.90	0.52	0.64	5.00	0.00	0.01	0.01
29.95	0.52	0.64	5.00	0.00	0.00	0.00
30.00	0.52	0.64	5.00	0.00	0.00	0.00
30.05	2.00	0.64	5.00	0.00	0.00	0.00
30.10	2.00	0.64	5.00	0.00	0.00	0.00
30.15	2.00	0.64	5.00	0.00	0.00	0.00
30.20	2.00	0.64	5.00	0.00	0.00	0.00
30.25	2.00	0.64	5.00	0.00	0.00	0.00
30.30	2.00	0.64	5.00	0.00	0.00	0.00
30.35	2.00	0.64	5.00	0.00	0.00	0.00
30.40	2.00	0.64	5.00	0.00	0.00	0.00
30.45	2.00	0.64	5.00	0.00	0.00	0.00
30.50	2.00	0.64	5.00	0.00	0.00	0.00
30.55	2.00	0.64	5.00	0.00	0.00	0.00
30.60	2.00	0.64	5.00	0.00	0.00	0.00
30.65	2.00	0.64	5.00	0.00	0.00	0.00
30.70	2.00	0.64	5.00	0.00	0.00	0.00
30.75	2.00	0.63	5.00	0.00	0.00	0.00
30.80	2.00	0.63	5.00	0.00	0.00	0.00
30.85	2.00	0.63	5.00	0.00	0.00	0.00
30.90	2.00	0.63	5.00	0.00	0.00	0.00
30.95	2.00	0.63	5.00	0.00	0.00	0.00
31.00	2.00	0.63	5.00	0.00	0.00	0.00
31.05	2.00	0.63	5.00	0.00	0.00	0.00
31.10	2.00	0.63	5.00	0.00	0.00	0.00
31.15	2.00	0.63	5.00	0.00	0.00	0.00
31.20	2.00	0.63	5.00	0.00	0.00	0.00

31.25	2.00	0.63	5.00	0.00	0.00	0.00
31.30	2.00	0.63	5.00	0.00	0.00	0.00
31.35	2.00	0.63	5.00	0.00	0.00	0.00
31.40	2.00	0.63	5.00	0.00	0.00	0.00
31.45	2.00	0.63	5.00	0.00	0.00	0.00
31.50	2.00	0.63	5.00	0.00	0.00	0.00
31.55	2.00	0.63	5.00	0.00	0.00	0.00
31.60	2.00	0.63	5.00	0.00	0.00	0.00
31.65	2.00	0.63	5.00	0.00	0.00	0.00
31.70	2.00	0.63	5.00	0.00	0.00	0.00
31.75	2.00	0.63	5.00	0.00	0.00	0.00
31.80	2.00	0.63	5.00	0.00	0.00	0.00
31.85	2.00	0.63	5.00	0.00	0.00	0.00
31.90	2.00	0.63	5.00	0.00	0.00	0.00
31.95	2.00	0.63	5.00	0.00	0.00	0.00
32.00	2.00	0.63	5.00	0.00	0.00	0.00
32.05	2.00	0.63	5.00	0.00	0.00	0.00
32.10	2.00	0.63	5.00	0.00	0.00	0.00
32.15	2.00	0.63	5.00	0.00	0.00	0.00
32.20	2.00	0.63	5.00	0.00	0.00	0.00
32.25	2.00	0.63	5.00	0.00	0.00	0.00
32.30	2.00	0.63	5.00	0.00	0.00	0.00
32.35	2.00	0.63	5.00	0.00	0.00	0.00
32.40	2.00	0.63	5.00	0.00	0.00	0.00
32.45	2.00	0.63	5.00	0.00	0.00	0.00
32.50	2.00	0.62	5.00	0.00	0.00	0.00
32.55	2.00	0.62	5.00	0.00	0.00	0.00
32.60	2.00	0.62	5.00	0.00	0.00	0.00
32.65	2.00	0.62	5.00	0.00	0.00	0.00
32.70	2.00	0.62	5.00	0.00	0.00	0.00
32.75	2.00	0.62	5.00	0.00	0.00	0.00
32.80	2.00	0.62	5.00	0.00	0.00	0.00
32.85	2.00	0.62	5.00	0.00	0.00	0.00
32.90	2.00	0.62	5.00	0.00	0.00	0.00
32.95	2.00	0.62	5.00	0.00	0.00	0.00
33.00	2.00	0.62	5.00	0.00	0.00	0.00
33.05	2.00	0.62	5.00	0.00	0.00	0.00
33.10	2.00	0.62	5.00	0.00	0.00	0.00
33.15	2.00	0.62	5.00	0.00	0.00	0.00
33.20	2.00	0.62	5.00	0.00	0.00	0.00
33.25	2.00	0.62	5.00	0.00	0.00	0.00
33.30	2.00	0.62	5.00	0.00	0.00	0.00
33.35	2.00	0.62	5.00	0.00	0.00	0.00
33.40	2.00	0.62	5.00	0.00	0.00	0.00
33.45	2.00	0.62	5.00	0.00	0.00	0.00
33.50	2.00	0.62	5.00	0.00	0.00	0.00
33.55	2.00	0.62	5.00	0.00	0.00	0.00
33.60	2.00	0.62	5.00	0.00	0.00	0.00
33.65	2.00	0.62	5.00	0.00	0.00	0.00
33.70	2.00	0.62	5.00	0.00	0.00	0.00

33.75	2.00	0.62	5.00	0.00	0.00	0.00
33.80	2.00	0.62	5.00	0.00	0.00	0.00
33.85	2.00	0.62	5.00	0.00	0.00	0.00
33.90	2.00	0.62	5.00	0.00	0.00	0.00
33.95	2.00	0.62	5.00	0.00	0.00	0.00
34.00	2.00	0.62	5.00	0.00	0.00	0.00
34.05	2.00	0.62	5.00	0.00	0.00	0.00
34.10	2.00	0.62	5.00	0.00	0.00	0.00
34.15	2.00	0.62	5.00	0.00	0.00	0.00
34.20	2.00	0.62	5.00	0.00	0.00	0.00
34.25	2.00	0.62	5.00	0.00	0.00	0.00
34.30	2.00	0.61	5.00	0.00	0.00	0.00
34.35	2.00	0.61	5.00	0.00	0.00	0.00
34.40	2.00	0.61	5.00	0.00	0.00	0.00
34.45	2.00	0.61	5.00	0.00	0.00	0.00
34.50	2.00	0.61	5.00	0.00	0.00	0.00
34.55	2.00	0.61	5.00	0.00	0.00	0.00
34.60	2.00	0.61	5.00	0.00	0.00	0.00
34.65	2.00	0.61	5.00	0.00	0.00	0.00
34.70	2.00	0.61	5.00	0.00	0.00	0.00
34.75	2.00	0.61	5.00	0.00	0.00	0.00
34.80	2.00	0.61	5.00	0.00	0.00	0.00
34.85	2.00	0.61	5.00	0.00	0.00	0.00
34.90	2.00	0.61	5.00	0.00	0.00	0.00
34.95	2.00	0.61	5.00	0.00	0.00	0.00
35.00	2.00	0.61	5.00	0.00	0.00	0.00
35.05	2.00	0.61	5.00	0.00	0.00	0.00
35.10	2.00	0.61	5.00	0.00	0.00	0.00
35.15	2.00	0.61	5.00	0.00	0.00	0.00
35.20	2.00	0.61	5.00	0.00	0.00	0.00
35.25	2.00	0.61	5.00	0.00	0.00	0.00
35.30	2.00	0.61	5.00	0.00	0.00	0.00
35.35	2.00	0.61	5.00	0.00	0.00	0.00
35.40	2.00	0.61	5.00	0.00	0.00	0.00
35.45	2.00	0.61	5.00	0.00	0.00	0.00
35.50	2.00	0.61	5.00	0.00	0.00	0.00
35.55	2.00	0.61	5.00	0.00	0.00	0.00
35.60	2.00	0.61	5.00	0.00	0.00	0.00
35.65	2.00	0.61	5.00	0.00	0.00	0.00
35.70	2.00	0.61	5.00	0.00	0.00	0.00
35.75	2.00	0.61	5.00	0.00	0.00	0.00
35.80	2.00	0.61	5.00	0.00	0.00	0.00
35.85	2.00	0.61	5.00	0.00	0.00	0.00
35.90	2.00	0.61	5.00	0.00	0.00	0.00
35.95	2.00	0.61	5.00	0.00	0.00	0.00
36.00	2.00	0.61	5.00	0.00	0.00	0.00
36.05	2.00	0.61	5.00	0.00	0.00	0.00
36.10	2.00	0.60	5.00	0.00	0.00	0.00
36.15	2.00	0.60	5.00	0.00	0.00	0.00
36.20	2.00	0.60	5.00	0.00	0.00	0.00

36.25	2.00	0.60	5.00	0.00	0.00	0.00
36.30	2.00	0.60	5.00	0.00	0.00	0.00
36.35	2.00	0.60	5.00	0.00	0.00	0.00
36.40	2.00	0.60	5.00	0.00	0.00	0.00
36.45	2.00	0.60	5.00	0.00	0.00	0.00
36.50	2.00	0.60	5.00	0.00	0.00	0.00
36.55	2.00	0.60	5.00	0.00	0.00	0.00
36.60	2.00	0.60	5.00	0.00	0.00	0.00
36.65	2.00	0.60	5.00	0.00	0.00	0.00
36.70	2.00	0.60	5.00	0.00	0.00	0.00
36.75	2.00	0.60	5.00	0.00	0.00	0.00
36.80	2.00	0.60	5.00	0.00	0.00	0.00
36.85	2.00	0.60	5.00	0.00	0.00	0.00
36.90	2.00	0.60	5.00	0.00	0.00	0.00
36.95	2.00	0.60	5.00	0.00	0.00	0.00
37.00	2.00	0.60	5.00	0.00	0.00	0.00
37.05	2.00	0.60	5.00	0.00	0.00	0.00
37.10	2.00	0.60	5.00	0.00	0.00	0.00
37.15	2.00	0.60	5.00	0.00	0.00	0.00
37.20	2.00	0.60	5.00	0.00	0.00	0.00
37.25	2.00	0.60	5.00	0.00	0.00	0.00
37.30	2.00	0.60	5.00	0.00	0.00	0.00
37.35	2.00	0.60	5.00	0.00	0.00	0.00
37.40	2.00	0.60	5.00	0.00	0.00	0.00
37.45	2.00	0.60	5.00	0.00	0.00	0.00
37.50	2.00	0.60	5.00	0.00	0.00	0.00
37.55	2.00	0.60	5.00	0.00	0.00	0.00
37.60	2.00	0.60	5.00	0.00	0.00	0.00
37.65	2.00	0.60	5.00	0.00	0.00	0.00
37.70	2.00	0.60	5.00	0.00	0.00	0.00
37.75	2.00	0.60	5.00	0.00	0.00	0.00
37.80	2.00	0.60	5.00	0.00	0.00	0.00
37.85	2.00	0.60	5.00	0.00	0.00	0.00
37.90	2.00	0.59	5.00	0.00	0.00	0.00
37.95	2.00	0.59	5.00	0.00	0.00	0.00
38.00	2.00	0.59	5.00	0.00	0.00	0.00
38.05	2.00	0.59	5.00	0.00	0.00	0.00
38.10	2.00	0.59	5.00	0.00	0.00	0.00
38.15	2.00	0.59	5.00	0.00	0.00	0.00
38.20	2.00	0.59	5.00	0.00	0.00	0.00
38.25	2.00	0.59	5.00	0.00	0.00	0.00
38.30	2.00	0.59	5.00	0.00	0.00	0.00
38.35	2.00	0.59	5.00	0.00	0.00	0.00
38.40	2.00	0.59	5.00	0.00	0.00	0.00
38.45	2.00	0.59	5.00	0.00	0.00	0.00
38.50	2.00	0.59	5.00	0.00	0.00	0.00
38.55	2.00	0.59	5.00	0.00	0.00	0.00
38.60	2.00	0.59	5.00	0.00	0.00	0.00
38.65	2.00	0.59	5.00	0.00	0.00	0.00
38.70	2.00	0.59	5.00	0.00	0.00	0.00

38.75	2.00	0.59	5.00	0.00	0.00	0.00
38.80	2.00	0.59	5.00	0.00	0.00	0.00
38.85	2.00	0.59	5.00	0.00	0.00	0.00
38.90	2.00	0.59	5.00	0.00	0.00	0.00
38.95	2.00	0.59	5.00	0.00	0.00	0.00
39.00	2.00	0.59	5.00	0.00	0.00	0.00
39.05	2.00	0.59	5.00	0.00	0.00	0.00
39.10	2.00	0.59	5.00	0.00	0.00	0.00
39.15	2.00	0.59	5.00	0.00	0.00	0.00
39.20	2.00	0.59	5.00	0.00	0.00	0.00
39.25	2.00	0.59	5.00	0.00	0.00	0.00
39.30	2.00	0.59	5.00	0.00	0.00	0.00
39.35	2.00	0.59	5.00	0.00	0.00	0.00
39.40	2.00	0.59	5.00	0.00	0.00	0.00
39.45	2.00	0.59	5.00	0.00	0.00	0.00
39.50	2.00	0.59	5.00	0.00	0.00	0.00
39.55	2.00	0.59	5.00	0.00	0.00	0.00
39.60	2.00	0.59	5.00	0.00	0.00	0.00
39.65	2.00	0.58	5.00	0.00	0.00	0.00
39.70	2.00	0.58	5.00	0.00	0.00	0.00
39.75	2.00	0.58	5.00	0.00	0.00	0.00
39.80	2.00	0.58	5.00	0.00	0.00	0.00
39.85	2.00	0.58	5.00	0.00	0.00	0.00
39.90	2.00	0.58	5.00	0.00	0.00	0.00
39.95	2.00	0.58	5.00	0.00	0.00	0.00
40.00	2.00	0.58	5.00	0.00	0.00	0.00
40.05	2.00	0.58	5.00	0.00	0.00	0.00
40.10	2.00	0.58	5.00	0.00	0.00	0.00
40.15	2.00	0.58	5.00	0.00	0.00	0.00
40.20	2.00	0.58	5.00	0.00	0.00	0.00
40.25	2.00	0.58	5.00	0.00	0.00	0.00
40.30	2.00	0.58	5.00	0.00	0.00	0.00
40.35	2.00	0.58	5.00	0.00	0.00	0.00
40.40	2.00	0.58	5.00	0.00	0.00	0.00
40.45	2.00	0.58	5.00	0.00	0.00	0.00
40.50	2.00	0.58	5.00	0.00	0.00	0.00
40.55	2.00	0.58	5.00	0.00	0.00	0.00
40.60	2.00	0.58	5.00	0.00	0.00	0.00
40.65	2.00	0.58	5.00	0.00	0.00	0.00
40.70	2.00	0.58	5.00	0.00	0.00	0.00
40.75	2.00	0.58	5.00	0.00	0.00	0.00
40.80	2.00	0.58	5.00	0.00	0.00	0.00
40.85	2.00	0.58	5.00	0.00	0.00	0.00
40.90	2.00	0.58	5.00	0.00	0.00	0.00
40.95	2.00	0.58	5.00	0.00	0.00	0.00
41.00	2.00	0.58	5.00	0.00	0.00	0.00
41.05	2.00	0.58	5.00	0.00	0.00	0.00
41.10	2.00	0.58	5.00	0.00	0.00	0.00
41.15	2.00	0.58	5.00	0.00	0.00	0.00
41.20	2.00	0.58	5.00	0.00	0.00	0.00

41.25	2.00	0.58	5.00	0.00	0.00	0.00
41.30	2.00	0.58	5.00	0.00	0.00	0.00
41.35	2.00	0.58	5.00	0.00	0.00	0.00
41.40	2.00	0.58	5.00	0.00	0.00	0.00
41.45	2.00	0.57	5.00	0.00	0.00	0.00
41.50	2.00	0.57	5.00	0.00	0.00	0.00
41.55	2.00	0.57	5.00	0.00	0.00	0.00
41.60	2.00	0.57	5.00	0.00	0.00	0.00
41.65	2.00	0.57	5.00	0.00	0.00	0.00
41.70	2.00	0.57	5.00	0.00	0.00	0.00
41.75	2.00	0.57	5.00	0.00	0.00	0.00
41.80	2.00	0.57	5.00	0.00	0.00	0.00
41.85	2.00	0.57	5.00	0.00	0.00	0.00
41.90	2.00	0.57	5.00	0.00	0.00	0.00
41.95	2.00	0.57	5.00	0.00	0.00	0.00
42.00	2.00	0.57	5.00	0.00	0.00	0.00
42.05	2.00	0.57	5.00	0.00	0.00	0.00
42.10	2.00	0.57	5.00	0.00	0.00	0.00
42.15	2.00	0.57	5.00	0.00	0.00	0.00
42.20	2.00	0.57	5.00	0.00	0.00	0.00
42.25	2.00	0.57	5.00	0.00	0.00	0.00
42.30	2.00	0.57	5.00	0.00	0.00	0.00
42.35	2.00	0.57	5.00	0.00	0.00	0.00
42.40	2.00	0.57	5.00	0.00	0.00	0.00
42.45	2.00	0.57	5.00	0.00	0.00	0.00
42.50	2.00	0.57	5.00	0.00	0.00	0.00
42.55	2.00	0.57	5.00	0.00	0.00	0.00
42.60	2.00	0.57	5.00	0.00	0.00	0.00
42.65	2.00	0.57	5.00	0.00	0.00	0.00
42.70	2.00	0.57	5.00	0.00	0.00	0.00
42.75	2.00	0.57	5.00	0.00	0.00	0.00
42.80	2.00	0.57	5.00	0.00	0.00	0.00
42.85	2.00	0.57	5.00	0.00	0.00	0.00
42.90	2.00	0.57	5.00	0.00	0.00	0.00
42.95	2.00	0.57	5.00	0.00	0.00	0.00
43.00	2.00	0.57	5.00	0.00	0.00	0.00
43.05	2.00	0.57	5.00	0.00	0.00	0.00
43.10	2.00	0.57	5.00	0.00	0.00	0.00
43.15	2.00	0.57	5.00	0.00	0.00	0.00
43.20	2.00	0.57	5.00	0.00	0.00	0.00
43.25	2.00	0.56	5.00	0.00	0.00	0.00
43.30	2.00	0.56	5.00	0.00	0.00	0.00
43.35	2.00	0.56	5.00	0.00	0.00	0.00
43.40	2.00	0.56	5.00	0.00	0.00	0.00
43.45	2.00	0.56	5.00	0.00	0.00	0.00
43.50	2.00	0.56	5.00	0.00	0.00	0.00
43.55	2.00	0.56	5.00	0.00	0.00	0.00
43.60	2.00	0.56	5.00	0.00	0.00	0.00
43.65	2.00	0.56	5.00	0.00	0.00	0.00
43.70	2.00	0.56	5.00	0.00	0.00	0.00

43.75	2.00	0.56	5.00	0.00	0.00	0.00
43.80	2.00	0.56	5.00	0.00	0.00	0.00
43.85	2.00	0.56	5.00	0.00	0.00	0.00
43.90	2.00	0.56	5.00	0.00	0.00	0.00
43.95	2.00	0.56	5.00	0.00	0.00	0.00
44.00	2.00	0.56	5.00	0.00	0.00	0.00
44.05	2.00	0.56	5.00	0.00	0.00	0.00
44.10	2.00	0.56	5.00	0.00	0.00	0.00
44.15	2.00	0.56	5.00	0.00	0.00	0.00
44.20	2.00	0.56	5.00	0.00	0.00	0.00
44.25	2.00	0.56	5.00	0.00	0.00	0.00
44.30	2.00	0.56	5.00	0.00	0.00	0.00
44.35	2.00	0.56	5.00	0.00	0.00	0.00
44.40	2.00	0.56	5.00	0.00	0.00	0.00
44.45	2.00	0.56	5.00	0.00	0.00	0.00
44.50	2.00	0.56	5.00	0.00	0.00	0.00
44.55	2.00	0.56	5.00	0.00	0.00	0.00
44.60	2.00	0.56	5.00	0.00	0.00	0.00
44.65	2.00	0.56	5.00	0.00	0.00	0.00
44.70	2.00	0.56	5.00	0.00	0.00	0.00
44.75	2.00	0.56	5.00	0.00	0.00	0.00
44.80	2.00	0.56	5.00	0.00	0.00	0.00
44.85	2.00	0.56	5.00	0.00	0.00	0.00
44.90	2.00	0.56	5.00	0.00	0.00	0.00
44.95	2.00	0.56	5.00	0.00	0.00	0.00
45.00	2.00	0.56	5.00	0.00	0.00	0.00
45.05	2.00	0.55	5.00	0.00	0.00	0.00
45.10	2.00	0.55	5.00	0.00	0.00	0.00
45.15	2.00	0.55	5.00	0.00	0.00	0.00
45.20	2.00	0.55	5.00	0.00	0.00	0.00
45.25	2.00	0.55	5.00	0.00	0.00	0.00
45.30	2.00	0.55	5.00	0.00	0.00	0.00
45.35	2.00	0.55	5.00	0.00	0.00	0.00
45.40	2.00	0.55	5.00	0.00	0.00	0.00
45.45	2.00	0.55	5.00	0.00	0.00	0.00
45.50	2.00	0.55	5.00	0.00	0.00	0.00
45.55	2.00	0.55	5.00	0.00	0.00	0.00
45.60	2.00	0.55	5.00	0.00	0.00	0.00
45.65	2.00	0.55	5.00	0.00	0.00	0.00
45.70	2.00	0.55	5.00	0.00	0.00	0.00
45.75	2.00	0.55	5.00	0.00	0.00	0.00
45.80	2.00	0.55	5.00	0.00	0.00	0.00
45.85	2.00	0.55	5.00	0.00	0.00	0.00
45.90	2.00	0.55	5.00	0.00	0.00	0.00
45.95	2.00	0.55	5.00	0.00	0.00	0.00
46.00	2.00	0.55	5.00	0.00	0.00	0.00
46.05	2.00	0.55	5.00	0.00	0.00	0.00
46.10	2.00	0.55	5.00	0.00	0.00	0.00
46.15	2.00	0.55	5.00	0.00	0.00	0.00
46.20	2.00	0.55	5.00	0.00	0.00	0.00

46.25	2.00	0.55	5.00	0.00	0.00	0.00
46.30	2.00	0.55	5.00	0.00	0.00	0.00
46.35	2.00	0.55	5.00	0.00	0.00	0.00
46.40	2.00	0.55	5.00	0.00	0.00	0.00
46.45	2.00	0.55	5.00	0.00	0.00	0.00
46.50	2.00	0.55	5.00	0.00	0.00	0.00
46.55	2.00	0.55	5.00	0.00	0.00	0.00
46.60	2.00	0.55	5.00	0.00	0.00	0.00
46.65	2.00	0.55	5.00	0.00	0.00	0.00
46.70	2.00	0.55	5.00	0.00	0.00	0.00
46.75	2.00	0.55	5.00	0.00	0.00	0.00
46.80	2.00	0.54	5.00	0.00	0.00	0.00
46.85	2.00	0.54	5.00	0.00	0.00	0.00
46.90	2.00	0.54	5.00	0.00	0.00	0.00
46.95	2.00	0.54	5.00	0.00	0.00	0.00
47.00	2.00	0.54	5.00	0.00	0.00	0.00
47.05	2.00	0.54	5.00	0.00	0.00	0.00
47.10	2.00	0.54	5.00	0.00	0.00	0.00
47.15	2.00	0.54	5.00	0.00	0.00	0.00
47.20	2.00	0.54	5.00	0.00	0.00	0.00
47.25	2.00	0.54	5.00	0.00	0.00	0.00
47.30	2.00	0.54	5.00	0.00	0.00	0.00
47.35	2.00	0.54	5.00	0.00	0.00	0.00
47.40	2.00	0.54	5.00	0.00	0.00	0.00
47.45	2.00	0.54	5.00	0.00	0.00	0.00
47.50	2.00	0.54	5.00	0.00	0.00	0.00
47.55	2.00	0.54	5.00	0.00	0.00	0.00
47.60	2.00	0.54	5.00	0.00	0.00	0.00
47.65	2.00	0.54	5.00	0.00	0.00	0.00
47.70	2.00	0.54	5.00	0.00	0.00	0.00
47.75	2.00	0.54	5.00	0.00	0.00	0.00
47.80	2.00	0.54	5.00	0.00	0.00	0.00
47.85	2.00	0.54	5.00	0.00	0.00	0.00
47.90	2.00	0.54	5.00	0.00	0.00	0.00
47.95	2.00	0.54	5.00	0.00	0.00	0.00
48.00	2.00	0.54	5.00	0.00	0.00	0.00
48.05	2.00	0.54	5.00	0.00	0.00	0.00
48.10	2.00	0.54	5.00	0.00	0.00	0.00
48.15	2.00	0.54	5.00	0.00	0.00	0.00
48.20	2.00	0.54	5.00	0.00	0.00	0.00
48.25	2.00	0.54	5.00	0.00	0.00	0.00
48.30	2.00	0.54	5.00	0.00	0.00	0.00
48.35	2.00	0.54	5.00	0.00	0.00	0.00
48.40	2.00	0.54	5.00	0.00	0.00	0.00
48.45	2.00	0.54	5.00	0.00	0.00	0.00
48.50	2.00	0.54	5.00	0.00	0.00	0.00
48.55	2.00	0.54	5.00	0.00	0.00	0.00
48.60	2.00	0.53	5.00	0.00	0.00	0.00
48.65	2.00	0.53	5.00	0.00	0.00	0.00
48.70	2.00	0.53	5.00	0.00	0.00	0.00

48.75	2.00	0.53	5.00	0.00	0.00	0.00
48.80	2.00	0.53	5.00	0.00	0.00	0.00
48.85	2.00	0.53	5.00	0.00	0.00	0.00
48.90	2.00	0.53	5.00	0.00	0.00	0.00
48.95	2.00	0.53	5.00	0.00	0.00	0.00
49.00	2.00	0.53	5.00	0.00	0.00	0.00
49.05	2.00	0.53	5.00	0.00	0.00	0.00
49.10	2.00	0.53	5.00	0.00	0.00	0.00
49.15	2.00	0.53	5.00	0.00	0.00	0.00
49.20	2.00	0.53	5.00	0.00	0.00	0.00
49.25	2.00	0.53	5.00	0.00	0.00	0.00
49.30	2.00	0.53	5.00	0.00	0.00	0.00
49.35	2.00	0.53	5.00	0.00	0.00	0.00
49.40	2.00	0.53	5.00	0.00	0.00	0.00
49.45	2.00	0.53	5.00	0.00	0.00	0.00
49.50	2.00	0.53	5.00	0.00	0.00	0.00
49.55	2.00	0.53	5.00	0.00	0.00	0.00
49.60	2.00	0.53	5.00	0.00	0.00	0.00
49.65	2.00	0.53	5.00	0.00	0.00	0.00
49.70	2.00	0.53	5.00	0.00	0.00	0.00
49.75	2.00	0.53	5.00	0.00	0.00	0.00
49.80	2.00	0.53	5.00	0.00	0.00	0.00
49.85	2.00	0.53	5.00	0.00	0.00	0.00
49.90	2.00	0.53	5.00	0.00	0.00	0.00
49.95	2.00	0.53	5.00	0.00	0.00	0.00
50.00	2.00	0.53	5.00	0.00	0.00	0.00
50.05	2.00	0.53	5.00	0.00	0.00	0.00
50.10	2.00	0.53	5.00	0.00	0.00	0.00
50.15	2.00	0.53	5.00	0.00	0.00	0.00
50.20	2.00	0.53	5.00	0.00	0.00	0.00
50.25	2.00	0.53	5.00	0.00	0.00	0.00
50.30	2.00	0.53	5.00	0.00	0.00	0.00
50.35	2.00	0.53	5.00	0.00	0.00	0.00
50.40	2.00	0.52	5.00	0.00	0.00	0.00
50.45	2.00	0.52	5.00	0.00	0.00	0.00
50.50	2.00	0.52	5.00	0.00	0.00	0.00
50.55	2.00	0.52	5.00	0.00	0.00	0.00
50.60	2.00	0.52	5.00	0.00	0.00	0.00
50.65	2.00	0.52	5.00	0.00	0.00	0.00
50.70	2.00	0.52	5.00	0.00	0.00	0.00
50.75	2.00	0.52	5.00	0.00	0.00	0.00
50.80	2.00	0.52	5.00	0.00	0.00	0.00
50.85	2.00	0.52	5.00	0.00	0.00	0.00
50.90	2.00	0.52	5.00	0.00	0.00	0.00
50.95	2.00	0.52	5.00	0.00	0.00	0.00
51.00	2.00	0.52	5.00	0.00	0.00	0.00

---

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

---

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

APPENDIX E

ALQUIST-PRIOLO SITE INVESTIGATION REPORTS

DEPARTMENT OF CONSERVATION

CALIFORNIA GEOLOGICAL SURVEY

801 K STREET • MS 12-30 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 445-1825 • **FAX** 916 / 445-5718 • **TDD** 916 / 324-2555 • **WEB SITE** conservation.ca.gov

February 21, 2006

Mr. David L. Jones
Riverside County Building and Safety Department
4080 Lemon Street, 9th Floor
Riverside, CA 92502

Dear Mr. Jones:

We are placing on open file the following reports submitted by Riverside County in compliance with the Alquist-Priolo Earthquake Fault Zoning Act:

Fault investigation report, 79 acre Doumas property north of Cottonwood Avenue, by Converse Consultants, dated September 29, 2004, with supplemental reports dated December 14, 2005 and February 3, 2006.

AP-3352 Fault investigation, Y.H. Lyon LLC Property, APN 431-090-035 and –044, by Geocon, dated May 6, 2005, with supplemental reports dated July 8, 2005 and August 4, 2005.

Alquist-Priolo Earthquake Fault Zone investigation, JBJ Ranch, Bosley Lane, by Pacific Soils Engineering, with supplemental reports dated November 3, 2004 and October 6, 2005.

Preliminary geotechnical and fault investigation report, 29-acre site north of Cottonwood Avenue, by Converse Consultants, dated July 27, 2004, with supplemental reports dated April 25, 2005, July 29, 2005, and November 4, 2005.

Subsurface engineering geology investigation, tentative parcel map 29845, by Rasmussen and Assoc., dated December 4, 2002 with supplemental report dated February 7, 2003.

Sincerely,

William A. Bryant

William A. Bryant, CEG 1554
Alquist-Priolo Program Manager

cc: A-P file

AP-3352

COUNTY OF RIVERSIDE

TRANSPORTATION AND LAND MANAGEMENT AGENCY

Building and Safety Department

James J. Miller
Director

August 16, 2005 Pages 2 (including this cover)

San Jacinto Community Development Department
FAX: (951) 781-6014
Attention: Michelle Rambo, Contract Planner
(Hogle-Ireland, Inc.)

RE: Conditions of Approval
GEO No. 1402
CITY OF SAN JACINTO CASE NO. TR33072

County Geologic Report (GEO) No. 1402, submitted for this City of San Jacinto project (TR33072), was prepared by Geocon and is entitled: "Fault Investigation, Y.H. Lyon LLC Property, APN's 431-090-035 and –044, San Jacinto, California", dated May 6, 2005. In addition, Geocon submitted the following documents for this project:

1. "Response to County of Riverside Review Comments Dated July 8, 2005, Y.H. Lyon LLC Property (GEO No. 1402) APN's 431-090-035 and –044, San Jacinto, California", dated July 27, 2005.

2. "Response to County of Riverside Review Comments Dated August 4, 2005, Y.H. Lyon LLC Property, (GEO No. 1402), APN's 431-090-035 and –044, San Jacinto, California", dated August 11, 2005.

GEO No. 1402 concluded:

1. Soil and geologic conditions that would preclude the proposed residential development of the property were not encountered during the investigation. Development is considered feasible provided that the recommendations of GEO No. 1402 are followed.

2. The trench excavated for this investigation should be re-excavated during grading and replaced with compacted fill.

3. Three fault ruptures were observed within Holocene sediments within the Geocon fault trench. The fault zone is 70 feet wide extending from Station 324 through 395.

4. No faulting was noted in connection with the lineament along the northeastern AP Zone boundary.

GEO No. 1402 recommended:

1. A 50 foot structural setback zone on either side of the "fault zone" as noted on the Geologic Map, Figure 2, of GEO No. 1402.

2. The soil engineer and engineering geologist should review the grading plans prior to finalization to verify their compliance with the recommendations of this report and the geotechnical report (Geocon, 2004) and determine the necessity for additional analyses and/or recommendations. The soil engineer should also be provided the opportunity to review the structural foundation plans prior to finalizing to verify substantial conformance with the recommendations of this report.

GEO No. 1402 satisfies the requirement for a fault hazard study for Planning/CEQA purposes. Engineering and other Uniform Building Code parameters where not included as a part of this review or approval and this approval is not intended, and should not be misconstrued as approval for grading permit. Engineering and other building code parameters should be reviewed by the City of San Jacinto and additional comments and/or conditions may be imposed by the City's Building and Safety Department upon application for grading and/or building permits. In addition, an environmental constraints sheet (ECS) should be prepared for this project indicating that active faulting was located on this site as documented in GEO No. 1402 and the ECS should provide graphical depiction of the location of the fault zone and structural setback zone.

Thank you for the opportunity to review this case for the City of San Jacinto. Please call me at (951) 955-2006 or David L. Jones at 955-6863 if you have any questions.

Sincerely,

RIVERSIDE COUNTY BUILDING AND SAFETY DEPARTMENT
James J. Miller, Building and Safety Director

Brad Fagrell

Brad Fagrell, P.E.
Engineering Division Manager
Building and Safety Department

cc: Geotechnical Consultant: Geocon, Attn: Lisa Battiato (951) 304-2392
Applicant: Young Homes, Attn: Nikki Chumley (909) 291-7633
GEO01402

Y:\Geology\San Jacinto Reviews\GEO01402 COA for TR33072.DOC

GED 1402

AP-3352

FAULT INVESTIGATION

Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL
CONSULTANTS

PREPARED FOR

Y.H. LYON, LLC
RANCHO CUCAMONGA, CALIFORNIA

MAY 6, 2005

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS

Project No. T2279-12-01
May 6, 2005

Y. H. Lyon, LLC
10370 Trademark Street
Rancho Cucamonga, California 91730

Attention: Mr. Rich Scott

Subject: Y.H. LYON, LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA
FAULT INVESTIGATION

Dear Mr. Scott:

In accordance with your authorization and our Proposal No. IE-156, dated November 11, 2004, we have performed a fault investigation for the subject property located west of Lyon Avenue, north of Cottonwood Avenue in the city of San Jacinto, Riverside County, California. The accompanying report presents the results of our fault study and includes our conclusions and recommendations pertaining to the geologic aspects of developing the property as presently proposed. It is our opinion that the site is suitable for development, provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Lisa Battiato
CEG 2316

PROFESSIONAL GEOLOGIST
LISA A. BATTIATO
No. 2316
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Dale Hamelehle
CEG 1760

PROFESSIONAL GEOLOGIST
DALE M. HAMELEHLE
NO. 1760
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

LAB:DH:tg

(6) Addressee

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LIMITATIONS AND UNIFORMITY OF CONDITIONS

REFERENCES

MAPS AND ILLUSTRATIONS
- Figure 1, Vicinity Map
- Figure 2, Site Geologic Map, in pocket

APPENDIX A
- FIELD INVESTIGATION
- Figures A-1 and A-2, Logs of Trenches, in pocket

APPENDIX B
- HISTORICAL EARTHQUAKE DATA

APPENDIX C
- COMPACTION DATA OF TRENCH BACKFILL

APPENDIX D
- AGE DATE REPORTS FROM BETA ANALYTICAL

FAULT INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the findings of a subsurface fault investigation for the 43-acre proposed residential development. The site is located along the west side of Lyon Avenue approximately 1000 feet north of Cottonwood Avenue, see the enclosed Vicinity Map, Figure 1. The purpose of the investigation was to perform a lineament analysis and subsurface fault investigation within the property. Due to an Alquist-Priolo (AP) Fault Zone and an observed lineament located within the subject site

The scope of the investigation included a site reconnaissance, review of aerial photographs, previous fault studies in the vicinity of the property, and pertinent geologic literature (see *References*), and the excavation of the necessary fault trench. The scope of this investigation also included the graphical depiction of the southern trench wall, a meeting with the Riverside County Geologist to review the excavation, the carbon dating of samples obtained from the trench and the preparation of this report. The approximate location of this fault trench and other nearby trench and boring excavations are depicted on the *Geologic Map* (Figure 2).

2. SITE AND PROJECT DESCRIPTION

The subject site is an irregular-shaped parcel of land consisting of approximately 43 acres, located in the city of San Jacinto, Riverside County. The site is bounded on the east by Lyon Avenue; on the north by open land and the San Jacinto reservoir; on the south by rough-graded residential Tract 30944; and on the west by a recently improved channel and Tract 30944. The site topography slopes gently to the northeast.

At the time of the field exploration, the property was occupied by the Hideaway Farms horse ranch. Vegetation in the vicinity of the fault trench consisted of low grasses and weeds.

Underground utilities known to exist within the site are utilities associated with the residences, including on-site sewage disposal systems and irrigation lines. Two wells and associated water lines are also present within the property.

A 200-scale ortho-topo map obtained from Riverside County Flood and Water Conservation District was utilized as the base for our *Geologic Map*, Figure 2. The site will be graded for the future construction of a residential subdivision. Maximum proposed cut and fill thicknesses are estimated to be on the order of three to ten feet. Fill slopes are expected to be on the order of ten feet or less.

The site description and proposed development are based on a site reconnaissance, observations during the field investigation, and a review of the referenced geologic publications. If project details differ significantly from those described, Geocon should be contacted for review and possible revision to this report.

3. LITERATURE REVIEW

Geocon performed a literature review as part of our investigation. County Geologic Reports in the vicinity of the site were reviewed as was information provided by the client.

Sladden Engineering (Sladden) performed geotechnical and geologic hazards investigations on Tentative Tract 31293, located immediately southeast of the subject property (see *References*). Sladden excavated fault trenches across the AP zone and did not identify the fault but recommended a structural setback from "interesting features" observed within their trenches. When responding to a Riverside County review sheet Sladden describes lineaments outside of the AP zone as erosional features based on the reoccurrence interval of 200 to 300 years on the local faults. It is our understanding that Riverside County still has outstanding faulting issues on Tentative Tract 31293.

Leighton and Associates, Inc. (L&A), performed a preliminary fault investigation on Tract 30944, located immediately south and west of the subject property. Their initial investigation included two fault trenches excavated to depths of 15 to 17 feet. They observed channel-like features within the trenches, which were interpreted as deformation due to faulting at depth. Based on the occurrence of 6 major (6.2 to 7.2 M_w) events since the 18th century, Leighton did not believe this faulting was recently active but recommended a 50-foot structural setback as a conservative measure. In a response to a Riverside County review sheet they discussed that the deformation observed within the trenches plus the observed photo-lineament are results of faulting at depth. L&A also discussed the possibility of the origin of the deformation being due to sympathetic movement resulting from groundwater withdrawal and the possible location of a ground subsidence margin along the mapped fault. In response to a second Riverside County review sheet L&A discussed that the AP zone was zoned based on tonal lineaments identified by another consultant, which were due to large lateral spread associated with liquefaction at depth. L&A believed that the potential for ground rupture was "nil" and the recommended setback was a conservative measure to mitigate the potential for differential settlement. L&A's trench locations and their recommended setback zones are noted on the Geologic Map, Figure 2. L&A's logs are not presented herein but are included in GEO 1182, on file with the County of Riverside.

GeoSoils, Inc. performed a geotechnical investigation on the subject property in 2004. In the report of that study, GeoSoils discussed a previous fault investigation that they performed on the property in 1990 where they encountered active faulting and recommended a structural setback zone. This report

was not available for our review. However, we did receive a 200-scale map indicating their fault trench locations with a recommended structural setback zone. They recommended additional fault trenching in their 2004 report. The GeoSoils trench locations (T-2 and T-4) are noted on the *Geologic Map*, Figure 2.

4. REGIONAL GEOLOGIC SETTING

The site is located along the western portion of the San Jacinto basin. The San Jacinto basin is a northwest-trending alluvial basin resulting from movement along the branches of the San Jacinto fault system. The basin is bounded on the east by the Claremont fault and the San Jacinto Mountains and the west by the Casa Loma fault, the Lakeview Mountains and isolated granitic hills of the Peninsular Ranges Batholith. The Casa Loma and Claremont branches of the San Jacinto fault system are located approximately 1000 feet and 2¼ miles northeast of the property, respectively. A splay of the Casa Loma fault is located on the property.

Morton (1994) has characterized the San Jacinto valley as a 3 to 4 km wide pull-apart basin in which as much as 3000 m of sediment has accumulated. The Casa Loma fault has been characterized as an east-dipping normal fault with a significant right-slip component. The Claremont fault is an east dipping reverse fault also with a right lateral component. As the movement on these faults indicates, compression is occurring on the eastern edge of the basin and extension is occurring along the western margin. In addition to the faulting, ground fissures have been documented within the valley. The ground fissures are attributed to groundwater withdrawal, and consequently aquifer compaction. Furthermore, tectonic subsidence on the order of 3 to 5 mm/yr is occurring within the San Jacinto valley as determined from wood samples obtained in drill holes. Total subsidence within the valley is estimated at 2½ to 3 cm/yr.

5. SOIL AND GEOLOGIC CONDITIONS

The materials encountered during this investigation include alluvial soils consisting of horizontal to nearly horizontal laminated to thickly bedded clays, silts and sands. The soils were generally loose in the upper three to six feet and medium dense/very firm below. Formational deposits were not encountered within the site to the depth of 51½ feet (Geocon, 2004). The soil units exposed in the exploratory trench were designated with letters: Units A through K are generally designated from the surface downward; Units L through O were labeled, as they were encountered within and northeast of the fault zone. Carbon dating on some of the units was performed and the dates are noted with the descriptions. The age of the units and a discussion on carbon dating is provided in Section 6.4.

A – Topsoil, the upper soil layer which consists of very dark gray brown (2.5Y 3/2) silty coarse sand. The unit was generally massive with some open borrows and root casts.

B – Alluvium which consists of loose, dry to damp light grey (2.5Y 7/1) fine and coarse sand with occasional silt rip-up clasts and basal interbeds. The sand is subtly cross-bedded to massive and is present in thick sequences and as thin interbeds within Unit C.

C – Alluvium which consists of soft to firm, moist, olive gray (5Y 4/2) silt which is laminated to thickly bedded. The silt contains variable amounts of clay and carbonate. Carbon sample obtained from this unit was dated at 890±40 Years Before Present (YBP).

D – Alluvium which consists of firm to very firm, moist, olive brown (2.5Y 4/3) silt. This unit grades into Unit E at station 80, and is present again after station 190.

E – Alluvium which consists of medium dense, moist, olive (5Y 5/4 to 5Y 4/3) fine sand with mottled texture. Contains occasional gray silt interbeds. Unit D grades into E at station 80.

F – Alluvium consisting of firm, moist, olive brown (5Y 5/3) clay with some carbonate nodules and iron oxide staining. Carbon sample obtained from this unit was dated at 8590±60 YBP.

F_2 – Firm, moist, olive brown (5Y 5/3) silty clay (CL) with iron oxidation staining present east of fault.

G – Alluvium consisting of medium dense, moist, pale olive (5Y 6/3) fine sand. Carbon sample obtained from this unit was dated at 3770±50 YBP.

H – Alluvium consisting of firm, very moist, olive (5Y 4/3) clay with some carbonate nodules and iron oxide staining. Carbon sample obtained from this unit was dated at 5750±50 YBP.

I_1 – Alluvium consisting of medium dense, moist, light gray (5Y 7/1) medium to coarse sand, horizontally laminated to thinly cross-bedded.

I_2 – Alluvium consisting of medium dense, moist, light gray (5Y 7/1) coarse sand. Generally horizontally bedded with some areas of cross bedding. Bedding dips predominantly to the northeast beyond station 450.

I_3 – Med dense, moist, light gray (5Y 7/1) med to coarse sand (SP) bedding generally dips to northeast with localized areas of crossbedding present east of fault.

J – Alluvium consisting of medium dense, moist, olive (5Y 5/3), fine to medium sand with silt, localized areas of darker beds with carbon. Carbon sample obtained from this unit was dated at 3700±40 YBP.

K – Alluvium consisting of medium dense, moist, pale yellow (5Y 7/4) coarse sand.

L – Alluvium consisting of firm, moist, dark green gray (10Y 4/1) silt with sand. A localized soil unit is included in L. The soil is present above the main fault at station 343 and extends a few feet northeast of the rupture where it grades into unit L. Carbon sample obtained from the soil unit was dated at 900±40 YBP.

M - Alluvium consisting of medium dense, moist, yellow brown (10YR 5/4) sand. Present within fault zone.

N – Alluvium consisting of loose, damp, light gray (5Y 7/1) coarse sand. Bedding dips predominantly to the southwest with localized areas of cross-bedded sands. Carbon sample obtained from this unit was dated at 1970±40 YBP.

O – Alluvium consisting of very firm, moist, olive gray (5Y 4/2) fine sandy silt, micaceous, with some root casts.

6. FAULTING

6.1 Regional Faulting

Southern California is a seismically active region near the active boundary 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. Total movement between the plates is estimated at 55 millimeters of slip per year.

By definition of the State Mining and Geology Board, an active fault is one, which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazards Zones Act of 1972 and as revised in 1994 and 1997 to the Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Hazard Zones (AP Zone). The intent of the act is to require fault investigations on sites located within Earthquake Fault Hazard Zones to preclude new construction of certain habitable structures across the traces of active faults. An AP zone along a splay of the Casa Loma Fault is present within the property. Additionally, a lineament was observed along the northeastern AP boundary during our lineament analysis.

Based on our review of geologic literature: a splay of the Casa Loma fault exists within the site; the closest published active faults to the site are the Casa Loma branch of the San Jacinto fault zone located approximately 1000 feet to the northeast; the Claremont branch of the San Jacinto fault zone located approximately 2¼ miles to the northeast; the San Andreas approximately 16½ miles to the northeast; and the Elsinore fault located approximately 21¾ miles to the southwest.

The earthquake history within a 50 mile radius of the site has been generated by the program *EQSEARCH* (Blake, 2000) and is presented in Appendix B.

6.2 Lineament Analysis

In order to identify possible unmapped faults and to evaluate topographic expressions of published fault traces, we performed a lineament analysis of the site. Black and white vertical, stereographic photographs of the site from flights taken in 1948, 1962, 1974, 1984, 1990, 1995, and 2000 at scales ranging from 1 inch equals 1,600 feet to 1 inch equals 2,000 feet were utilized in our lineament analysis.

Lineaments were classified according to their development as strong, moderate or weak. A strong lineament is a well-defined feature, which can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well defined, somewhat discontinuous and can be traced

for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet or less.

Strong northwest trending lineaments were observed along the mapped trace of the fault and along the northeastern AP boundary in the 1948, 1962, 1974, 1980, 1984, 1990, and 2000, photos. The lineament along the mapped trace of the fault was expressed as a slight topographic high, or bulge, within the site. The lineament along the AP boundary was noted as a tonal contrast within the site and as a drainage northwest of the property.

6.3 On-Site Fault Investigation

The Geocon fault investigation was performed from November 29 through December 3, 2004. One 575-foot long trench was excavated in a N35E direction from the southwestern property corner, through the AP zone and extending approximately 25 feet northeast of the AP zone to cover the lineament along the AP boundary. The trench was 20 to 22 feet deep. The sides of the excavation were benched at an effective slope ratio of 1½:1 (horizontal:vertical) to provide safe working conditions. The trench was geologically logged by a Certified Engineering Geologist from our firm at a scale of 1 inch equals 5 feet. The main rupture at station 344 was surveyed.

The trench excavation exposed layered alluvial sands, silts and clays. The units were generally horizontal in the western portion of the trench from station 0 to station 324. At station 324, an offset bed was observed near the base of the trench. The units above the offset appear to be relatively undisturbed. A main fault rupture was observed at station 344 where clay beds appear to be vertically offset 14½ inches down on the east. The rupture did not appear to propagate through overlying clay/sand bed sequences, however, these overlying beds were warped and appear to have been post-depositionally deformed. Movement on a third rupture zone at station 390 also appears to have resulted in down-dropping on the eastern side. Fine sand and clay beds above this zone appear undeformed. From station 390 to station 575 continuous laminated to cross-bedded sands, and clays are generally horizontal and continuous. Based on age-dating of the soils, it is estimated that the event at station 324 occurred about 3700 YBP, the event at station 344 occurred after 900 YBP, and the event at station 390 occurred shortly after the station 344 event. The apparent movement is down to the east. However, the localized appearance of Unit M within the fault zone indicates that lateral movement was also likely to have occurred. The main fault within our trench aligned with the fault found in the L&A and GeoSoils trenches. Therefore, those trenches have been noted on the *Geologic Map* and were utilized to align the fault zone through the property.

Mr. David Jones, Riverside County Geologist, observed the trench on December 7, 2004. Three rupture areas were discussed, as was a recommended set back zone. Mr. Jones stated that, a 50 foot

setback on either side of the "fault zone" would be appropriate given the evidence of recent rupture. Typically the County of Riverside requires that offset trenches be excavated when faulting is discovered, however, Mr. Jones agreed that it would be appropriate to use the L&A trenches on Tract 30944 as offset trenches to align the setback zone. The lineament along the northeastern AP boundary was not observed within the trench. A continuous 2 to 3 inch thick clay layer at a depth of 13 feet was observed from station 540 to the end of the trench at station 575.

The trenches were backfilled will some compactive effort in order to achieve a relative compaction similar to the surrounding, native soils. Native soils were density tested prior to backfilling to establish a baseline for backfilling operations. During backfilling, the soils were periodically tested by a Geocon Soils Technician to verify the appropriate level of compaction was achieved. Results of the compaction procedures are provided in Appendix C. Although some compactive effort was employed during backfilling, the backfilled soils are not considered engineered fill. Therefore, the trenches should be re-excavated during grading and backfilled in accordance with recommendations provided in our referenced investigation (Geocon, 2004).

6.4 Age Dating

It has been a standard of practice within the San Jacinto Valley to extend fault trenches to a depth of 18 feet where a fairly continuous silt layer has reportedly been dated at 15,000 to 18,000 years. Initially, it was believed that L&A had performed this age dating, however, personal communications with Mr. Matt Clark of L&A, indicated that GeoSoils had determined that age. In an attempt to review the report, which discussed the work, it was discovered that neither L&A nor Riverside County possessed the report, which has been relied upon within the San Jacinto Valley for several years. Therefore, Geocon will not rely on the 15,000 to 18,000 year date for this investigation.

Carbon samples were obtained from several units throughout the trench. Eight samples were selected and forwarded to Beta Analytical for Acceleration Mass Spectrometer (AMS) age dating. Documents received from Beta Analytical are provided in Appendix D. The samples were selected based on their presence within stratigraphic layers and on the quantity of charcoal present. Results indicated that the charcoal samples within the trench ranged in age from 8590±60 YBP to 890±40 YBP. Three samples of organic sediment resulted in anomalously older, out of sequence dates than the other five samples and are believed to be older carbon, which was deposited in the sediment during mass wasting events. Five of the samples consisted of charred material, which, if sequenced from the top of the trench to the bottom of the excavation, indicate that the sediments range in age from 3770±40 YBP to 890±40 YBP. Given the age of the sediments, it is estimated that the sedimentation rate west of the fault is approximately 0.06 inches per year. The units located within and east of the fault zone appear to be much younger on the order of 2000 to 1500 YBP resulting in a sedimentation rate approximately double that of the area east of the fault.

Based on age dating of sediments above the main fault trace and in sediments above the fault, it appears that the fault at station 344 ruptured approximately 900±40 YBP. Due to the fact that slightly younger sediments above the main rupture were deformed, it is likely that the event occurred on the younger side of the date (about 900 to 860 YBP). Moreover, an offset sand observed at station 324 could have been a result of a previous event, which based on dates of the sediments occurred about 3700 ± 40 YBP. A third event was noted at station 390 and appears to be a similar age slightly younger than the main rupture at station 344. Table 6.4 Provides a summary of the age dating and the documents received from Beta Analytical are provided in Appendix D.

Table 6.4
Age Dating Results

Unit	Sample Number	Depth	Sample Material	Date
N	C13	3'	Organic Sediment	1970 ± 40 YBP
C	C14	5'	Charred Material	890 ± 40 YBP
Soil above Main Fault	C16	14'	Charred Material	900 ± 40 YBP
E	C10	10'	Charred Material	1060 ± 40 YBP
F	C7	17'	Organic Sediment	8590 ± 60 YBP
G	C3	18'	Charred Material	3770 ± 40 YBP
H	C1	19'	Organic Sediment	5750 ± 50 YBP
J	C6	20'	Charred Material	3700 ± 40 YBP

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 Soil or geologic conditions that would preclude the proposed residential development of the property were not encountered during our investigation. Therefore, development of the property is considered feasible provided that the recommendations of this report are followed.

7.1.2 The trench excavated for this investigation should be re-excavated during grading and replaced with compacted fill.

7.2 Fault Evaluation

7.2.1 Three fault ruptures were observed within Holocene sediments within the Geocon fault trench, this "fault zone" is located from station 325 to station 395. Therefore, a 50 foot structural setback zone on either side of the "fault zone" is recommended as noted on the *Geologic Map*, Figure 2. During the preparation of the grading plans the surveyed location of the main fault at station 344 should be used as a point of reference to establish the exact location of the structural setbacks. Measuring from that point one set back is located 70 feet to the southwest (20 feet for the fault zone and 50 feet for the structural setback) and, the other setback is 95 feet to the northeast (45 feet for the fault zone and 50 feet for the structural setback).

7.2.2 No faulting was noted in connection with the lineament along the northeastern AP Zone boundary, therefore, no structural setback zones are recommended along the lineament.

7.3 Plan Review

The soil engineer and engineering geologist should review the grading plans prior to finalization to verify their compliance with the recommendations of this report and the geotechnical report (Geocon, 2004) and determine the necessity for additional analyses and/or recommendations. The soils engineer should also be provided the opportunity to review the structural foundation plans prior to finalizing to verify substantial conformance with the recommendations of this report.

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Riverside County Flood Control and Water Conservation District
Aerial Photographs

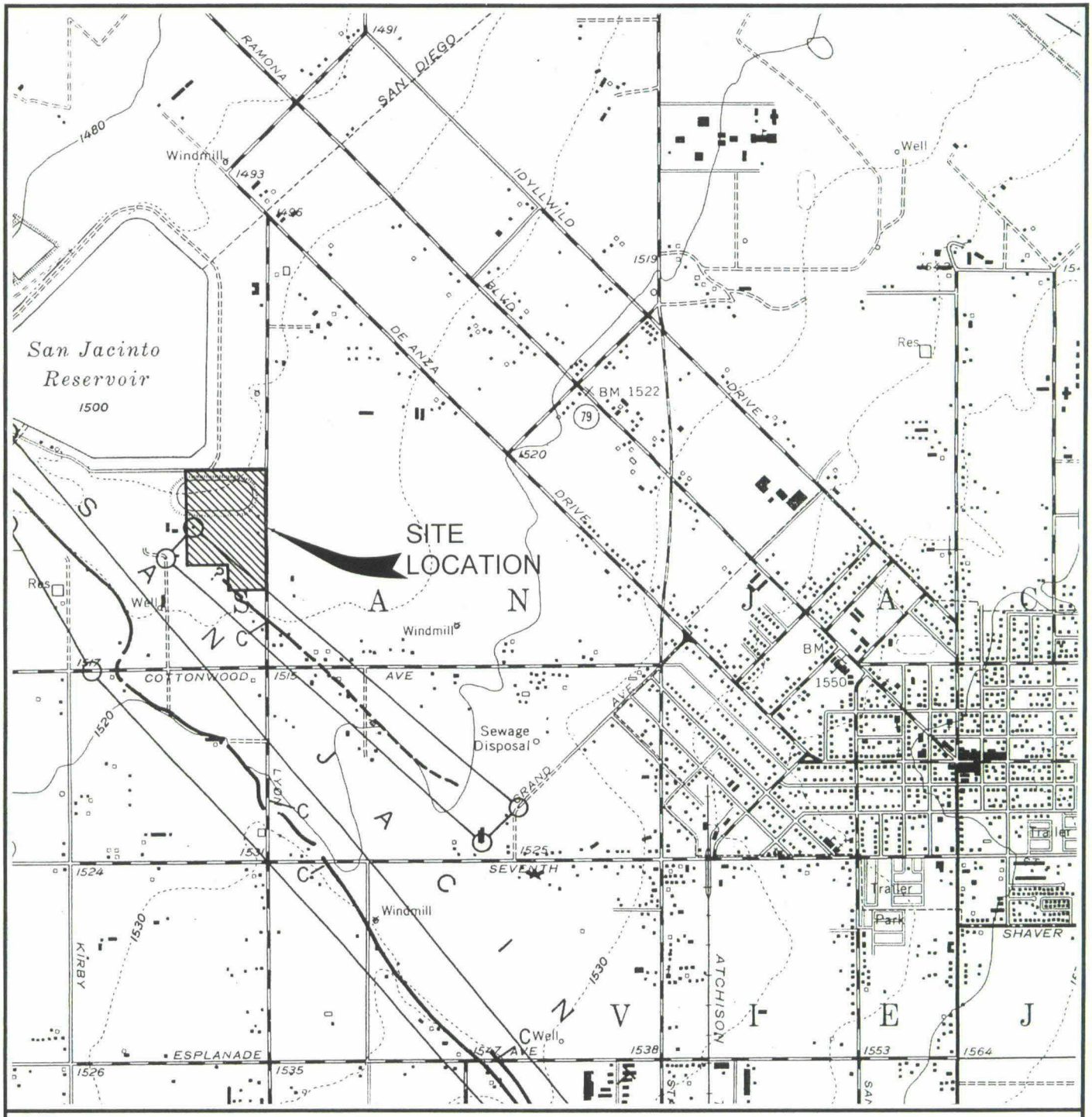
Date	Photograph Numbers	Scale
1948	191, 192	1 inch = 2000 feet ±
5/25/49	AXM-11F-164	1 inch = 2000 feet
1/29/62	2-210, 2-211	1 inch = 2000 feet
5/24/74	458, 459	1 inch = 2000 feet
4/10/80	485, 486	1 inch = 2000 feet
1/25/84	1087, 1088	1 inch = 1600 feet
1/9/90	9-40, 9-41	1 inch = 1600 feet
1/30/95	9-35, 9-36	1 inch = 1600 feet
3/18/00	9-37, 9-38	1 inch = 1600 feet

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



SOURCE: SPECIAL STUDIES ZONES MAP, 7.5 MINUTE SERIES, SAN JACINTO QUADRANGLE, DATED 1-1-80.

N

SCALE

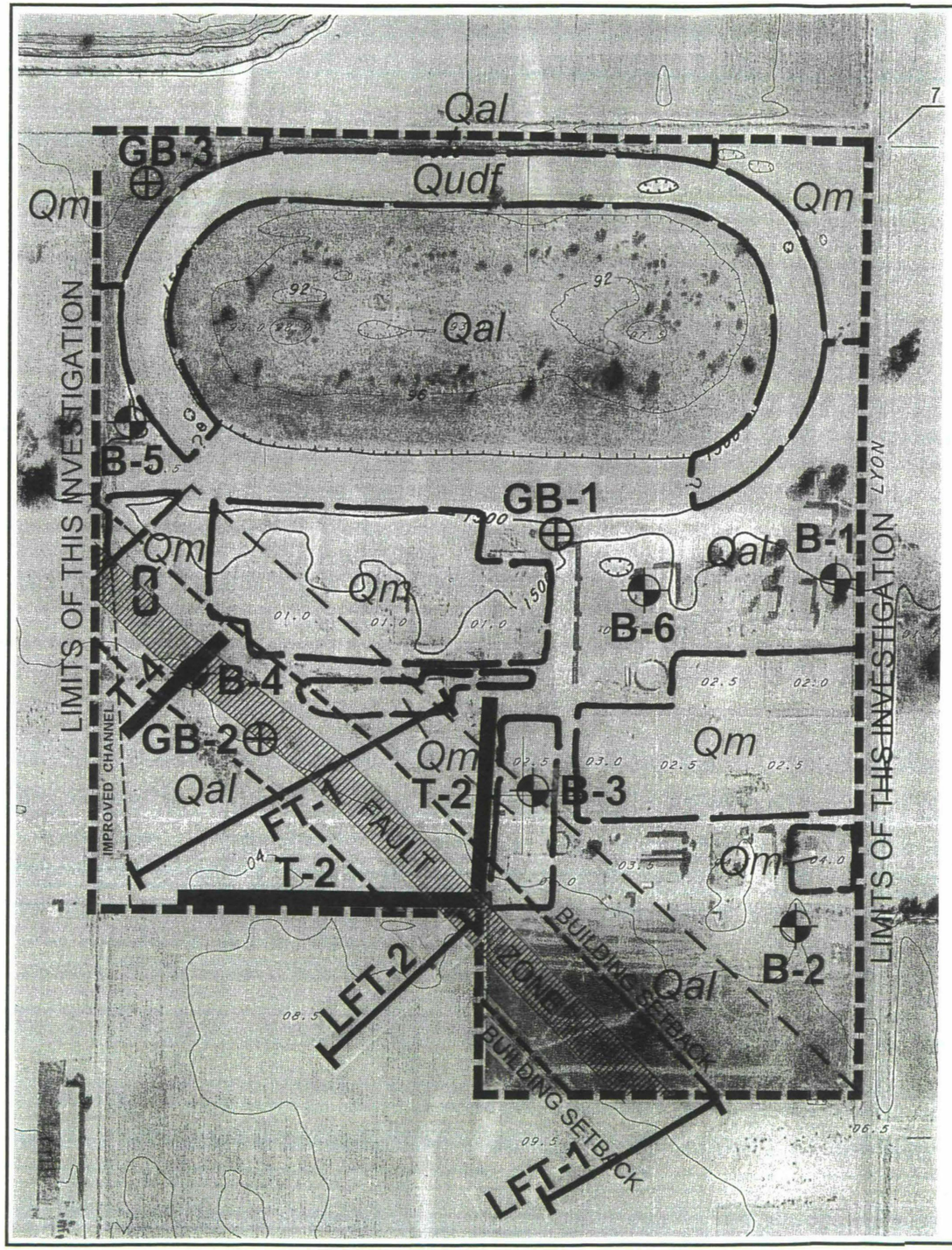
0 2,000 Feet

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE, SUITE 101 - MURRIETA, CA. 92562-7065
PHONE 951 304-2300 - FAX 951 304-2392

VICINITY MAP

Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

DATE: 5-6-2005	PROJECT NO.: T2279-12-01	FIG. 1



GEOCON LEGEND
(LOCATIONS ARE APPROXIMATE)

Qm	MANURE/ORGANIC IMPACTED SOIL
Qudf	UNDOCUMENTED FILL
Qal	ALLUVIUM
?	GEOLOGIC CONTACT (Queried Where Uncertain)
B-6	GEOCON BORING WITH RECOMMENDED REMOVAL DEPTH IN FEET
GB-3	GEOSOILS BORING, 2004
FT-1	FAULT TRENCH LOCATION
	AP ZONE BOUNDARY
T-4	GEOSOILS FAULT TRENCHES (T-2 & T-4), 1990?
LFT-2	LEIGHTON FAULT TRENCHES, 2002

SOURCE: RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT MAP, SECTION 28. T.4S., R.IW.,SBB & M, DATE OF PHOTOGRAPHY 5-30-89.

N

GEOLOGIC MAP
Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE, SUITE 101 - MURRIETA, CA 92562-7065
PHONE 951 304-2300 - FAX 951 304-2392

SCALE 1" = 200'	DATE 5-6-2005	
PROJECT NO. T2279-12-01		FIGURE 2
SHEET 1 OF 1		

APPENDIX A

APPENDIX A
FIELD INVESTIGATION

The field investigation was performed from November 29 through December 3, 2004, and consisted of a site reconnaissance, and excavation of a 575-foot long fault trench to depths of 20 to 22 feet.

The soil conditions encountered in the trench excavation were visually observed, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). The soil color was classified in accordance with the 2000 *Munsel Soil Color Chart*. Logs of the trenches are presented on Figures A-1 and A-2. The location of the fault trench is shown, on the *Geologic Map*, Figure 2. The fault trench was geologically logged at a scale of 1 inch equals 5 feet by a Certified Engineering Geologist from our firm.

APPENDIX B

APPENDIX B

HISTORICAL EARTHQUAKE DATA

FOR

Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

PROJECT NO. T2279-12-01

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*                        *
*    E Q S E A R C H     *
*                        *
*     Version 3.00       *
*                        *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: T2279-12-01

DATE: 11-16-2004

JOB NAME: Lyon LLC

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

SITE COORDINATES:
SITE LATITUDE: 33.7924
SITE LONGITUDE: 116.9918

SEARCH DATES:
START DATE: 1800
END DATE: 1999

SEARCH RADIUS:
50.0 mi
80.5 km

ATTENUATION RELATION: 10) Bozorgnia Campbell Niazi (1999) Hor.-Holocene Soil-Cor.
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
SCOND: 0 Depth Source: A
Basement Depth: 5.00 km Campbell SSR: 0 Campbell SHR: 0
COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 3.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE [km]	
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.654	X	0.7	(1.1)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.214	VIII	3.0	(4.8)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.602	X	3.0	(4.8)
MGI	33.8000	116.9000	04/23/1918	1415 0.0	0.0	4.00	0.101	VII	5.3	(8.5)
MGI	33.8000	116.9000	06/14/1918	1024 0.0	0.0	4.00	0.101	VII	5.3	(8.5)
MGI	33.8000	116.9000	04/29/1918	2 0 0.0	0.0	4.00	0.101	VII	5.3	(8.5)
MGI	33.8000	116.9000	12/18/1920	1726 0.0	0.0	4.00	0.101	VII	5.3	(8.5)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.142	VIII	6.9	(11.0)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.089	VII	8.9	(14.3)
PAS	33.7010	116.8370	08/22/1979	2 136.3	5.0	4.10	0.061	VI	10.9	(17.5)
DMG	33.7380	117.1870	04/27/1962	91232.1	5.7	4.10	0.057	VI	11.8	(19.0)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.080	VII	13.6	(21.9)
DMG	33.9680	116.8820	06/27/1959	162211.1	13.8	4.00	0.047	VI	13.7	(22.0)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.144	VIII	14.1	(22.6)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.058	VI	14.3	(23.1)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.056	VI	15.9	(25.5)
DMG	33.9670	116.8000	09/07/1945	153424.0	0.0	4.30	0.046	VI	16.3	(26.2)
DMG	33.9170	116.7500	01/25/1933	1444 0.0	0.0	4.00	0.040	V	16.3	(26.3)
DMG	33.8000	116.7000	08/11/1911	1820 0.0	0.0	4.00	0.039	V	16.7	

(26.9)
DMG |33.8000|116.7000|08/11/1911|2340 0.0| 0.0| 4.50| 0.050 | VI | 16.7
(26.9)
DMG |33.9330|116.7500|08/06/1938| 228 0.0| 0.0| 4.00| 0.038 | V | 16.9
(27.2)
DMG |33.9330|116.7500|10/28/1944|183016.0| 0.0| 4.40| 0.047 | VI | 16.9
(27.2)
DMG |33.6500|116.7500|09/05/1950|191956.0| 0.0| 4.80| 0.058 | VI | 17.0
(27.4)
GSP |33.6500|116.7400|12/02/1989|231647.8| 14.0| 4.20| 0.041 | V | 17.5
(28.1)
DMG |33.9760|116.7750|10/17/1965| 94519.0| 17.0| 4.90| 0.058 | VI | 17.7
(28.6)
DMG |33.9730|116.7690|06/10/1944|111531.9| 10.0| 4.00| 0.037 | V | 17.8
(28.7)
DMG |33.9500|116.7330|04/26/1942|151023.0| 0.0| 4.00| 0.035 | V | 18.4
(29.6)
DMG |33.9170|116.7000|11/17/1943|112841.0| 0.0| 4.50| 0.045 | VI | 18.8
(30.3)
PDP |33.6320|116.7190|07/19/1999|220927.5| 14.0| 4.20| 0.037 | V | 19.2
(30.9)
DMG |34.0140|116.7710|06/10/1944|111150.5| 10.0| 4.50| 0.042 | VI | 19.8
(31.9)
DMG |33.9760|116.7210|06/12/1944|104534.7| 10.0| 5.10| 0.058 | VI | 20.0
(32.2)
DMG |34.0290|116.7870|04/30/1954| 03623.9| 11.1| 4.20| 0.036 | V | 20.1
(32.4)
DMG |33.5000|117.0000|08/08/1925|1013 0.0| 0.0| 4.50| 0.042 | V | 20.2
(32.5)
GSP |34.0850|116.9890|06/30/1992|214900.3| 3.0| 4.40| 0.039 | V | 20.2
(32.5)
PAS |33.9760|116.7130|08/06/1984| 81436.6| 14.2| 4.30| 0.037 | V | 20.4
(32.8)
DMG |34.0000|117.2500|07/23/1923| 73026.0| 0.0| 6.25| 0.114 | VII| 20.6
(33.1)
DMG |34.0000|117.2500|11/01/1932| 445 0.0| 0.0| 4.00| 0.032 | V | 20.6
(33.1)
DMG |33.5000|116.9170|11/04/1935| 355 0.0| 0.0| 4.50| 0.041 | V | 20.6
(33.2)
T-A |33.5000|117.0700|12/29/1880| 7 0 0.0| 0.0| 4.30| 0.037 | V | 20.7
(33.3)
GSP |34.0240|117.2300|03/11/1998|121851.8| 14.0| 4.50| 0.040 | V | 21.0
(33.8)
GSP |34.0970|116.9960|12/05/1997|170438.9| 4.0| 4.10| 0.033 | V | 21.0
(33.8)
DMG |33.9810|116.7020|06/12/1944|222119.5| 10.0| 4.20| 0.034 | V | 21.1
(34.0)
DMG |33.9940|116.7120|06/12/1944|111636.0| 10.0| 5.30| 0.062 | VI | 21.2
(34.2)
DMG |33.9960|117.2700|02/17/1952|123658.3| 16.0| 4.50| 0.039 | V | 21.3
(34.2)
PAS |34.0230|117.2450|10/02/1985|234412.4| 15.2| 4.80| 0.046 | VI | 21.5
(34.7)
DMG |34.0430|117.2280|04/03/1939| 25044.7| 10.0| 4.00| 0.030 | V | 22.0
(35.3)
PAS |33.9790|116.6810|12/16/1988| 553 5.0| 8.1| 4.80| 0.045 | VI | 22.0
(35.4)
DMG |34.0000|117.2830|11/07/1939|1852 8.4| 0.0| 4.70| 0.042 | VI | 22.0
(35.4)
DMG |34.0000|116.7000|08/25/1944| 73025.0| 0.0| 4.20| 0.033 | V | 22.0
(35.4)

DMG |34.1000|116.8830|10/24/1935|1527 0.0| 0.0| 4.00| 0.029 | V | 22.1
(35.6)
DMG |34.1000|116.8830|10/24/1935|1452 0.0| 0.0| 4.50| 0.038 | V | 22.1
(35.6)
DMG |34.1000|116.8830|10/24/1935|1451 0.0| 0.0| 4.50| 0.038 | V | 22.1
(35.6)
GSP |34.1120|116.9200|10/01/1998|181816.0| 4.0| 4.70| 0.041 | V | 22.4
(36.1)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.8000	116.6000	09/10/1931	436 0.0	0.0	4.00	0.029	V	22.5 (36.2)
GSP	34.1200	116.9980	06/29/1992	144126.0	4.0	4.40	0.035	V	22.6 (36.4)
DMG	33.9590	116.6510	09/23/1949	214440.1	12.2	4.00	0.029	V	22.7 (36.5)
GSP	34.1210	116.9280	08/16/1998	133440.2	6.0	4.70	0.040	V	23.0 (37.0)
MGI	33.5000	116.8000	06/02/1917	435 0.0	0.0	4.00	0.028	V	23.0 (37.0)
MGI	33.5000	116.8000	03/30/1918	16 5 0.0	0.0	4.60	0.038	V	23.0 (37.0)
MGI	33.5000	116.8000	05/31/1917	435 0.0	0.0	4.00	0.028	V	23.0 (37.0)
MGI	33.5000	116.8000	11/26/1916	17 5 0.0	0.0	4.00	0.028	V	23.0 (37.0)
DMG	33.8330	117.4000	06/05/1940	82727.0	0.0	4.00	0.028	V	23.6 (37.9)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.028	V	23.6 (38.0)
DMG	34.1330	116.9500	06/10/1938	1440 0.0	0.0	4.00	0.027	V	23.6 (38.0)
DMG	33.4560	116.8960	06/16/1938	55916.9	10.0	4.00	0.027	V	23.9 (38.4)
PAS	33.9890	116.6490	07/17/1986	203515.0	6.2	4.00	0.027	V	23.9 (38.4)
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.049	VI	23.9 (38.5)
PAS	33.9910	116.6490	07/17/1986	215445.2	7.4	4.40	0.033	V	24.0 (38.5)
DMG	33.4540	116.8980	07/29/1936	142252.8	10.0	4.00	0.027	V	24.0 (38.6)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.045	VI	24.3 (39.1)

DMG |33.7000|117.4000|05/15/1910|1547 0.0| 0.0| 6.00| 0.082 | VII| 24.3
(39.1)
DMG |33.7000|117.4000|04/11/1910| 757 0.0| 0.0| 5.00| 0.045 | VI | 24.3
(39.1)
MGI |34.1000|117.2000|04/23/1923|2113 0.0| 0.0| 4.00| 0.027 | V | 24.4
(39.2)
DMG |33.4880|116.7770|06/12/1959|11 313.0| 5.7| 4.00| 0.027 | V | 24.4
(39.2)
PAS |33.9670|116.6170|07/08/1986|102240.6| 6.0| 4.40| 0.032 | V | 24.6
(39.6)
PAS |33.9670|116.6170|07/08/1986|155526.2| 6.0| 4.00| 0.026 | V | 24.6
(39.6)
PAS |33.5580|116.6670|06/15/1982|234921.3| 12.2| 4.80| 0.040 | V | 24.7
(39.7)
T-A |34.0800|117.2500|10/07/1869| 0 0 0.0| 0.0| 4.30| 0.030 | V | 24.8
(39.8)
PAS |34.1510|116.9720|11/20/1978| 655 9.5| 6.1| 4.30| 0.030 | V | 24.8
(39.9)
DMG |34.0330|117.3170|09/03/1935| 647 0.0| 0.0| 4.50| 0.033 | V | 25.0
(40.2)
GSP |34.1410|116.8570|09/19/1997|223714.5| 10.0| 4.10| 0.027 | V | 25.3
(40.7)
PAS |34.0310|116.6570|07/08/1986| 92412.8| 6.0| 4.40| 0.031 | V | 25.3
(40.7)
DMG |33.8980|116.5690|11/17/1964|145228.2| 10.3| 4.00| 0.026 | V | 25.3
(40.7)
DMG |34.1670|116.9830|10/16/1951|1241 5.0| 0.0| 4.00| 0.025 | V | 25.9
(41.6)
PAS |33.9980|116.6060|07/08/1986| 92044.5| 11.7| 5.60| 0.059 | VI | 26.3
(42.3)
DMG |34.1170|116.7500|08/22/1942|125913.0| 0.0| 4.00| 0.025 | V | 26.3
(42.4)
DMG |34.0330|117.3500|04/18/1940|184343.9| 0.0| 4.40| 0.030 | V | 26.4
(42.5)
PAS |33.9530|116.5720|10/15/1986| 22847.8| 8.7| 4.70| 0.035 | V | 26.5
(42.6)
GSP |34.1630|116.8550|06/28/1992|144321.0| 6.0| 5.30| 0.049 | VI | 26.8
(43.1)
GSP |34.1800|117.0200|12/04/1991|081703.5| 11.0| 4.00| 0.024 | V | 26.8
(43.1)
GSP |34.1780|116.9220|06/28/1992|170131.9| 13.0| 4.70| 0.034 | V | 26.9
(43.3)
DMG |34.1000|116.7000|02/07/1889| 520 0.0| 0.0| 5.30| 0.048 | VI | 27.0
(43.5)
DMG |34.1800|116.9200|01/16/1930| 034 3.6| 0.0| 5.10| 0.043 | VI | 27.1
(43.6)
DMG |34.1800|116.9200|01/16/1930| 02433.9| 0.0| 5.20| 0.045 | VI | 27.1
(43.6)
DMG |33.4830|116.7000|12/28/1948|125341.0| 0.0| 4.00| 0.024 | IV | 27.2
(43.7)
GSP |34.1630|116.8270|06/28/1992|150451.5| 12.0| 4.40| 0.029 | V | 27.3
(43.9)
DMG |33.5330|116.6330|09/21/1942| 7 754.0| 0.0| 4.00| 0.024 | IV | 27.3
(43.9)
MGI |34.0000|117.4000|05/22/1907| 652 0.0| 0.0| 4.60| 0.032 | V | 27.4
(44.1)
DMG |33.7330|117.4670|10/26/1954|162226.0| 0.0| 4.10| 0.025 | V | 27.6
(44.4)
GSP |34.1300|116.7340|06/30/1992|212254.4| 12.0| 4.80| 0.035 | V | 27.6
(44.4)
MGI |34.1000|117.3000|12/27/1901|11 0 0.0| 0.0| 4.60| 0.032 | V | 27.6

(44.4)
MGI |34.1000|117.3000|07/15/1905|2041 0.0| 0.0| 5.30| 0.047 | VI | 27.6
(44.4)
DMG |34.1000|117.3000|02/16/1931|1327 0.0| 0.0| 4.00| 0.023 | IV | 27.6
(44.4)
MGI |34.1000|117.3000|11/22/1911| 257 0.0| 0.0| 4.00| 0.023 | IV | 27.6
(44.4)
PAS |33.9870|116.5690|07/09/1986| 01232.1| 6.0| 4.40| 0.029 | V | 27.7
(44.6)
PAS |34.1980|116.9590|04/01/1978|105227.4| 8.0| 4.00| 0.023 | IV | 28.1
(45.2)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE [km]
DMG	33.7480	117.4790	06/22/1971	104119.0	8.0	4.20	0.025	V	28.1 (45.3)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.035	V	28.2 (45.4)
T-A	34.0000	117.4200	09/10/1920	1415 0.0	0.0	4.30	0.026	V	28.4 (45.7)
T-A	34.0000	117.4200	04/12/1888	1315 0.0	0.0	4.30	0.026	V	28.4 (45.7)
DMG	33.5080	116.6310	08/11/1967	05711.4	10.7	4.10	0.024	IV	28.6 (46.0)
MGI	34.2000	116.9000	10/10/1915	5 6 0.0	0.0	4.00	0.023	IV	28.6 (46.1)
GSP	34.1950	116.8620	08/17/1992	204152.1	11.0	5.30	0.045	VI	28.8 (46.3)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.069	VI	28.8 (46.4)
GSP	34.1980	116.8620	08/18/1992	094640.7	12.0	4.20	0.025	V	29.0 (46.6)
GSP	34.1830	116.8020	06/28/1992	192637.6	1.0	4.00	0.022	IV	29.1 (46.8)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.031	V	29.4 (47.3)
DMG	33.4500	116.6830	04/25/1955	25515.0	0.0	4.00	0.022	IV	29.6 (47.6)
GSP	34.1110	116.6460	06/28/1992	140928.8	7.0	4.10	0.023	IV	29.6 (47.6)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.105	VII	29.9 (48.1)
DMG	33.7170	117.5070	08/06/1938	22 056.0	10.0	4.00	0.021	IV	30.0 (48.3)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.025	V	30.1

(48.4)
DMG |34.1270|117.3380|02/23/1936|222042.7| 10.0| 4.50| 0.027 | V | 30.4
(49.0)
DMG |34.0650|116.5740|08/26/1959| 53250.2| 16.7| 4.30| 0.025 | V | 30.4
(49.0)
DMG |33.6990|117.5110|05/31/1938| 83455.4| 10.0| 5.50| 0.048 | VI | 30.5
(49.1)
DMG |33.4670|116.6330|02/20/1934|1035 0.0| 0.0| 4.00| 0.021 | IV | 30.5
(49.1)
DMG |33.5340|116.5610|09/23/1956|112441.9| 12.2| 4.30| 0.025 | V | 30.5
(49.1)
DMG |33.7170|117.5170|06/19/1935|1117 0.0| 0.0| 4.00| 0.021 | IV | 30.6
(49.2)
DMG |33.5060|116.5850|05/21/1967|144234.4| 19.4| 4.70| 0.030 | V | 30.6
(49.3)
PAS |33.4200|116.6980|06/05/1978|16 3 3.9| 11.9| 4.40| 0.026 | V | 30.8
(49.5)
GSP |34.2250|116.8440|07/09/1992|023435.0| 0.0| 4.10| 0.022 | IV | 31.0
(50.0)
DMG |34.1400|117.3390|02/26/1936| 93327.6| 10.0| 4.00| 0.021 | IV | 31.2
(50.1)
PAS |33.5200|116.5580|08/02/1975| 014 7.7| 13.4| 4.70| 0.030 | V | 31.2
(50.2)
GSP |34.2320|116.8460|07/10/1992|012940.0| 0.0| 4.20| 0.023 | IV | 31.5
(50.6)
PAS |34.2430|116.8960|06/30/1979| 03411.6| 5.8| 4.90| 0.033 | V | 31.6
(50.8)
GSP |34.2070|116.7570|06/28/1992|161719.2| 3.0| 4.20| 0.022 | IV | 31.6
(50.9)
PAS |34.2460|116.9010|06/29/1979| 55320.5| 5.7| 4.60| 0.028 | V | 31.7
(51.1)
GSP |34.2110|116.7600|06/28/1992|152429.3| 6.0| 4.50| 0.026 | V | 31.8
(51.2)
PAS |34.2490|116.9000|06/30/1979| 7 353.0| 5.6| 4.50| 0.026 | V | 32.0
(51.4)
GSP |34.2190|116.7710|07/21/1992|211029.0| 1.0| 4.10| 0.021 | IV | 32.0
(51.6)
GSP |34.2390|116.8370|07/09/1992|014357.6| 0.0| 5.30| 0.040 | V | 32.1
(51.6)
T-A |34.1700|117.3200|12/02/1859|2210 0.0| 0.0| 4.30| 0.023 | IV | 32.1
(51.7)
DMG |34.0170|116.5000|07/25/1947| 15647.0| 0.0| 4.60| 0.027 | V | 32.2
(51.8)
DMG |34.0170|116.5000|07/24/1947|225426.0| 0.0| 4.90| 0.032 | V | 32.2
(51.8)
DMG |34.0170|116.5000|08/01/1947|17 137.0| 0.0| 4.10| 0.021 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/24/1947|221046.0| 0.0| 5.50| 0.045 | VI | 32.2
(51.8)
DMG |34.0170|116.5000|07/26/1947|23 425.0| 0.0| 4.50| 0.026 | V | 32.2
(51.8)
DMG |34.0170|116.5000|07/26/1947| 24941.0| 0.0| 5.10| 0.036 | V | 32.2
(51.8)
DMG |34.0170|116.5000|07/26/1947| 12415.0| 0.0| 4.20| 0.022 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/25/1947| 75730.0| 0.0| 4.20| 0.022 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/25/1947| 51752.0| 0.0| 4.30| 0.023 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/29/1947|163615.0| 0.0| 4.20| 0.022 | IV | 32.2
(51.8)

DMG |34.0170|116.5000|07/30/1947| 52217.0| 0.0| 4.20| 0.022 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/25/1947| 04631.0| 0.0| 5.00| 0.034 | V | 32.2
(51.8)
DMG |34.0170|116.5000|07/26/1947|231351.0| 0.0| 4.10| 0.021 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|08/08/1947| 64745.0| 0.0| 4.00| 0.020 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/24/1947|225341.0| 0.0| 4.30| 0.023 | IV | 32.2
(51.8)
DMG |34.0170|116.5000|07/25/1947|161453.0| 0.0| 4.50| 0.026 | V | 32.2
(51.8)
DMG |34.0170|116.5000|07/25/1947| 61949.0| 0.0| 5.20| 0.038 | V | 32.2
(51.8)

EARTHQUAKE SEARCH RESULTS

FILE CODE	APPROX. LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	DISTANCE [km]
DMG	34.2290	116.7950	05/11/1956	163050.5	13.3	4.70	0.029	V	32.2 (51.8)
GSP	34.2560	116.9120	06/28/1992	170557.5	8.0	4.60	0.027	V	32.3 (52.0)
DMG	33.8800	116.4370	04/17/1959	1619 0.2	22.2	4.20	0.022	IV	32.4 (52.1)
GSP	34.2370	116.8110	06/28/1992	125730.8	10.0	4.00	0.020	IV	32.4 (52.1)
DMG	34.0000	117.5000	07/03/1908	1255 0.0	0.0	4.00	0.020	IV	32.5 (52.2)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.118	VII	32.5 (52.2)
DMG	33.4670	116.5830	03/27/1937	528 0.0	0.0	4.00	0.020	IV	32.5 (52.3)
DMG	33.4670	116.5830	01/04/1938	029 0.0	0.0	4.50	0.025	V	32.5 (52.3)
DMG	33.4670	116.5830	03/27/1937	742 0.0	0.0	4.50	0.025	V	32.5 (52.3)
DMG	33.4670	116.5830	03/26/1937	2124 0.0	0.0	4.00	0.020	IV	32.5 (52.3)
GSP	34.1680	117.3370	06/28/1997	214525.1	9.0	4.20	0.022	IV	32.6 (52.5)
DMG	34.2670	116.9670	08/29/1943	51630.0	0.0	4.00	0.020	IV	32.8 (52.8)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.044	VI	32.8 (52.8)
DMG	34.2670	116.9670	08/29/1943	35754.0	0.0	4.00	0.020	IV	32.8 (52.8)

USG |34.1390|117.3860|02/21/1987|231530.1| 2.6| 4.07| 0.020 | IV | 32.9
(52.9)
DMG |33.6820|117.5530|07/05/1938|18 655.7| 10.0| 4.50| 0.025 | V | 33.1
(53.3)
MGI |34.2000|117.3000|04/13/1913|1045 0.0| 0.0| 4.00| 0.019 | IV | 33.2
(53.4)
DMG |34.1120|117.4260|03/19/1937| 12338.4| 10.0| 4.00| 0.019 | IV | 33.2
(53.5)
DMG |33.9670|116.4500|12/11/1948|161220.0| 0.0| 4.50| 0.025 | V | 33.3
(53.6)
DMG |34.0000|116.4670|12/06/1948| 246 8.0| 0.0| 4.30| 0.022 | IV | 33.3
(53.6)
DMG |34.0000|116.4670|12/05/1948| 05057.0| 0.0| 4.40| 0.024 | IV | 33.3
(53.6)
DMG |34.2500|116.7700|03/16/1956|203344.3| 0.8| 4.00| 0.019 | IV | 34.0
(54.8)
PAS |33.5010|116.5130|02/25/1980|104738.5| 13.6| 5.50| 0.043 | VI | 34.1
(54.9)
DMG |34.1320|117.4260|04/15/1965|20 833.3| 5.5| 4.50| 0.024 | V | 34.2
(55.0)
DMG |33.9670|116.4330|12/05/1948| 04235.0| 0.0| 4.60| 0.025 | V | 34.2
(55.1)
DMG |33.9630|116.4250|01/13/1950| 5 719.4| 5.9| 4.10| 0.020 | IV | 34.6
(55.6)
DMG |33.5000|116.5000|09/30/1916| 211 0.0| 0.0| 5.00| 0.031 | V | 34.7
(55.9)
PAS |33.4840|116.5130|08/11/1976|152455.5| 15.4| 4.30| 0.021 | IV | 34.8
(56.0)
DMG |33.8000|117.6000|09/16/1903|1210 0.0| 0.0| 4.00| 0.018 | IV | 34.9
(56.2)
MGI |33.8000|117.6000|04/22/1918|2115 0.0| 0.0| 5.00| 0.031 | V | 34.9
(56.2)
GSP |34.2500|116.7190|06/29/1992|164141.9| 1.0| 4.90| 0.029 | V | 35.2
(56.7)
PAS |34.1350|117.4480|01/08/1983| 71930.4| 4.6| 4.10| 0.019 | IV | 35.2
(56.7)
DMG |34.2640|116.7550|03/16/1956|203613.6| 3.3| 4.00| 0.018 | IV | 35.3
(56.7)
DMG |33.9330|116.4000|12/10/1948|204257.0| 0.0| 4.40| 0.022 | IV | 35.3
(56.8)
DMG |33.4830|116.5000|02/15/1951|104957.0| 0.0| 4.80| 0.027 | V | 35.4
(57.0)
DMG |33.4830|116.5000|02/15/1951|104759.0| 0.0| 4.80| 0.027 | V | 35.4
(57.0)
MGI |34.3000|116.9000|12/01/1915|14 5 0.0| 0.0| 4.00| 0.018 | IV | 35.4
(57.0)
GSP |34.2730|116.7740|08/24/1992|135146.0| 1.0| 4.30| 0.021 | IV | 35.4
(57.0)
DMG |33.5000|116.4830|02/23/1941|183614.0| 0.0| 4.50| 0.023 | IV | 35.5
(57.2)
DMG |34.1160|117.4750|06/28/1960|20 048.0| 12.0| 4.10| 0.019 | IV | 35.6
(57.2)
GSP |33.9450|116.3990|07/05/1992|054938.2| 3.0| 4.00| 0.018 | IV | 35.6
(57.3)
DMG |33.9500|117.5830|04/11/1941| 12024.0| 0.0| 4.00| 0.018 | IV | 35.6
(57.3)
DMG |33.4170|116.5670|12/22/1950| 2 536.0| 0.0| 4.00| 0.018 | IV | 35.6
(57.3)
GSP |34.1900|117.3900|12/28/1989|094108.1| 15.0| 4.50| 0.023 | IV | 35.7
(57.4)
PAS |34.0220|116.4260|08/14/1975| 8 849.8| 10.9| 4.00| 0.018 | IV | 36.1

(58.1)
DMG |34.1240|117.4800|05/15/1955|17 326.0| 7.6| 4.00| 0.018 | IV | 36.1
(58.1)
DMG |34.0830|116.4670|03/01/1942|104631.0| 0.0| 4.00| 0.018 | IV | 36.1
(58.2)
DMG |34.0830|116.4670|01/26/1934|1844 0.0| 0.0| 4.00| 0.018 | IV | 36.1
(58.2)
DMG |33.9330|116.3830|12/04/1948|234317.0| 0.0| 6.50| 0.075 | VII| 36.2
(58.3)
DMG |33.2670|117.0170|06/07/1935|1633 0.0| 0.0| 4.00| 0.018 | IV | 36.3
(58.4)
PAS |33.9850|116.4020|02/15/1985|232626.6| 2.3| 4.00| 0.018 | IV | 36.3
(58.5)
DMG |34.3120|116.8790|01/31/1972| 155 4.2| 8.0| 4.00| 0.018 | IV | 36.4
(58.7)
DMG |33.4000|116.5670|02/04/1953| 43616.0| 0.0| 4.30| 0.020 | IV | 36.5
(58.7)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE [km]
GSP	34.2980	116.8040	07/05/1992	200303.1	3.0	4.00	0.018	IV	36.5 (58.8)
GSP	34.2750	116.7300	07/01/1992	204617.8	1.0	4.20	0.019	IV	36.5 (58.8)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.040	V	36.6 (58.9)
DMG	34.0500	116.4330	02/08/1938	739 0.0	0.0	4.00	0.017	IV	36.6 (58.9)
DMG	34.3200	116.9250	04/18/1968	174213.4	4.7	4.00	0.017	IV	36.6 (58.9)
DMG	34.3070	116.8350	08/28/1950	194526.4	11.7	4.20	0.019	IV	36.6 (59.0)
GSP	33.9460	116.3790	04/24/1992	123605.7	10.0	4.10	0.018	IV	36.7 (59.0)
GSP	33.5100	116.4500	02/18/1990	155259.9	9.0	4.10	0.018	IV	36.7 (59.1)
GSP	34.2810	116.7310	07/01/1992	205356.8	1.0	4.00	0.017	IV	36.9 (59.4)
DMG	34.2990	116.7840	03/18/1956	24217.3	6.3	4.40	0.021	IV	36.9 (59.4)
DMG	33.9330	116.3670	12/05/1948	0 721.0	0.0	4.90	0.028	V	37.1 (59.7)
DMG	34.3240	116.8850	12/01/1962	03548.8	9.6	4.30	0.020	IV	37.2 (59.9)
DMG	34.0670	116.4320	12/04/1957	25144.0	3.7	4.30	0.020	IV	37.3

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( 59.9)
GSP |34.3200|116.8500|10/27/1998|154017.1|  4.0| 4.10| 0.018 | IV | 37.3
( 60.1)
DMG |34.3330|117.0000|02/27/1942| 1 853.0|  0.0| 4.00| 0.017 | IV | 37.3
( 60.1)
DMG |34.3250|116.8750|12/02/1962| 04138.4|  6.7| 4.40| 0.021 | IV | 37.4
( 60.1)
GSP |34.2740|116.6920|07/01/1992|170715.1|  4.0| 4.20| 0.019 | IV | 37.4
( 60.2)
DMG |34.3250|116.8650|10/29/1962| 24253.9|  8.6| 4.80| 0.026 |  V | 37.5
( 60.3)
PDP |34.3220|116.8460|09/20/1999|070249.2|  2.0| 4.20| 0.019 | IV | 37.5
( 60.3)
GSP |34.3230|116.8440|10/27/1998|010840.7|  5.0| 4.90| 0.027 |  V | 37.6
( 60.5)
DMG |34.0000|116.3830|05/05/1944|134715.0|  0.0| 4.00| 0.017 | IV | 37.7
( 60.7)
DMG |34.3330|116.8830|10/14/1943|142844.0|  0.0| 4.50| 0.022 | IV | 37.8
( 60.9)
DMG |34.3170|116.8000|08/12/1950| 21717.0|  0.0| 4.30| 0.020 | IV | 37.8
( 60.9)
DMG |34.3060|116.7590|03/16/1956|202933.6|  1.3| 4.80| 0.026 |  V | 37.9
( 61.0)
DMG |34.3370|116.9090|11/30/1962|2351 5.5|  7.0| 4.30| 0.020 | IV | 37.9
( 61.0)
PAS |34.3220|116.8150|08/29/1985| 759 8.7|  6.1| 4.10| 0.018 | IV | 37.9
( 61.0)
DMG |33.9330|116.3500|12/05/1948| 04032.0|  0.0| 4.40| 0.021 | IV | 38.1
( 61.2)
DMG |33.5010|116.4290|02/23/1971| 0 739.2|  8.0| 4.20| 0.019 | IV | 38.1
( 61.3)
DMG |34.1270|117.5210|12/27/1938|10 928.6| 10.0| 4.00| 0.017 | IV | 38.1
( 61.3)
GSP |34.3400|116.9000|11/27/1992|160057.5|  1.0| 5.30| 0.034 |  V | 38.2
( 61.4)
GSP |34.0890|116.4260|06/28/1992|143906.9|  0.0| 4.30| 0.019 | IV | 38.3
( 61.7)
PAS |33.4830|116.4380|07/02/1988| 02658.2| 12.6| 4.00| 0.017 | IV | 38.3
( 61.7)
DMG |34.1400|117.5150|01/01/1965| 8 418.0|  5.9| 4.40| 0.020 | IV | 38.4
( 61.8)
GSP |34.0950|116.4270|06/28/1992|211316.5|  3.0| 4.60| 0.023 | IV | 38.5
( 62.0)
DMG |33.4200|116.4900|03/29/1937|17 316.8| 10.0| 4.00| 0.017 | IV | 38.6
( 62.2)
GSP |33.9400|116.3410|05/04/1992|011602.6|  6.0| 4.00| 0.017 | IV | 38.7
( 62.2)
DMG |33.9580|116.3460|01/08/1952| 63427.4| 11.4| 4.40| 0.020 | IV | 38.7
( 62.3)
GSP |34.0300|116.3790|06/28/1992|160115.2|  1.0| 4.10| 0.017 | IV | 38.8
( 62.4)
GSP |34.1520|116.4680|06/28/1992|224822.9| 11.0| 4.10| 0.017 | IV | 38.9
( 62.7)
GSP |34.0040|116.3610|06/30/1992|143811.6|  0.0| 4.80| 0.025 |  V | 39.0
( 62.7)
DMG |34.0170|116.3670|06/06/1940|235637.2|  0.0| 4.40| 0.020 | IV | 39.0
( 62.8)
GSP |34.0920|116.4140|12/21/1992|114402.9|  3.0| 4.00| 0.016 | IV | 39.0
( 62.8)
GSP |34.0960|116.4170|07/18/1992|000611.2|  2.0| 4.00| 0.016 | IV | 39.0
( 62.8)
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GSP |33.9510|116.3380|05/18/1992|154418.0| 7.0| 4.90| 0.026 | V | 39.0
(62.8)
DMG |34.3500|116.8670|10/15/1943|1650 1.0| 0.0| 4.50| 0.021 | IV | 39.2
(63.0)
DMG |33.4000|116.5000|10/11/1918| 4 0 0.0| 0.0| 4.00| 0.016 | IV | 39.2
(63.0)
DMG |33.4670|116.4330|05/12/1939|1925 2.2| 0.0| 4.50| 0.021 | IV | 39.2
(63.1)
GSP |33.9470|116.3300|09/09/1992|125045.1| 5.0| 4.30| 0.019 | IV | 39.4
(63.4)
GSP |34.0880|116.4020|08/15/1992|082414.7| 0.0| 4.80| 0.024 | V | 39.5
(63.5)
PAS |33.4580|116.4340|02/12/1979| 44842.3| 3.9| 4.20| 0.018 | IV | 39.5
(63.6)
GSP |34.3610|116.9130|12/04/1992|125942.1| 0.0| 4.20| 0.018 | IV | 39.5
(63.6)
GSP |34.3620|116.9230|12/07/1992|033331.5| 1.0| 4.00| 0.016 | IV | 39.5
(63.6)
GSG |33.9430|116.3250|04/23/1992|052316.2| 5.0| 4.00| 0.016 | IV | 39.6
(63.7)

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.9850	116.3400	02/01/1957	75215.4	11.0	4.60	0.022	IV	39.7 (63.8)
GSP	34.1120	116.4150	07/28/1992	182703.9	0.0	4.60	0.022	IV	39.7 (63.9)
GSP	34.3640	116.9040	11/27/1992	183225.0	1.0	4.10	0.017	IV	39.8 (64.0)
GSP	34.0690	116.3820	07/07/1992	082103.1	3.0	4.00	0.016	IV	39.8 (64.1)
GSP	34.0340	116.3600	05/14/1999	105235.2	1.0	4.20	0.018	IV	39.9 (64.1)
GSP	34.1110	116.4100	06/28/1992	135045.7	0.0	4.90	0.026	V	39.9 (64.2)
GSP	34.0610	116.3740	08/11/1992	061117.3	0.0	4.30	0.019	IV	40.0 (64.3)
GSP	34.0570	116.3710	06/28/1992	160953.9	3.0	4.10	0.017	IV	40.0 (64.3)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.016	IV	40.0 (64.3)
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.028	V	40.0 (64.4)
GSP	34.1080	116.4040	06/29/1992	141338.8	9.0	5.40	0.034	V	40.1 (64.5)

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GSP |34.1060|116.4020|06/29/1992|140837.7| 11.0| 4.90| 0.025 |  V | 40.1
( 64.6)
DMG |34.3360|116.7420|03/16/1956|233456.4|  1.7| 4.40| 0.019 | IV | 40.2
( 64.6)
GSP |33.9430|116.3150|05/06/1992|023843.3|  7.0| 4.50| 0.020 | IV | 40.2
( 64.6)
GSP |34.3690|116.8970|12/04/1992|020857.5|  3.0| 5.30| 0.032 |  V | 40.2
( 64.7)
GSP |33.9570|116.3170|04/23/1992|022529.9| 11.0| 4.60| 0.021 | IV | 40.3
( 64.9)
GSP |33.9610|116.3180|04/23/1992|045023.0| 12.0| 6.10| 0.052 | VI | 40.3
( 64.9)
DMG |34.1670|117.5330|03/01/1948| 81213.0|  0.0| 4.70| 0.023 | IV | 40.4
( 64.9)
GSP |34.3700|116.8800|11/29/1992|142120.5|  3.0| 4.00| 0.016 | IV | 40.4
( 65.0)
GSP |34.0620|116.3660|05/14/1999|075403.2|  1.0| 4.90| 0.025 |  V | 40.4
( 65.0)
GSP |33.9530|116.3140|11/27/1996|014243.8|  6.0| 4.10| 0.017 | IV | 40.4
( 65.0)
GSP |34.0820|116.3780|07/06/1992|194137.9|  3.0| 4.40| 0.019 | IV | 40.4
( 65.1)
DMG |34.2000|117.5000|06/14/1892|1325 0.0|  0.0| 4.90| 0.025 |  V | 40.5
( 65.1)
GSP |33.9510|116.3110|04/26/1992|062608.0|  0.0| 4.20| 0.017 | IV | 40.5
( 65.2)
PDP |33.9370|116.3060|07/25/1992|043160.0|  5.0| 4.90| 0.025 |  V | 40.6
( 65.3)
GSP |34.3770|116.9180|12/04/1992|052511.2|  2.0| 4.80| 0.024 | IV | 40.6
( 65.3)
DMG |33.7830|116.2830|03/04/1937|16 4 0.0|  0.0| 4.00| 0.016 | IV | 40.7
( 65.5)
GSP |34.0640|116.3610|09/15/1992|084711.3|  9.0| 5.20| 0.030 |  V | 40.7
( 65.5)
GSP |33.9330|116.3020|04/27/1992|031119.3|  0.0| 4.20| 0.017 | IV | 40.7
( 65.5)
GSP |33.9420|116.3040|05/04/1992|161949.7| 12.0| 4.80| 0.024 | IV | 40.8
( 65.6)
GSP |34.0970|116.3820|07/01/1992|070149.2|  0.0| 4.30| 0.018 | IV | 40.8
( 65.6)
GSP |34.0580|116.3550|06/28/1992|221312.0|  7.0| 4.00| 0.016 | IV | 40.8
( 65.7)
GSP |34.1020|116.3830|08/04/1992|190612.3|  0.0| 4.00| 0.016 | IV | 40.9
( 65.8)
MGI |33.2000|117.0000|07/20/1923| 7 0 0.0|  0.0| 4.00| 0.016 | IV | 40.9
( 65.8)
GSP |33.9050|116.2880|05/07/1995|110333.0| 10.0| 4.80| 0.023 | IV | 41.1
( 66.1)
GSG |34.0120|116.3250|04/23/1992|051009.4|  3.0| 4.60| 0.021 | IV | 41.1
( 66.2)
GSP |34.1270|116.3970|06/30/1992|000608.5|  2.0| 4.30| 0.018 | IV | 41.2
( 66.2)
GSP |34.0920|116.3690|07/06/1992|120059.2|  1.0| 4.50| 0.020 | IV | 41.2
( 66.4)
DMG |34.0000|116.3170|06/06/1940|222115.1|  0.0| 4.30| 0.018 | IV | 41.2
( 66.4)
GSP |33.9020|116.2840|07/24/1992|181436.2|  9.0| 5.00| 0.026 |  V | 41.3
( 66.4)
GSP |34.0120|116.3190|11/20/1994|043143.5|  6.0| 4.20| 0.017 | IV | 41.4
( 66.7)
DMG |33.4260|116.4210|03/25/1937|20 4 8.3| 10.0| 4.00| 0.015 | IV | 41.4
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(66.7)
GSP |34.0500|116.3350|04/26/1992|172138.0| 0.0| 4.30| 0.018 | IV | 41.6
(67.0)
DMG |34.1830|117.5480|09/01/1937|163533.5| 10.0| 4.50| 0.020 | IV | 41.7
(67.1)
GSP |34.0290|116.3210|08/21/1993|014638.4| 9.0| 5.00| 0.026 | V | 41.8
(67.2)
GSP |33.8760|116.2670|06/29/1992|160142.8| 1.0| 5.20| 0.029 | V | 42.0
(67.5)
DMG |33.4170|116.4170|01/02/1943|141118.0| 0.0| 4.50| 0.020 | IV | 42.0
(67.6)
DMG |34.0330|116.3170|06/11/1940|195118.1| 0.0| 4.40| 0.018 | IV | 42.1
(67.7)
DMG |34.4000|116.9170|01/25/1942|215133.0| 0.0| 4.00| 0.015 | IV | 42.2
(67.9)
DMG |34.4000|116.9170|02/01/1942|151828.0| 0.0| 4.50| 0.019 | IV | 42.2
(67.9)
DMG |34.4000|116.9170|02/01/1942|151555.0| 0.0| 4.00| 0.015 | IV | 42.2
(67.9)
DMG |34.4000|116.9170|02/01/1942|16 334.0| 0.0| 4.50| 0.019 | IV | 42.2
(67.9)
GSP |34.1620|116.4050|06/28/1992|132605.1| 6.0| 4.90| 0.024 | V | 42.2
(67.9)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE [km]
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.025	V	42.2 (68.0)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.028	V	42.2 (68.0)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.019	IV	42.2 (68.0)
PAS	34.2110	117.5300	10/19/1979	122237.8	4.9	4.10	0.016	IV	42.2 (68.0)
GSP	34.1990	116.4390	09/05/1995	202718.4	0.0	4.40	0.018	IV	42.3 (68.1)
GSP	34.1710	116.4090	06/30/1992	151905.0	0.0	4.00	0.015	IV	42.4 (68.2)
PAS	33.4600	116.3700	09/07/1984	175730.3	15.2	4.10	0.016	IV	42.5 (68.4)
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.136	VIII	42.5 (68.4)
GSP	33.9510	117.7090	01/05/1998	181406.5	11.0	4.30	0.017	IV	42.5 (68.5)
GSP	34.1980	116.4320	07/20/1992	040822.6	0.0	4.10	0.016	IV	42.6

(68.5)
GSP |33.9900|116.2870|05/02/1992|124641.4| 4.0| 4.10| 0.016 | IV | 42.6
(68.6)
MGI |33.7500|116.2500|11/19/1917|1730 0.0| 0.0| 4.00| 0.015 | IV | 42.7
(68.7)
DMG |34.0830|116.3330|06/02/1940| 61310.2| 0.0| 4.50| 0.019 | IV | 42.7
(68.8)
DMG |34.0830|116.3330|06/01/1940| 527 1.2| 0.0| 4.70| 0.021 | IV | 42.7
(68.8)
GSP |33.9910|116.2840|04/23/1992|185603.0| 3.0| 4.40| 0.018 | IV | 42.8
(68.9)
DMG |33.3680|116.4440|03/25/1937|232026.7| 10.0| 4.00| 0.015 | IV | 43.0
(69.2)
MGI |34.0000|117.7000|12/03/1929| 9 5 0.0| 0.0| 4.00| 0.015 | IV | 43.0
(69.3)
DMG |34.0670|116.3170|05/18/1940| 6 430.6| 0.0| 4.60| 0.020 | IV | 43.1
(69.3)
DMG |34.1830|117.5830|10/03/1948| 24628.0| 0.0| 4.00| 0.015 | IV | 43.3
(69.6)
DMG |34.1000|116.3330|06/01/1940| 65428.0| 0.0| 4.30| 0.017 | IV | 43.3
(69.7)
GSP |33.9920|116.2740|08/07/1994|151026.0| 7.0| 4.00| 0.015 | IV | 43.4
(69.8)
DMG |33.9170|116.2500|08/15/1946|19 1 8.0| 0.0| 4.00| 0.015 | IV | 43.4
(69.8)
GSG |34.1570|116.3730|06/29/1992|103657.8| 5.0| 4.00| 0.015 | IV | 43.5
(69.9)
DMG |33.2000|116.7200|05/12/1930|172548.5| 0.0| 4.20| 0.016 | IV | 43.8
(70.5)
DMG |33.8540|117.7520|10/04/1961| 22131.6| 4.3| 4.10| 0.015 | IV | 43.8
(70.5)
DMG |34.4170|116.8500|02/11/1932|231120.0| 0.0| 4.00| 0.014 | IV | 43.9
(70.6)
GSG |33.9820|116.2600|05/12/1992|023111.0| 6.0| 4.00| 0.014 | IV | 43.9
(70.7)
GSP |34.2390|116.4430|06/29/1992|030156.4| 7.0| 4.40| 0.018 | IV | 44.0
(70.8)
DMG |33.2000|116.7000|01/01/1920| 235 0.0| 0.0| 5.00| 0.024 | V | 44.2
(71.2)
DMG |34.4330|116.9830|04/18/1945| 458 2.0| 0.0| 4.30| 0.017 | IV | 44.2
(71.2)
DMG |34.0500|116.2830|08/04/1940|181520.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|06/14/1940|215850.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/22/1940|1410 5.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|06/01/1940| 55646.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|08/01/1940|193140.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|06/24/1940|163936.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/18/1940|134719.0| 0.0| 4.50| 0.018 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/27/1940| 32727.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/19/1940| 226 2.0| 0.0| 4.50| 0.018 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/19/1940| 22730.0| 0.0| 4.50| 0.018 | IV | 44.3
(71.3)

DMG |34.0500|116.2830|05/19/1940|193941.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/22/1940| 63137.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|06/08/1940|171032.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|05/19/1940| 35145.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0500|116.2830|06/06/1940|234849.0| 0.0| 4.00| 0.014 | IV | 44.3
(71.3)
DMG |34.0830|116.3000|05/18/1940| 5 358.5| 0.0| 5.40| 0.030 | V | 44.4
(71.5)
DMG |34.2670|117.5180|09/12/1970|141011.2| 8.0| 4.10| 0.015 | IV | 44.5
(71.6)
GSP |34.2450|116.4290|07/08/1993|225744.9| 2.0| 4.00| 0.014 | IV | 44.9
(72.2)
DMG |34.1000|117.6830|01/18/1934| 214 0.0| 0.0| 4.00| 0.014 | IV | 44.9
(72.3)
DMG |34.1000|117.6830|01/09/1934|1410 0.0| 0.0| 4.50| 0.018 | IV | 44.9
(72.3)
PAS |34.3020|116.4990|03/31/1979| 016 8.6| 0.1| 4.20| 0.016 | IV | 45.1
(72.5)
DMG |33.3330|116.4330|02/12/1954| 94428.0| 0.0| 4.50| 0.018 | IV | 45.2
(72.7)
PAS |34.2570|116.4350|07/13/1979| 226 3.5| 5.0| 4.00| 0.014 | IV | 45.2
(72.8)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.1750	116.3500	06/11/1992	002419.2	0.0	4.30	0.016	IV	45.3 (72.8)
PAS	34.0060	117.7390	02/18/1989	717 4.8	3.3	4.30	0.016	IV	45.3 (72.9)
DMG	34.4360	116.8340	07/14/1973	8 020.1	8.0	4.80	0.021	IV	45.3 (73.0)
DMG	33.7830	116.2000	10/31/1943	131210.0	0.0	4.50	0.018	IV	45.4 (73.1)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.030	V	45.5 (73.2)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.059	VI	45.5 (73.3)
GSP	33.3990	116.3540	07/26/1997	031456.0	11.0	4.80	0.021	IV	45.6 (73.4)
MGI	33.7000	116.2000	08/12/1917	11 0 0.0	0.0	4.00	0.014	IV	45.9 (73.9)

PAS |34.3820|116.6130|06/11/1984|222110.4| 1.8| 4.00| 0.014 | III| 46.1
(74.2)
DMG |34.4050|116.6670|07/02/1955|162938.5| 10.0| 4.20| 0.015 | IV | 46.2
(74.3)
GSP |34.3410|116.5290|06/28/1992|124053.5| 6.0| 5.20| 0.026 | V | 46.2
(74.4)
GSP |34.2940|116.4530|06/28/1992|173121.5| 6.0| 4.10| 0.014 | IV | 46.4
(74.6)
MGI |33.8000|117.8000|11/10/1926|1723 0.0| 0.0| 4.60| 0.019 | IV | 46.4
(74.6)
MGI |33.8000|117.8000|05/19/1917| 719 0.0| 0.0| 4.00| 0.014 | III| 46.4
(74.6)
MGI |33.8000|117.8000|11/07/1926|1948 0.0| 0.0| 4.60| 0.019 | IV | 46.4
(74.6)
MGI |33.8000|117.8000|05/20/1917| 945 0.0| 0.0| 4.00| 0.014 | III| 46.4
(74.6)
MGI |33.8000|117.8000|11/09/1926|1535 0.0| 0.0| 4.60| 0.019 | IV | 46.4
(74.6)
MGI |33.8000|117.8000|05/19/1917| 635 0.0| 0.0| 4.00| 0.014 | III| 46.4
(74.6)
MGI |33.8000|117.8000|11/04/1926|2238 0.0| 0.0| 4.60| 0.019 | IV | 46.4
(74.6)
DMG |34.2810|117.5520|09/13/1970| 44748.6| 8.0| 4.40| 0.017 | IV | 46.5
(74.9)
PAS |34.4010|116.6410|02/10/1975|125117.6| 8.0| 4.40| 0.017 | IV | 46.6
(74.9)
GSP |34.1400|117.6900|03/02/1990|172625.4| 6.0| 4.60| 0.018 | IV | 46.6
(75.0)
MGI |33.2000|116.6000|10/12/1920|1748 0.0| 0.0| 5.30| 0.027 | V | 46.7
(75.2)
GSP |34.3010|116.4520|09/28/1997|155723.0| 7.0| 4.40| 0.017 | IV | 46.8
(75.2)
GSP |34.1300|117.7000|03/01/1990|003457.1| 4.0| 4.00| 0.014 | III| 46.8
(75.3)
DMG |34.4500|116.7830|05/22/1942|151829.0| 0.0| 4.00| 0.013 | III| 46.9
(75.5)
PAS |34.2300|116.3630|03/18/1979|2253 2.7| 3.4| 4.20| 0.015 | IV | 47.0
(75.6)
GSP |34.2680|116.4020|06/16/1994|162427.5| 3.0| 5.00| 0.023 | IV | 47.1
(75.8)
GSP |34.1100|117.7200|04/17/1990|223227.2| 4.0| 4.60| 0.018 | IV | 47.1
(75.8)
GSP |34.1400|117.7000|02/28/1990|234336.6| 5.0| 5.20| 0.025 | V | 47.1
(75.8)
GSP |34.2720|116.4030|12/11/1992|013834.2| 2.0| 4.10| 0.014 | IV | 47.2
(76.0)
DMG |33.7670|117.8170|08/22/1936| 521 0.0| 0.0| 4.00| 0.013 | III| 47.4
(76.3)
PAS |34.1360|117.7090|06/26/1988|15 458.5| 7.9| 4.60| 0.018 | IV | 47.4
(76.3)
PAS |34.3090|116.4400|03/15/1979|201749.9| 2.0| 4.90| 0.021 | IV | 47.6
(76.6)
GSP |34.3130|116.4440|07/02/1992|001622.4| 6.0| 4.00| 0.013 | III| 47.7
(76.7)
GSP |34.3320|116.4620|07/01/1992|074029.9| 9.0| 5.40| 0.028 | V | 48.0
(77.3)
DMG |34.3000|116.4170|08/07/1942| 11533.0| 0.0| 4.50| 0.017 | IV | 48.1
(77.3)
DMG |34.3000|116.4170|08/07/1942| 12358.0| 0.0| 4.00| 0.013 | III| 48.1
(77.3)
DMG |34.3000|116.4170|08/07/1942| 15314.0| 0.0| 4.00| 0.013 | III| 48.1

(77.3)
DMG |33.4000|116.3000|02/09/1890|12 6 0.0| 0.0| 6.30| 0.049 | VI | 48.1
(77.5)
GSP |33.8900|116.1600|10/12/1991|143932.0| 3.0| 4.00| 0.013 | III| 48.2
(77.5)
PAS |34.3270|116.4450|03/15/1979|21 716.5| 2.5| 5.20| 0.025 | V | 48.4
(77.9)
GSP |34.3420|116.4670|07/07/1992|220928.3| 2.0| 4.40| 0.016 | IV | 48.4
(77.9)
DMG |34.3040|117.5700|05/05/1969|16 2 9.6| 8.8| 4.40| 0.016 | IV | 48.4
(77.9)
DMG |33.3430|116.3460|04/28/1969|232042.9| 20.0| 5.80| 0.035 | V | 48.4
(77.9)
DMG |34.2330|116.3330|05/11/1947| 5 620.0| 0.0| 4.90| 0.021 | IV | 48.4
(78.0)
GSP |34.1500|117.7200|03/01/1990|032303.0| 11.0| 4.70| 0.019 | IV | 48.5
(78.0)
PAS |34.3300|116.4430|03/15/1979|23 758.2| 2.8| 4.80| 0.020 | IV | 48.6
(78.2)
MGI |33.1000|116.8000|06/22/1918| 557 0.0| 0.0| 4.00| 0.013 | III| 49.1
(79.0)
PAS |34.3480|116.4530|03/15/1979|213425.6| 1.5| 4.50| 0.017 | IV | 49.2
(79.2)
DMG |34.3000|117.6000|07/30/1894| 512 0.0| 0.0| 6.00| 0.039 | V | 49.4
(79.5)
DMG |34.1740|116.2570|02/15/1938| 74539.8| 10.0| 4.50| 0.016 | IV | 49.6
(79.9)
DMG |33.4080|116.2610|03/25/1937|1649 1.8| 10.0| 6.00| 0.039 | V | 49.7
(80.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE [km]
DMG	33.2670	116.4000	06/06/1940	2321 4.0	0.0	4.00	0.013	III	49.8 (80.1)
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.016	IV	49.9 (80.2)

****

-END OF SEARCH- 426 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 1999

LENGTH OF SEARCH TIME: 200 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 0.7 MILES (1.1 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.654 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 3.332
b-value= 0.760
beta-value= 1.750

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	426	2.14070
4.5	172	0.86432
5.0	61	0.30653
5.5	22	0.11055
6.0	15	0.07538
6.5	6	0.03015
7.0	2	0.01005
7.5	1	0.00503

APPENDIX C

APPENDIX C

COMPACTION DATA OF TRENCH BACKFILL

FOR

Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

PROJECT NO. T2279-12-01

TABLE I
SUMMARY OF FIELD DENSITY TEST RESULTS

Test No.		Date	Location	Elev. or Depth (ft)	Curve No.	Plus 3/4" Rock (%)	Field Dry Dens. (pcf)	Field Moist. Cont. (%)	Field Rel. Comp. (%)	Req'd. Rel. Comp. (%)
OG	1	12/06/04	Near St. 100 N. of trench	0	T1 2	0	99.6	15.0	85	87
OG	2	12/06/04	Station	-7	T1 2	0	98.2	3.4	84	87
OG	3	12/06/04	Lot 300; Station	-7	T1 2	0	96.1	8.4	82	87
OG	4	12/06/04	Lot 150; Station	-13	B1 1	0	101.5	15.7	82	87
OG	5	12/06/04	Lot 50; Station	-13	B1 1	0	95.5	19.2	77	87
OG	6	12/06/04	Lot 200; Station	-13	B1 1	0	107.5	13.3	87	87
OG	7	12/06/04	Lot 400; Station	-7	T1 2	0	92.6	13.0	79	87
	8	12/06/04	Lot 425; Station	-7	T1 2	0	106.5	7.8	91	87
	9	12/06/04	Lot 315; Station	-7	B1 1	0	113.0	12.1	91	87
	10	12/06/04	Lot 250; Station	-7	T1 2	0	106.7	10.0	91	87
	11	12/06/04	Lot 160; Station	-7	B1 1	0	112.0	9.4	91	87
	12	12/13/04	Lot 410; Station	-4	B1 1	0	109.1	10.7	88	87
	13	12/13/04	Lot 300; Station	-4	B1 1	0	110.8	9.8	90	87
	14	12/13/04	Lot 215; Station	-4	B1 1	0	112.9	12.6	91	87
	15	12/13/04	Lot 155; Station	-4	B1 1	0	113.1	7.7	92	87
	16	12/14/04	Lot 390; Station	0	B1 1	0	110.1	11.2	89	87
	17	12/14/04	Lot 185; Station	0	B1 1	0	108.7	11.8	88	87

TABLE I
EXPLANATION OF CODED TERMS

- TEST SUFFIX

A, B, C, . . . : Retest of previous density test failure, following moisture conditioning and/or recompaction.

- ~~STRIKE-OUT~~

Fill in area of density test failure was removed and replaced with properly compacted fill soil.

- PREFIX CODE DESIGNATION FOR TEST NUMBERS

OG - Original Ground (Density undisturbed soil

- CURVE NO.

Corresponds to curve numbers listed in the summary of laboratory maximum dry density and optimum moisture content test results table for selected fill soil samples encountered during testing and observation.

- ROCK CORRECTION

For density tests with rock percentage greater than zero, laboratory maximum dry density and optimum moisture content were adjusted for rock content. For tests with rock content equal to zero, laboratory maximum dry density and optimum moisture content values are unadjusted.

- TYPE OF TEST

SC: Sand Cone Test (ASTM D1556)
NU: Nuclear Density Test (ASTM D2922)
OT: Other

- ELEVATION/DEPTH

Test elevations/depths have been rounded to the nearest whole foot.

APPENDIX D

APPENDIX D

AGE DATE REPORTS FROM BETA ANALYTICAL

FOR

Y.H. LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

PROJECT NO. T2279-12-01

BETA

Consistent Accuracy
Delivered On Time.

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
beta@radiocarbon.com
www.radiocarbon.com

DEC 2 2004

MR. DARDEN HOOD
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

December 19, 2004

Dr. Lisa A. Battiato
Geocon Incorporated
41471 Corning Place
Suite 101
Murrieta, CA 92562
USA

RE: Radiocarbon Dating Results For Samples C1, C3, C6, C7, C10, C13, C14

Dear Dr. Battiato:

Enclosed are the radiocarbon dating results for seven samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses went normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Lisa A. Battiato

Report Date: 12/19/2004

Geocon Incorporated

Material Received: 12/2/2004

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 198673	5720 +/- 50 BP	-23.3 o/oo	5750 +/- 50 BP
SAMPLE : C1			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 4710 to 4470 (Cal BP 6660 to 6420)			
Beta - 198674	3740 +/- 50 BP	-23.4 o/oo	3770 +/- 50 BP
SAMPLE : C3			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2330 to 2030 (Cal BP 4280 to 3980)			
Beta - 198675	3690 +/- 40 BP	-24.1 o/oo	3700 +/- 40 BP
SAMPLE : C6			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2200 to 1960 (Cal BP 4150 to 3910)			
Beta - 198676	8540 +/- 60 BP	-21.9 o/oo	8590 +/- 60 BP
SAMPLE : C7			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 7730 to 7550 (Cal BP 9680 to 9500)			
Beta - 198677	1000 +/- 40 BP	-21.4 o/oo	1060 +/- 40 BP
SAMPLE : C10			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 900 to 1030 (Cal BP 1060 to 920)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Lisa A. Battiato

Report Date: 12/19/2004

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 198678	1960 +/- 40 BP	-24.1 o/oo	1970 +/- 40 BP
SAMPLE : C13			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 50 to Cal AD 110 (Cal BP 2000 to 1840)			
Beta - 198679	940 +/- 40 BP	-28.1 o/oo	890 +/- 40 BP
SAMPLE : C14			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1030 to 1240 (Cal BP 920 to 710)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.3:lab. mult=1)

Laboratory number: **Beta-198673**

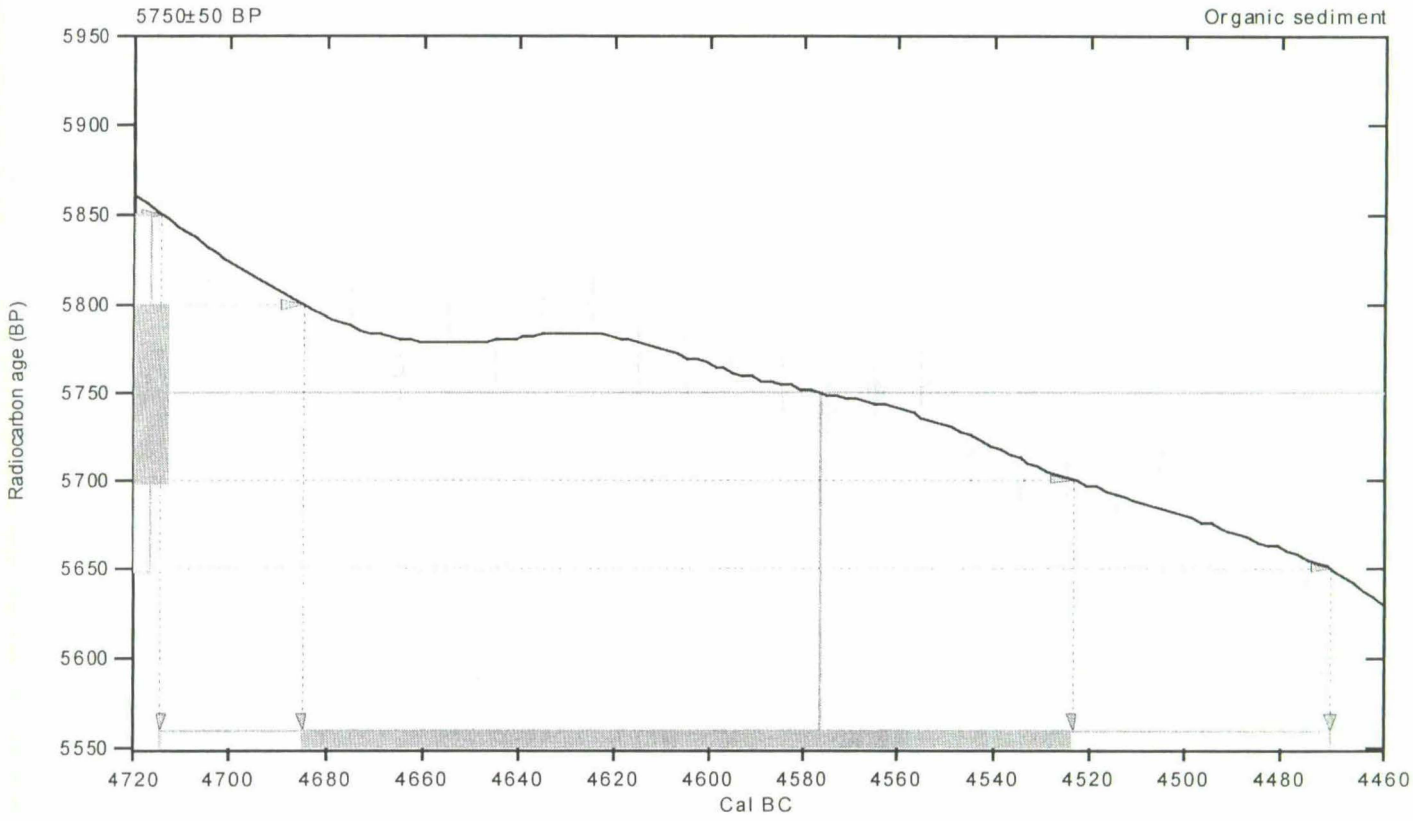
Conventional radiocarbon age: **5750±50 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 4710 to 4470 (Cal BP 6660 to 6420)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 4580 (Cal BP 6530)

1 Sigma calibrated result: (68% probability) Cal BC 4680 to 4520 (Cal BP 6640 to 6470)



References:

Database used

INTCAL98

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.4:lab. mult=1)

Laboratory number: **Beta-198674**

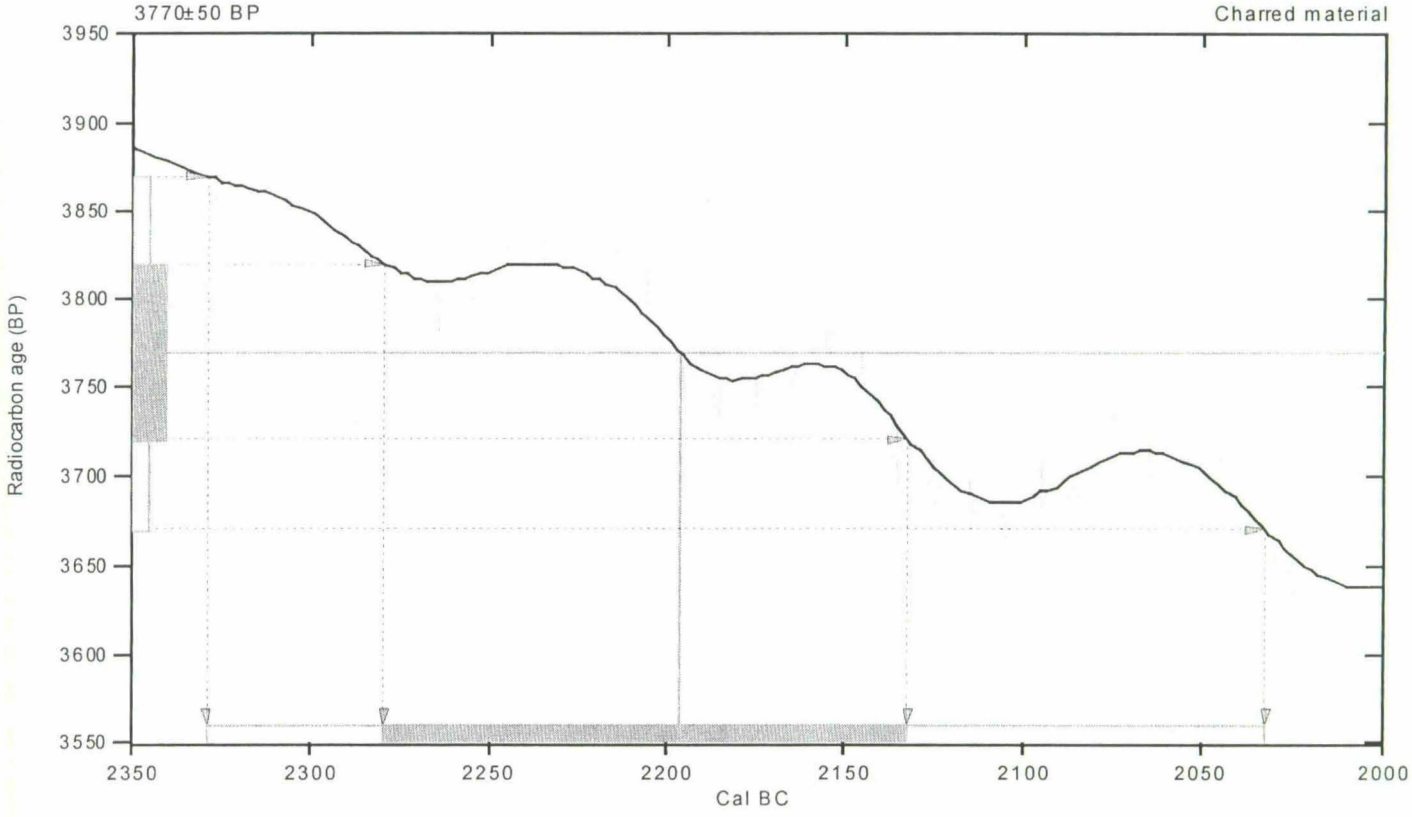
Conventional radiocarbon age: **3770±50 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 2330 to 2030 (Cal BP 4280 to 3980)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 2200 (Cal BP 4150)

1 Sigma calibrated result: (68% probability) Cal BC 2280 to 2130 (Cal BP 4230 to 4080)



References:

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: **Beta-198675**

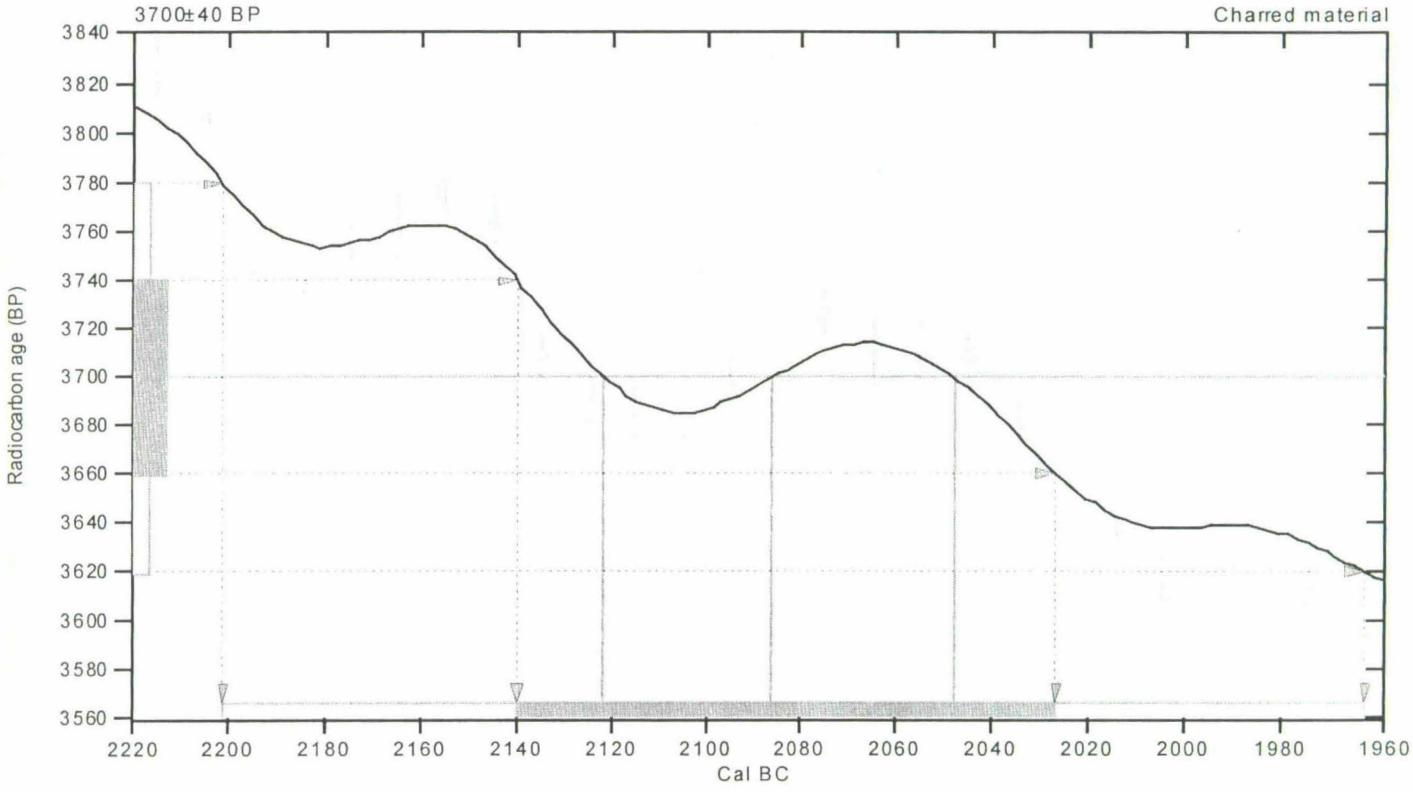
Conventional radiocarbon age: **3700±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 2200 to 1960 (Cal BP 4150 to 3910)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 2120 (Cal BP 4070) and Cal BC 2090 (Cal BP 4040) and Cal BC 2050 (Cal BP 4000)

1 Sigma calibrated result: (68% probability) Cal BC 2140 to 2030 (Cal BP 4090 to 3980)



References:

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INTCAL98 Radiocarbon Age Calibration

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.9:lab. mult=1)

Laboratory number: **Beta-198676**

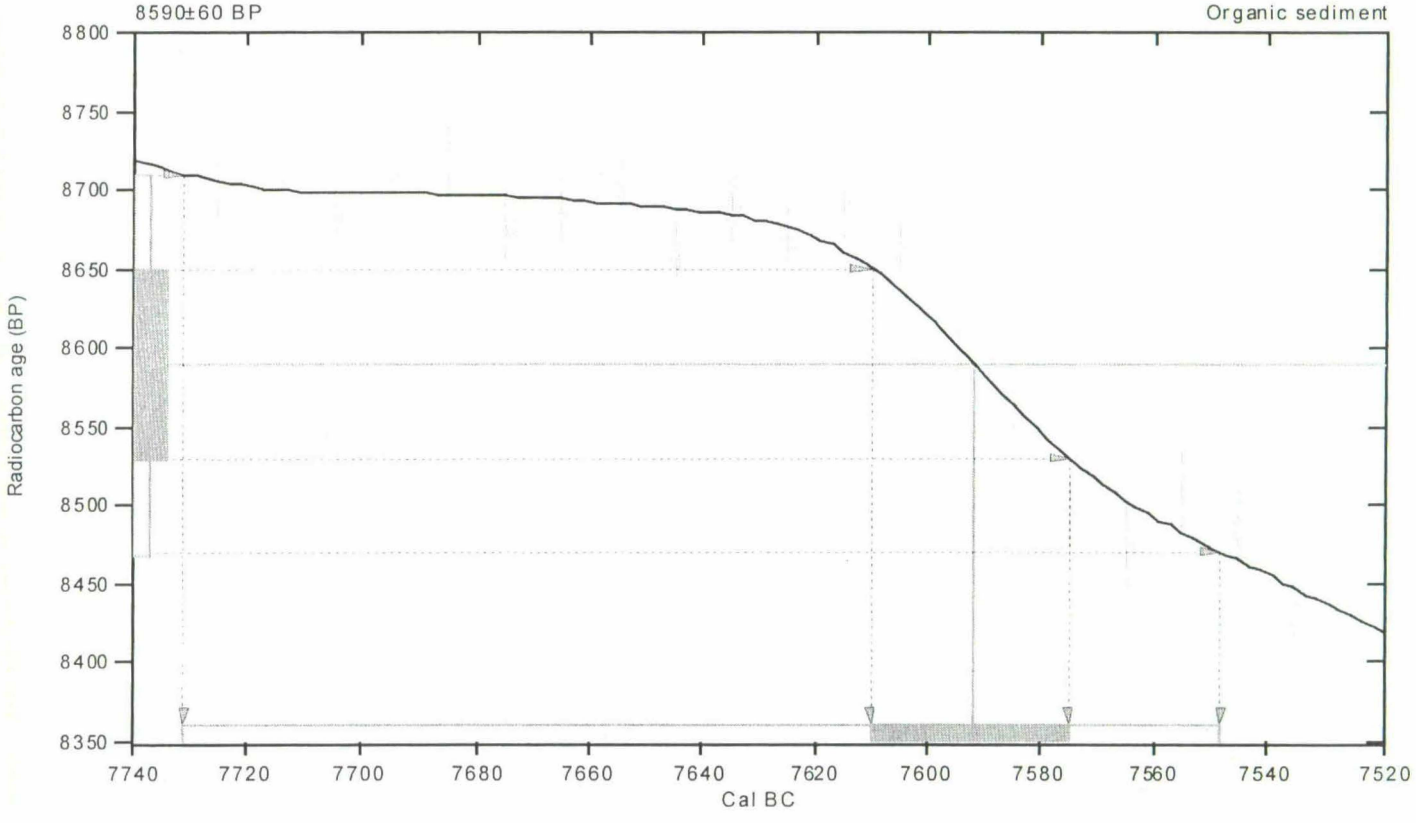
Conventional radiocarbon age: **8590±60 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 7730 to 7550 (Cal BP 9680 to 9500)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 7590 (Cal BP 9540)

1 Sigma calibrated result: (68% probability) Cal BC 7610 to 7580 (Cal BP 9560 to 9520)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.4:lab. mult=1)

Laboratory number: **Beta-198677**

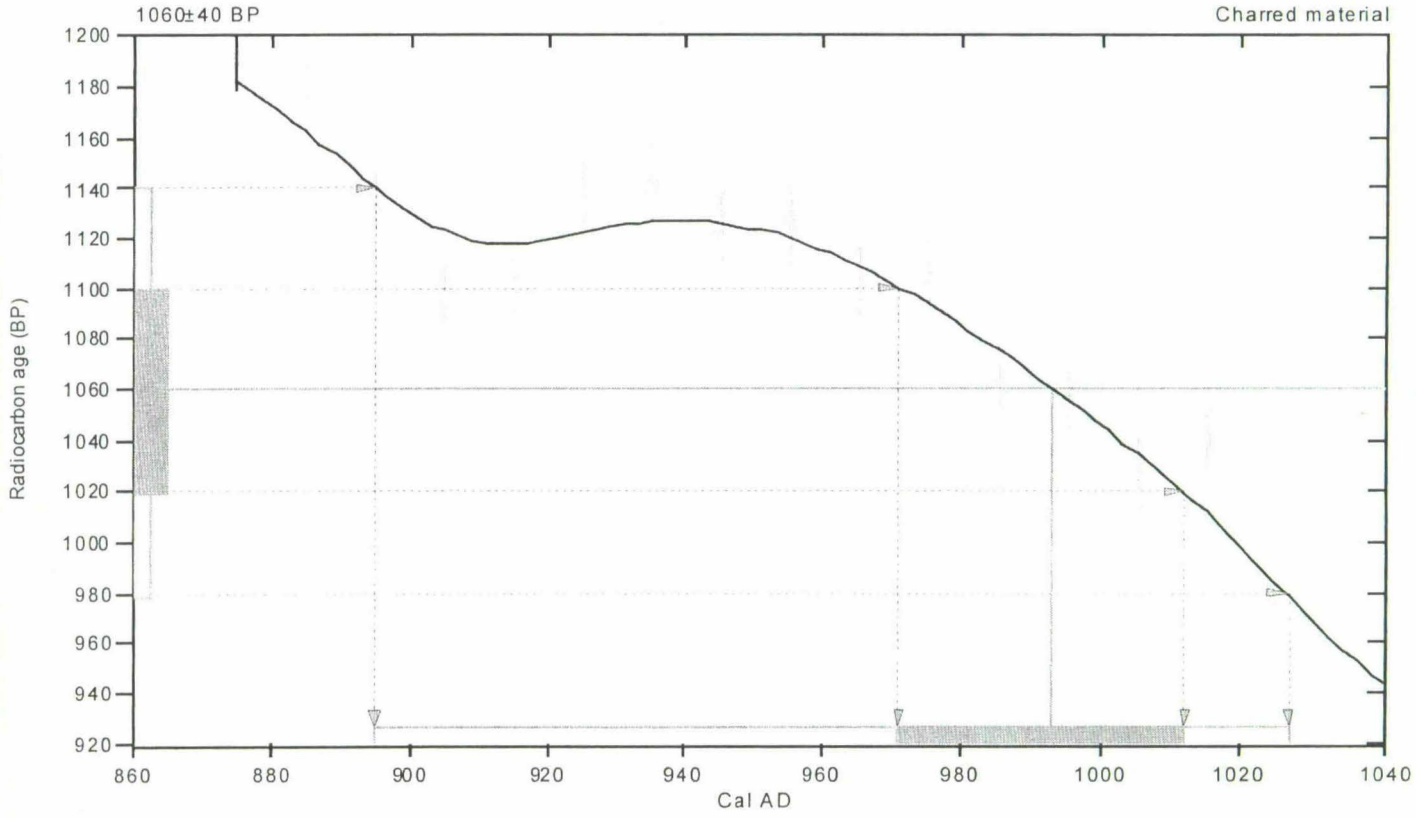
Conventional radiocarbon age: **1060±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 900 to 1030 (Cal BP 1060 to 920)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 990 (Cal BP 960)

1 Sigma calibrated result: (68% probability) Cal AD 970 to 1010 (Cal BP 980 to 940)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: **Beta-198678**

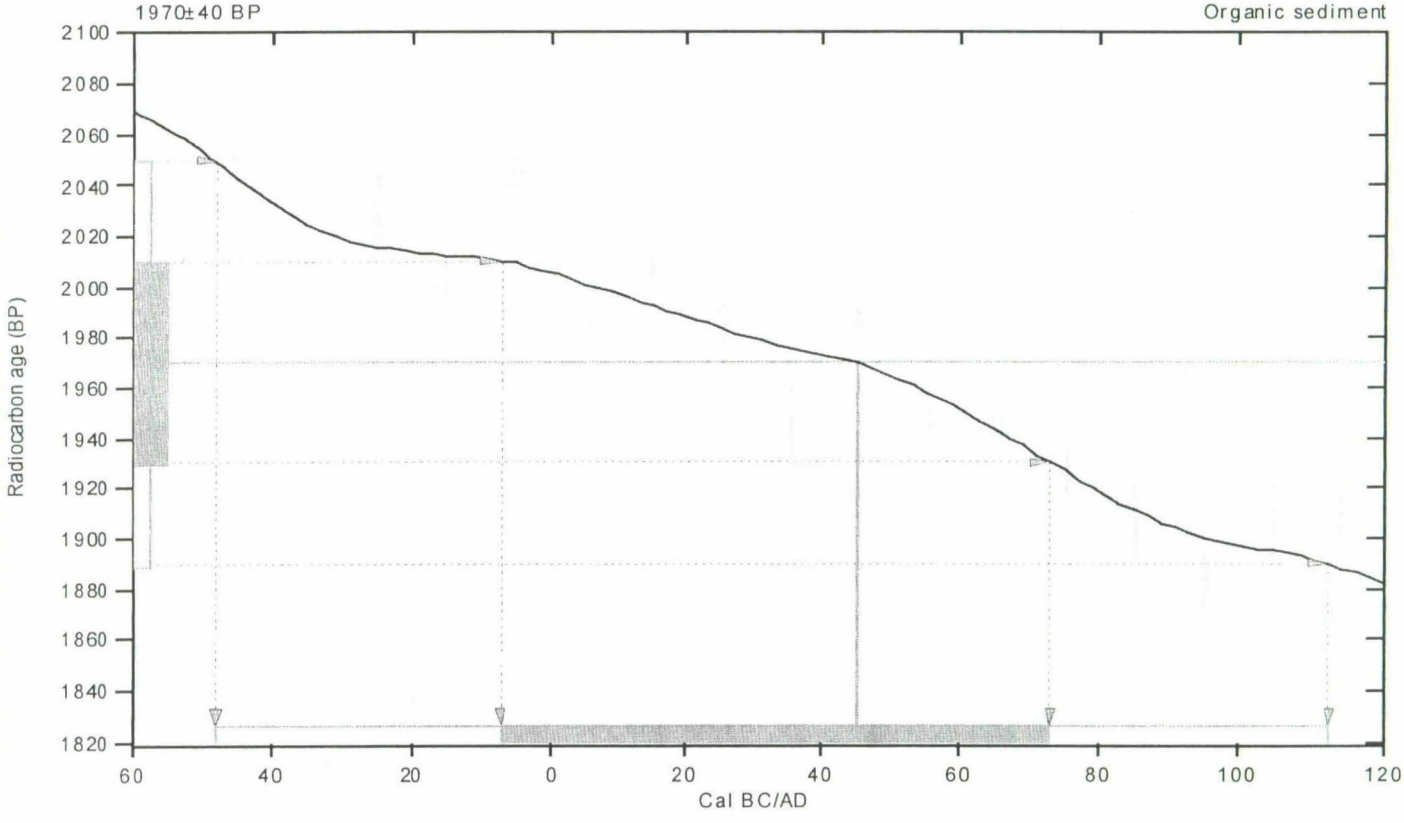
Conventional radiocarbon age: **1970±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 50 to Cal AD 110 (Cal BP 2000 to 1840)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 40 (Cal BP 1900)

1 Sigma calibrated result: (68% probability) Cal BC 10 to Cal AD 70 (Cal BP 1960 to 1880)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.1:lab. mult=1)

Laboratory number: **Beta-198679**

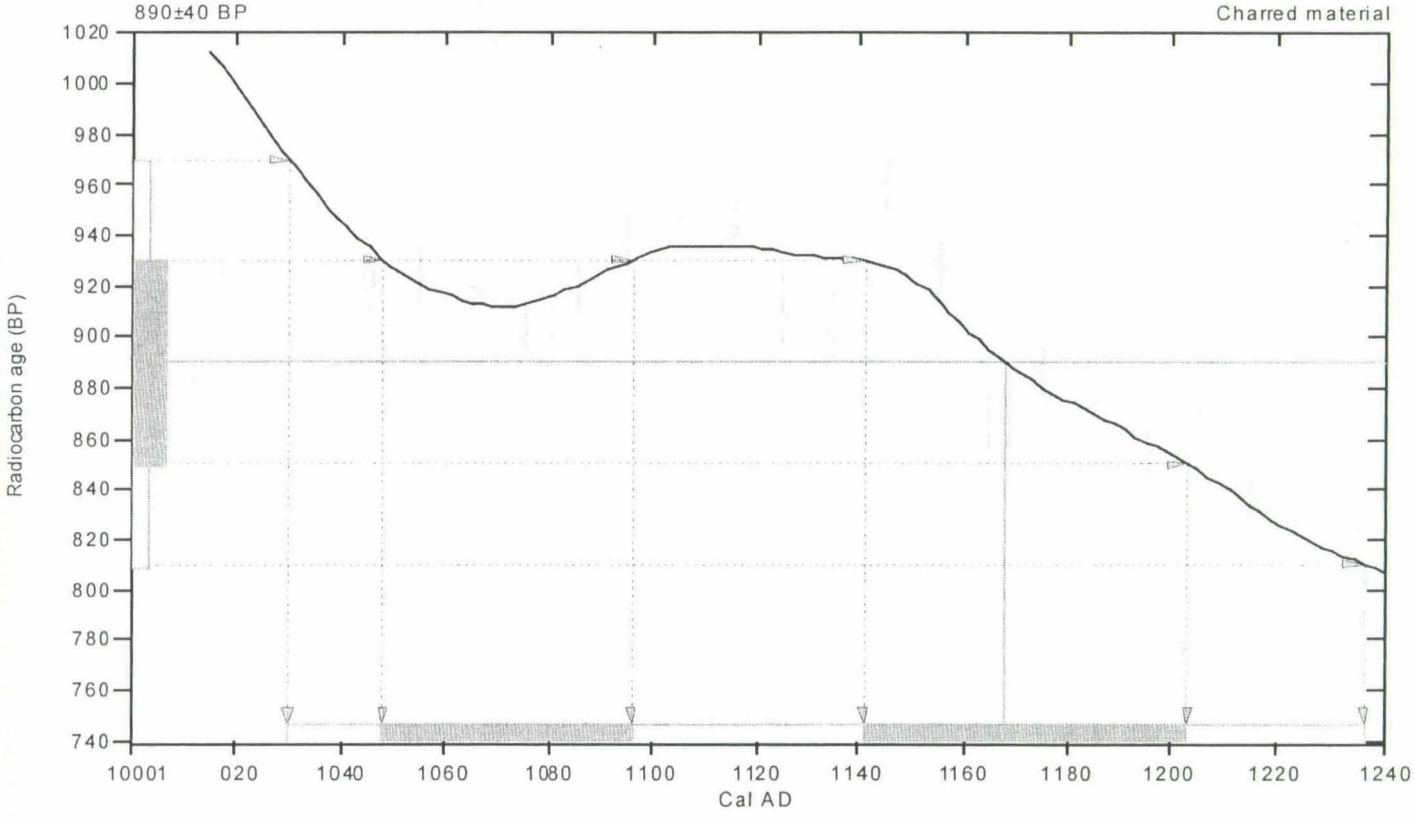
Conventional radiocarbon age: **890±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1030 to 1240 (Cal BP 920 to 710)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1170 (Cal BP 780)

1 Sigma calibrated results: (68% probability) Cal AD 1050 to 1100 (Cal BP 900 to 850) and Cal AD 1140 to 1200 (Cal BP 810 to 750)



References:

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DEC 2 2004
BY: GEOCON

MR. DARDEN HOOD
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

December 20, 2004

Dr. Lisa A. Battiato
Geocon Incorporated
41471 Corning Place
Suite 101
Murrieta, CA 92562
USA

RE: Radiocarbon Dating Result For Sample C-16

Dear Dr. Battiato:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis went normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Lisa A. Battiato

Report Date: 12/20/2004

Geocon Incorporated

Material Received: 12/9/2004

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 198962	950 +/- 40 BP	-27.9 o/oo	900 +/- 40 BP

SAMPLE : C-16
ANALYSIS : AMS-Advance delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1030 to 1230 (Cal BP 920 to 720)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.9:lab. mult=1)

Laboratory number: **Beta-198962**

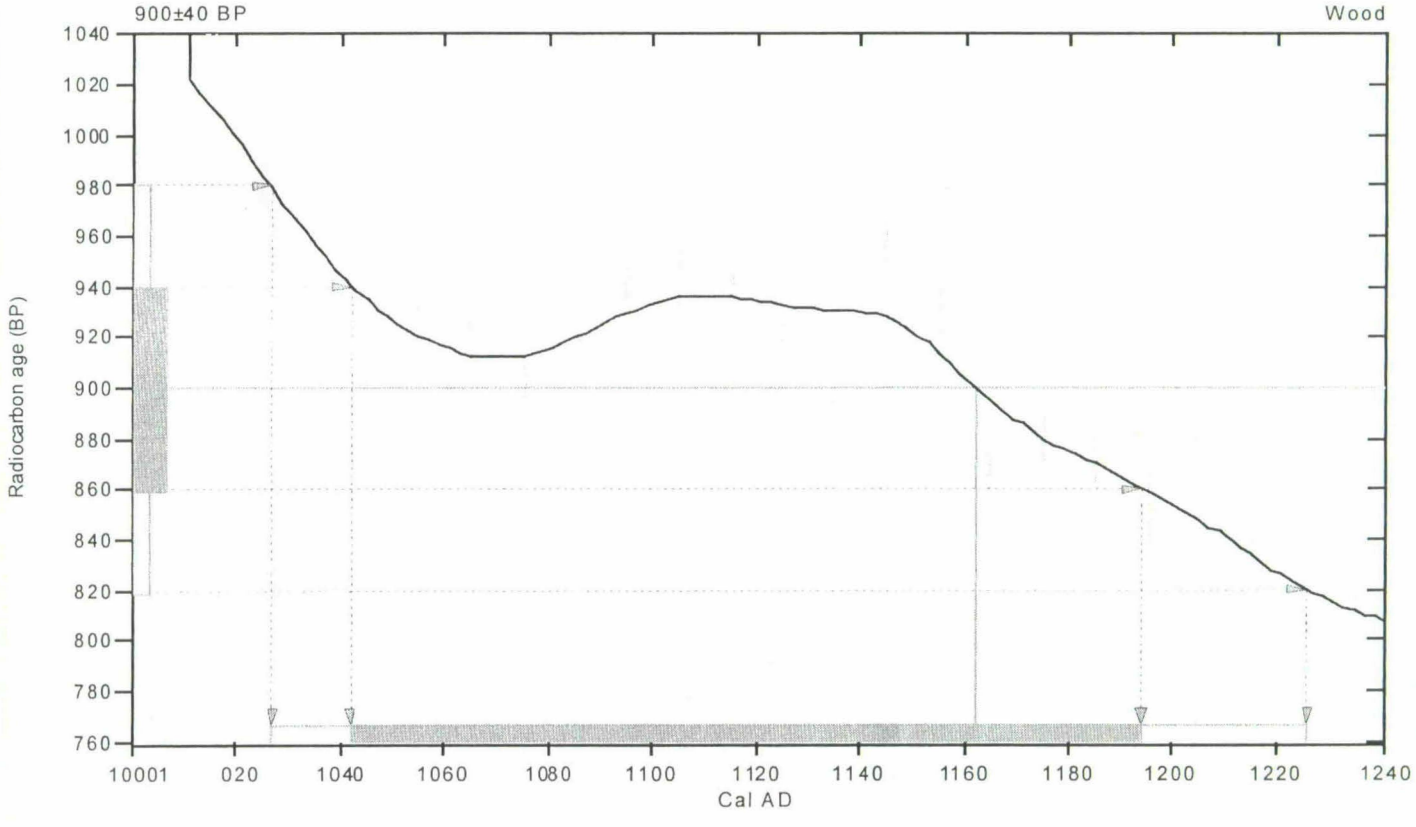
Conventional radiocarbon age: **900±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1030 to 1230 (Cal BP 920 to 720)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1160 (Cal BP 790)

1 Sigma calibrated result: (68% probability) Cal AD 1040 to 1190 (Cal BP 910 to 760)



References:

Database used

INTCAL98

Calibration Database

Editorial Comment

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INTCAL98 Radiocarbon Age Calibration

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Mathematics

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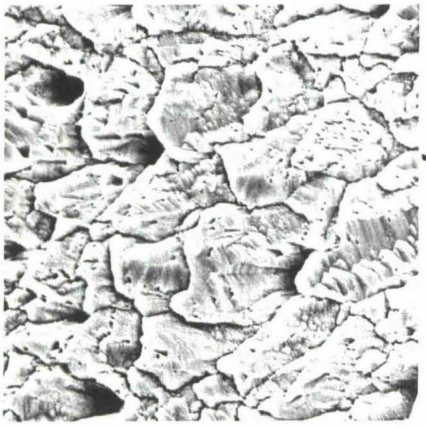
Mr. Darden Hood
Director

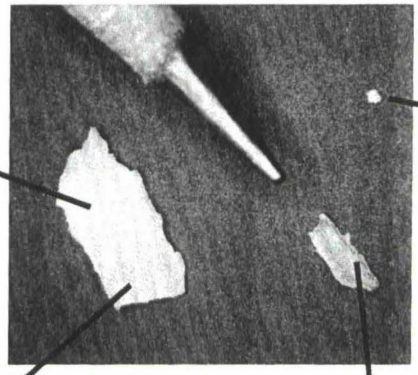
Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

SCANNING ELECTRON MICROSCOPY (SEM)
of materials submitted for radiocarbon dating

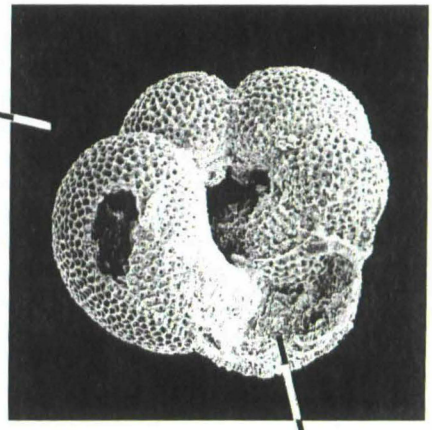
Scanning Electron Microscopy (SEM) can be used to magnify objects up to 50,000 times. SEM photographs showing microscopic details provide very useful information in the interpretation of radiocarbon dates. For instance, SEM can be used to distinguish primary vs. secondary shell structure and to identify very small wood, charcoal, and carbonate samples. SEM micrographs are also an excellent addition to reports and theses. We highly recommend this analysis through your own sources, or if not available, by our services.



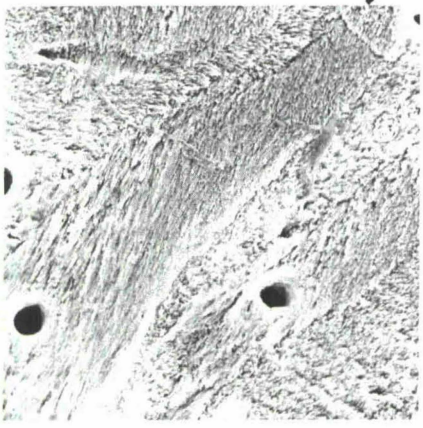
Primary $CaCO_3$, 690x, SEM



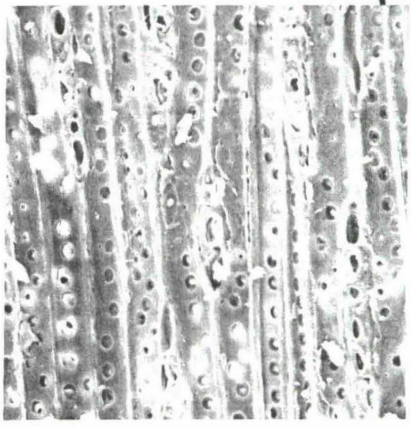
Samples and pencil point
6x, light photo



Planktonic foraminifera, 95x, SEM



Secondary $CaCO_3$, 690x, SEM



Cedar or cypress, 180x, SEM

$CaCO_3$ foram infilling, 1360x, SEM

APPROPRIATE MATERIALS: SEM is especially useful for AMS samples. It is recommended for: (1) very small carbonates which cannot be pretreated (forams, ostracods, coccoliths); (2) unidentified macrofossils concentrated from sediments; and (3) wood or charcoal for which some taxon identification is useful.

THE SERVICE & COST: Three (3) micrographs of various angles and/or magnifications are provided for each sample. Micrographs are obtained on a representative portion of the material submitted for radiocarbon dating, not on the dated material itself. The technician will usually be able to choose the angles and magnifications, which are most appropriate. The service does not include identification or characterization, but wherever possible, some will be provided.

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Mr. Darden Hood
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

Final Report

The final report package includes the final date report, a statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, billing documents (containing balance/credit information and the number of samples submitted within the yearly discount period), and peripheral items to use with future submittals. The final report includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied. The final report has been sent by mail and e-mail (where available).

Pretreatment

Pretreatment methods are reported along with each result. All necessary chemical and mechanical pretreatments of the submitted material were applied at the laboratory to isolate the carbon which may best represent the time event of interest. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated, making their ^{14}C ages more subjective than samples which can be fully pretreated. Some materials receive no pretreatments. Please look at the pretreatment indicated for each sample and read the pretreatment glossary to understand the implications.

Analysis

Materials measured by the radiometric technique were analyzed by synthesizing sample carbon to benzene (92% C), measuring for ^{14}C content in one of 53 scintillation spectrometers, and then calculating for radiocarbon age. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time. AMS results were derived from reduction of sample carbon to graphite (100% C), along with standards and backgrounds. The graphite was then detected for ^{14}C content in one of 9 accelerator-mass-spectrometers (AMS) .

The Radiocarbon Age and Calendar Calibration

The "Conventional ^{14}C Age (*)" is the result after applying $^{13}C/^{12}C$ corrections to the measured age and is the most appropriate radiocarbon age. If an "*" is attached to this date, it means the $^{13}C/^{12}C$ was estimated rather than measured (The ratio is an option for radiometric analysis, but included on all AMS analyses.) Ages are reported with the units "BP" (Before Present). "Present" is defined as AD 1950 for the purposes of radiocarbon dating.

Results for samples containing more ^{14}C than the modern reference standard are reported as "percent modern carbon" (pMC). These results indicate the material was respiring carbon after the advent of thermo-nuclear weapons testing (and is less than ~ 50 years old).

Applicable calendar calibrations are included for materials between about 100 and 19,000 BP. If calibrations are not included with a report, those results were either too young, too old, or inappropriate for calibration. Please read the enclosed page discussing calibration.

Beta Analytic Inc. - 4985 SW 74 Court, Miami, Florida 33155 USA - Tel: 305-667-5167 - Fax: 305-663-0964 - beta@radiocarbon.com

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic

Unless otherwise requested by a submitter or discussed in a final date report, the following procedures apply to pretreatment of samples submitted for analysis. This glossary defines the pretreatment methods applied to each result listed on the date report form (e.g. you will see the designation "acid/alkali/acid" listed along with the result for a charcoal sample receiving such pretreatment).

Pretreatment of submitted materials is required to eliminate secondary carbon components. These components, if not eliminated, could result in a radiocarbon date, which is too young or too old. Pretreatment does not ensure that the radiocarbon date will represent the time event of interest. This is determined by the sample integrity. Effects such as the old wood effect, burned intrusive roots, bioturbation, secondary deposition, secondary biogenic activity incorporating recent carbon (bacteria) and the analysis of multiple components of differing age are just some examples of potential problems. The pretreatment philosophy is to reduce the sample to a single component, where possible, to minimize the added subjectivity associated with these types of problems. If you suspect your sample requires special pretreatment considerations be sure to tell the laboratory prior to analysis.

"acid/alkali/acid"

The sample was first gently crushed/dispersed in deionized water. It was then given hot HCl acid washes to eliminate carbonates and alkali washes (NaOH) to remove secondary organic acids. The alkali washes were followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were eliminated. This type of pretreatment is considered a "full pretreatment". On occasion the report will list the pretreatment as "acid/alkali/acid - insolubles" to specify which fraction of the sample was analyzed. This is done on occasion with sediments (See "acid/alkali/acid - solubles"

Typically applied to: charcoal, wood, some peats, some sediments, and textiles "acid/alkali/acid - solubles"

On occasion the alkali soluble fraction will be analyzed. This is a special case where soil conditions imply
That the soluble fraction will provide a more accurate date. It is also used on some occasions to verify the present/absence or degree of contamination present from secondary organic acids. The sample was first pretreated with acid to remove any carbonates and to weaken organic bonds. After the alkali washes (as discussed above) are used, the solution containing the alkali soluble fraction is isolated/filtered and combined with acid. The soluble fraction, which precipitates, is rinsed and dried prior to combustion.

"acid/alkali/acid/cellulose extraction"

Following full acid/alkali/acid pretreatments, the sample is bathed in (sodium chlorite) $NaClO_2$ under very controlled conditions (Ph = 3, temperature = 70 degrees C). This eliminates all components except wood cellulose. It is useful for woods that are either very old or highly contaminated.

Applied to: wood

"acid washes"

Surface area was increased as much a possible. Solid chunks were crushed, fibrous materials were shredded, and sediments were dispersed. Acid (HCl) was applied repeatedly to ensure the absence of carbonates. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of each sample. The sample was not be subjected to alkali washes to ensure the absence of secondary organic acids for intentional reasons. The most common reason is that the primary carbon is soluble in the alkali. Dating results reflect the total organic content of the analyzed material. Their accuracy depends on the researcher's ability to subjectively eliminate potential contaminants based on contextual facts.

Typically applied to: organic sediments, some peats, small wood or charcoal, special cases

Beta Analytic Inc. - 4985 SW 74 Court, Miami, Florida 33155 USA - Tel: 305-667-5167 - Fax: 305-663-0964 - beta@radiocarbon.com

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic
(Continued)

"collagen extraction: with alkali" or "collagen extraction: without alkali"

The material was first tested for friability ("softness"). Very soft bone material is an indication of the potential absence of the collagen fraction (basal bone protein acting as a "reinforcing agent" within the crystalline apatite structure). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCI acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were also removed when replenishing the acid solutions. "With alkali" refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids. "Without alkali" refers to the NaOH step being skipped due to poor preservation conditions, which could result in removal of all available organics if performed.

Typically applied to: bones

"acid etch"

The calcareous material was first washed in de-ionized water, removing associated organic sediments and debris (where present). The material was then crushed/dispersed and repeatedly subjected to HCI etches to eliminate secondary carbonate components. In the case of thick shells, the surfaces were physically abraded prior to etching down to a hard, primary core remained. In the case of porous carbonate nodules and caliches, very long exposure times were applied to allow infiltration of the acid. Acid exposure times, concentrations, and number of repetitions, were applied accordingly with the uniqueness of the sample.

Typically applied to: shells, caliches, and calcareous nodules

"neutralized"

Carbonates precipitated from ground water are usually submitted in an alkaline condition (ammonium Hydroxide or sodium hydroxide solution). Typically this solution is neutralized in the original sample container, using deionized water. If larger volume dilution was required, the precipitate and solution were transferred to a sealed separatory flask and rinsed to neutrality. Exposure to atmosphere was minimal.

Typically applied to: Strontium carbonate, Barium carbonate
(i.e. precipitated ground water samples)

"carbonate precipitation"

Dissolved carbon dioxide and carbonate species are precipitated from submitted water by complexing them as ammonium carbonate. Strontium chloride is added to the ammonium carbonate solution and strontium carbonate is precipitated for the analysis. The result is representative of the dissolved inorganic carbon within the water. Results are reported as "water DIC".

Applied to: water

"solvent extraction"

The sample was subjected to a series of solvent baths typically consisting of benzene, toluene, hexane, pentane, and/or acetone. This is usually performed prior to acid/alkali/acid pretreatments.

Applied to: textiles, prevalent or suspected cases of pitch/tar contamination, conserved materials.

"none"

No laboratory pretreatments were applied. Special requests and pre-laboratory pretreatment usually accounts for this.

BETA

Consistent Accuracy ...
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Miami, Florida 33155 USA
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Beta@radiocarbon.com
Www.radiocarbon.com

Mr. Darden Hood
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

Calendar Calibration at Beta Analytic

Calibrations of radiocarbon age determinations are applied to convert BP results to calendar years. The short-term difference between the two is caused by fluctuations in the heliomagnetic modulation of the galactic cosmic radiation and, recently, large scale burning of fossil fuels and nuclear devices testing. Geomagnetic variations are the probable cause of longer-term differences.

The parameters used for the corrections have been obtained through precise analyses of hundreds of samples taken from known-age tree rings of oak, sequoia, and fir up to about 10,000 BP. Calibration using tree-rings to about 12,000 BP is still being researched and provides somewhat less precise correlation. Beyond that, up to about 20,000 BP, correlation using a modeled curve determined from U/Th measurements on corals is used. This data is still highly subjective. Calibrations are provided up to about 19,000 years BP using the most recent calibration data available.

The Pretoria Calibration Procedure (Radiocarbon, Vol 35, No.1, 1993, pg 317) program has been chosen for these calendar calibrations. It uses splines through the tree-ring data as calibration curves, which eliminates a large part of the statistical scatter of the actual data points. The spline calibration allows adjustment of the average curve by a quantified closeness-of-fit parameter to the measured data points. A single spline is used for the precise correlation data available back to 9900 BP for terrestrial samples and about 6900 BP for marine samples. Beyond that, splines are taken on the error limits of the correlation curve to account for the lack of precision in the data points.

In describing our calibration curves, the solid bars represent one sigma statistics (68% probability) and the hollow bars represent two sigma statistics (95% probability). Marine carbonate samples that have been corrected for $^{13}C/^{12}C$, have also been corrected for both global and local geographic reservoir effects (as published in Radiocarbon, Volume 35, Number 1, 1993) prior to the calibration. Marine carbonates that have not been corrected for $^{13}C/^{12}C$ are adjusted by an assumed value of 0 %0 in addition to the reservoir corrections. Reservoir corrections for fresh water carbonates are usually unknown and are generally not accounted for in those calibrations. In the absence of measured $^{13}C/^{12}C$ ratios, a typical value of -5 %0 is assumed for freshwater carbonates.

(Caveat: the correlation curve for organic materials assume that the material dated was living for exactly ten years (e.g. a collection of 10 individual tree rings taken from the outer portion of a tree that was cut down to produce the sample in the feature dated). For other materials, the maximum and minimum calibrated age ranges given by the computer program are uncertain. The possibility of an "old wood effect" must also be considered, as well as the potential inclusion of younger or older material in matrix samples. Since these factors are indeterminant error in most cases, these calendar calibration results should be used only for illustrative purposes. In the case of carbonates, reservoir correction is theoretical and the local variations are real, highly variable and dependent on provenience. Since imprecision in the correlation data beyond 10,000 years is high, calibrations in this range are likely to change in the future with refinement in the correlation curve. The age ranges and especially the intercept ages generated by the program must be considered as approximations.)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables used in the calculation of age calibration → (Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-123456**

The uncalibrated Conventional Radiocarbon Age (± 1 sigma)

Conventional radiocarbon age[1]: **2400±60 BP**

The calendar age range in both calendar years (AD or BC) and in Radiocarbon Years (BP)

2 Sigma calibrated result: **Cal BC 770 to 380 (Cal BP 2720 to 2330)**
(95% probability)

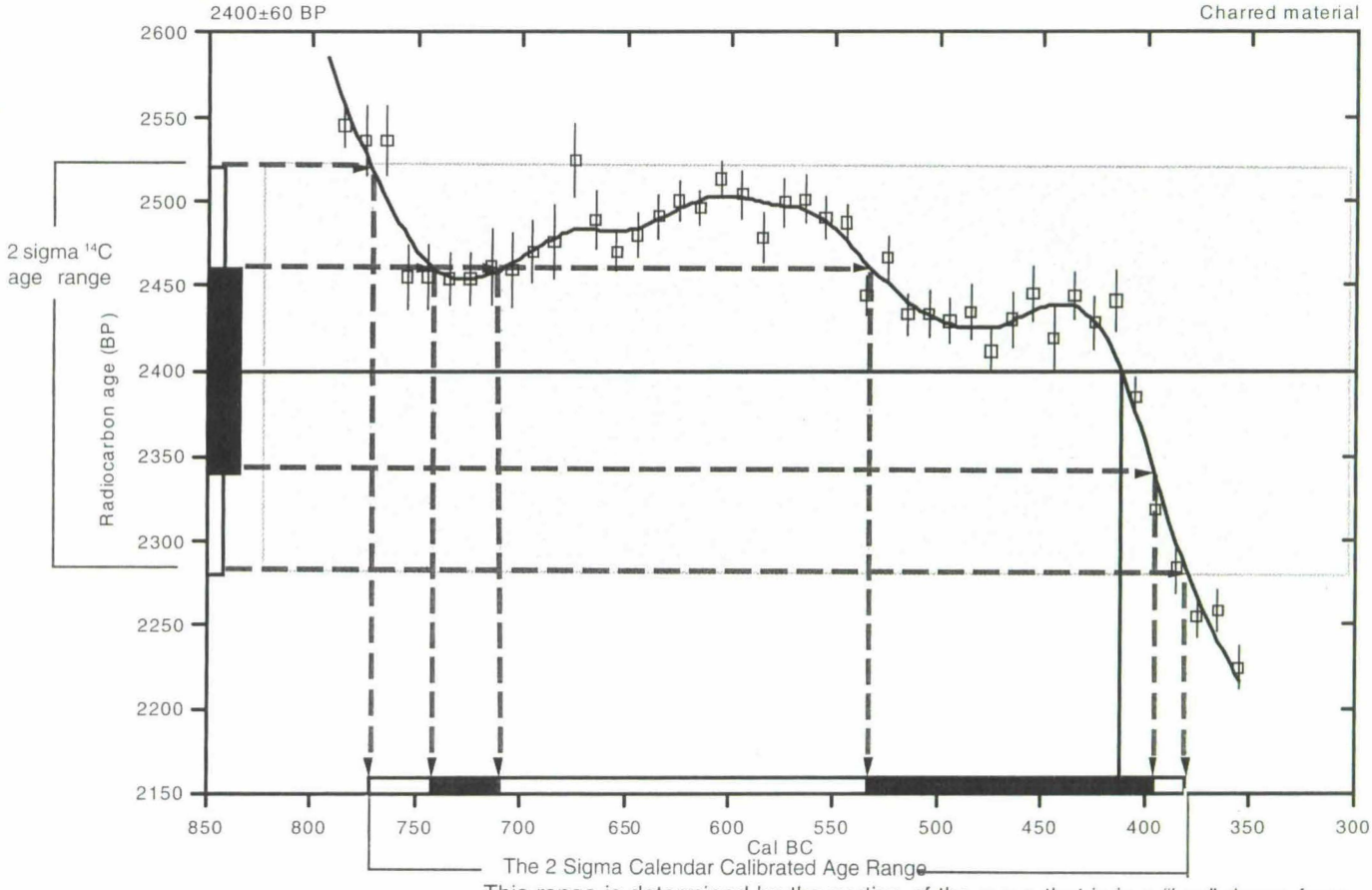
[1] C13/C12 ratio estimated

Intercept data

The intercept between the average radiocarbon age and the calibrated curve time scale. This value is illustrative and should not be used by itself.

Intercept of radiocarbon age with calibration curve: Cal BC 410 (Cal BP 2360)

1 Sigma calibrated result: (68% probability) Cal BC 740 to 710 (Cal BP 2690 to 2660) and Cal BC 535 to 395 (Cal BP 2485 to 2345)



This range is determined by the portion of the curve that is in a "box" drawn from the 2 sigma limits on the radiocarbon age. If a section of the curve goes outside of the "box", multiple ranges will occur as shown by the two 1 sigma ranges which occur from sections going outside of a similar "box" which would be drawn at the 1 sigma limits.

References:

Database used
Intcal 98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

References for the calibration data and the mathematics applied to the data. These references, as well as the Conventional Radiocarbon Age and the 13C/12C ratio used should be included in your papers.

Beta Analytic Radiocarbon Dating Laboratory

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GEO 1402

AP-3352

RESPONSE TO COUNTY OF RIVERSIDE REVIEW COMMENTS DATED JULY 8, 2005

Y.H. LYON LLC PROPERTY (GEO NO. 1402) APN'S 431-090-035 AND -044 SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL
CONSULTANTS

PREPARED FOR

Y.H. LYON, LLC
RANCHO CUCAMONGA, CALIFORNIA

JULY 27, 2005
PROJECT NO. T2279-12-01

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS

Project No. T2279-12-01
July 27, 2005

Y.H. Lyon, LLC.
10370 Trademark Street
Rancho Cucamonga, California 91730

Attention: Ms. Nikki Chumley

Subject: Y.H. LYON LLC PROPERTY (GEO NO. 1402)
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA
RESPONSE TO COUNTY OF RIVERSIDE REVIEW COMMENTS
DATED JULY 8, 2005

References:

1. *Geotechnical Investigation, Y.H. Lyon Property, APN's 431-090-035 and -044, San Jacinto, California*, prepared by Geocon Inland Empire, Inc., dated May 2, 2005 (Project No.T2279-12-01 and Geo No. 1402).

2. *Fault Investigation, Y.H. Lyon Property, APN's 431-090-035 and -044, San Jacinto, California*, prepared by Geocon Inland Empire, Inc., dated May 6, 2005 (Project No. T2279-12-01 and Geo No. 1402).

3. *Riverside County Building and Safety Department Review Comments, GEO No. 1402, City of San Jacinto Case No. TR 33072*, dated July 8, 2005

Dear Ms. Chumley:

We have prepared this response report to address the comments presented in the referenced County of Riverside review letter. This report will present each review comment in *italics* followed by our response.

1. *GEO No. 1402 references trench logs performed by Leighton and Associates and Geosoils. These logs should be provided as an appendix in the report. In addition, the consultant should provide discussion with regard to the geologic features (faults, lithology, etc.) documented in those logs and relate those features to ones observed in the Geocon trench. Furthermore, the location and trend of all faults encountered by Geocon and other consultants should be plotted on the geologic map for GEO No. 1402.*

Response: The Leighton and Associates (L&A) trench logs are included in Appendix B of this response. The Geosoils trench logs were produced in 1990 and referred to in their 2004 report, however, they were not depicted in the 2004 report and the 1990 report was not available for our review, as we stated in the last paragraph in Section 3 of the subject fault report. Geosoils 2004 report did discuss the faulting that was encountered within the trenches. Geosoils (and L&A) data correlated with our findings. Therefore, those trench locations were placed on our map to

provide additional supportive evidence of the fault location. The locations of the faults encountered by L&A and Geosoils were plotted on the Geologic Map and were utilized to trace the fault across the site. The L&A trenches were discussed in Section 3.0 of the subject report. Also discussed in Section 3.0 was the fact that we did not review the Geosoils trenches because they were not available. We reviewed a later Geosoils report which discussed their trenches and provided a fault trench location map. Therefore, we could not discuss the Geosoils trench logs.

2. *GEO No. 1402 refers to tectonic subsidence rates determined from wood samples obtained in drill holes. The consultant should provide the reference for this data (i.e. when and whom were the holes drilled).*

Response: The tectonic subsidence rates are discussed in an article entitled "Subsurface Deformation in Part of the San Jacinto Valley, Southern California" written by D.D. Morton and published in the *U.S.G.S. Journal of Research*, Vol. 5, No., 1 in 1977.

3. *GEO No. 1402 states a lineament was observed along the northeastern AP boundary during the lineament analysis. This lineament should be indicated on the geologic map. In addition, the consultant should indicate whether trenching intercepted the lineament and should provide an explanation of its existence.*

Response: The lineament has been added to the Geologic Map, Figure 1. The lineament is traversed by the Geocon fault trench at approximately Station 510 where undisturbed cross bedded sands were observed within the trench. Therefore, we do not believe that the lineament is due to faulting. This feature is most likely due to drainage as was observed to the northwest in our lineament analysis.

4. *GEO No. 1402 states at station 324, an offset bed was observed near the base of the trench. This offset is not indicated on the fault trench log. Please explain this apparent discrepancy and indicate if this is an active fault.*

Response: The offset was inadvertently mislocated at Station 330 during drafting. The log has been corrected to reflect the feature at Station 324. The feature is an abrupt vertical contact exposed at the bottom of the fault trench. A continuous sand bed was present above this feature and was not disturbed. The fault zone is considered to extend from this feature at Station 324 to Station 389.

5. *The fault trench log provided in GEO No. 1402 indicates offset bedding at station 335. However, this is not discussed in the text of the report. Please explain.*

Response: The offset located at Station 335 appears to have resulted in 6 inches of vertical movement, down to the southwest. However, this apparent vertical offset is likely the result of strike slip motion, due to the probability of strike slip (lateral) movement elsewhere within the trench (at Stations 345 and 394). The lateral movement is consistent with the character of the fault as exposed within the Geocon trench.

6. *GEO No. 1402 indicates a third rupture zone at station 390. The consultant should indicate the trend of this rupture zone.*

Response: The trend of the rupture at Station 390 is N44W with a dip of 56NE. The trench log has been amended to include this information.

7. *A vertical line is plotted on the trench log at station 330. The consultant should describe/define this feature.*

Response: This feature was not plotted correctly during drafting and should have been plotted at Station 324. The drafting error has been corrected as is reflected on the enclosed trench logs, Figures 2 and 3. See also Response to Comment No. 4, above.

8. *The GEO No. 1402 states the localized appearance of Unit M within the fault zone indicates that lateral movement is also likely to have occurred. Please explain.*

Response: Unit M was a very distinct unit which was not observed elsewhere within the trench. Due to the appearance of subsidence within the fault zone, and considering only vertical movement, if Unit M had merely been down-dropped within the fault zone, it should have appeared at a higher elevation southwest of the fault zone, as other units did. Furthermore, the units within the bottom approximately 8 feet of the fault trench can be correlated southwest of Station 394 and then change abruptly at the fault at Station 394 becoming consistent but totally different northeast of Station 394 within the bottom portion of the trench. Some minor vertical movement (drag) was observed along the rupture surface northeast of the fault at approximately Station 391. However, due to the lack of unit correlation across the fault, strike slip (lateral) movement seems to be the most plausible explanation.

9. *The consultant should provide an explanation for the sand filled fracture indicated at approximate station 425.*

Response: The sand filled fracture at approximate Station 425 is interpreted as a historic liquefaction feature. Further evidence for liquefaction in the vicinity of Station 425 are the soft sediment deformation and fluidized flame structures in silts immediately southwest of the fracture.

10. *The consultant should explain the line drawn on the trench log between approximate stations 182 and 187.*

Response: The line drawn between Station 182 and 187 at the depth of 13 to 16 feet depicts the subtle margin of a channel, which appeared to continue up from the channel contact below. The contact was gradational, poorly defined, and died out.

11. *The consultant should explain the brown silty sand indicated at approximate station 113.*

Response: The fracture filled with brown silty sand at Station 113 was not observed in the opposite trench wall, therefore, the possibility of a through-going fault like feature was eliminated. It was interpreted as a liquefaction feature similar to that observed at Station 425.

12. *GEO No. 1402 states a continuous 2 to 3 inch thick clay layer at a depth of 13 feet was observed from station 540 to the end of the trench at station 575. This is not indicated on the trench log. Please explain.*

Response: The clay layer is depicted on the trench log but is labeled as silt. This has been corrected on the trench log.

13. *The consultant should explain how they determined no additional active faults exists outside their zone of faulting (station 325-395), as trenching did not apparently extend below Holocene sediments.*

Response: Geocon determined that there was not evidence for active faults outside of the fault zone (Stations 324 through 389) based on the following:

a. The presence of down warped bedding observed only above the fault zone within the Geocon trench. Bedding outside of the fault zone was continuous and undeformed.

b. Although the trench did not extend through the Holocene sediments. There have been six historic events greater than magnitude 6.0 which have resulted in surface rupture in the San Jacinto Valley. The sedimentary profile observed within the Geocon trench represents approximately 3770±ybp southwest of the fault and approximately 1500 to 2000 ybp northeast of the fault. Therefore, if faulting were currently active outside of the designated fault zone evidence of that faulting should have been observed within the trench.

c. There was no geomorphic expression observed during the aerial photo review which would indicate faulting outside of the encountered fault zone or the lineament at Station 510 (which was determined to be a drainage feature).

d. In a discussion regarding the subject review comments, the County requested Geocon address the possibility of other exploration methods to get through the approximate 60+ feet of Holocene sediments within the site. Other exploration methods such as seismic data and Cone Penetrometer (CPT) drilling were considered for the project. Seismic data would not be effective due to the lack of distinctly different units beneath the site. The velocities of the various sedimentary layers would not be distinct enough to pick out areas of offset within the seismic profile. CPT correlations require very consistent wide spread units which can be correlated from boring to boring. The sediments encountered within the trench excavation were not continuous enough to develop a correlation from boring to boring to determine if they had been disturbed by faulting. Therefore, CPT data would also not be effective due to the variability of the different alluvial units in the meandering stream environment of the property.

14. *GEO No. 1402 states the Mr. Jones stated that, a 50 foot setback on either side of the "fault zone" would be appropriate given the evidence of recent rupture. The consultant should recall that the discussion with regard to fault setbacks was centered on the fact that the setback distance typically recommended by other consultants in the area 50 feet (SIC). Discussion was also had relative to the potential for narrower setbacks requiring additional trenching. Mr. Jones never stated that 50 feet was necessarily appropriate for the faulting encountered on this site. The consultant should provide their own recommendations with regard to what setback distance is appropriate and protective for this project.*

Response: Geocon believes that a 50 foot setback is appropriate for this project. Furthermore, due to the depth of Holocene sediments, Geocon does not believe a less conservative setback zone of less than 50 feet is appropriate.

15. *GEO No. 1402 states that Mr. Jones agreed that it would be appropriate to use the L&A trenches on Tract 30944 as offset trenches to align the setback zone. The consultant should recall that it was agreed that the consultant should review and consider the adjacent reports and the information contained in those report could aid Geocon in decision making and in the preparation of GEO NO. 1402. Hence, the consultant should review all of the pertinent information gained from their own research and that which is contained in the other reports in order to formulate their own conclusions and recommendations for this project.*

Response: Geocon did review the referenced reports by L&A and Geosoils and does believe that the information within the other consultant's reports is applicable to the subject project. Therefore, we have utilized the adjacent site information, as is a standard practice in Riverside County, to supplement our investigation and delineate the fault zone.

16. *GEO No. 1402 states it has been a standard of practice within the San Jacinto Valley to extend fault trenches to a depth of 18 feet where a fairly continuous silt layer (SIC). The consultant should explain; who's standard of practice is this and for what portion of the San Jacinto Valley has this been applied? Did Geocon encounter this silt layer? The consultant should note that in recent years, trenching along the Casa Loma Fault (SIC) in a portion of the Valley (East of Warren, North of Cottonwood, South of Ramona Expressway, West and East of Sanderson (SIC)) has indicated a need to extend fault trench excavations to depths deeper than 10 feet, which was a common practice in earlier years. A relatively continuous clayey silt layer has been found in some of the studies performed along the main mapped trace of the Casa Loma Fault (SIC) and it has been found to be very useful in the stratigraphic correlation by others. The ultimate depth of exploratory trenches should be evaluated by the consultant and should be based on site specific data.*

Response: The presence of the silt layer, its age, and depth have been discussed with several consultants who practice within the San Jacinto Valley and with the previous Riverside County Geologist, Mr. Wayne Harrison. Geocon did encounter two carbonate-rich lean clay layers (Units F and H) southwest of the fault. Either of these layers may have been the subject clay/silt layer but it is uncertain. It is acknowledged that a continuous layer exposed within a trench or series of trenches is useful for correlation. However, the age of this layer has not been determined. The presence of the clay/silt layer does not have any bearing on the subject project because actual carbon samples were obtained and age dated within Geocon's fault trench. Furthermore, the depth of the trenches was determined by Geocon and was based on site specific data.

17. *GEO No. 1402 provides age dates for 8 carbon samples. However, the report seems to indicate that a total of 16 samples may have been collected. Please explain.*

Response: As discussed within the second paragraph of Section 6.4, the eight samples were selected based on their location and the amount of carbon present. The eight samples which weren't submitted for age dating were either in the same stratigraphic unit as a larger carbon sample or were in a stratigraphic unit in which age dating information would not have provided enough additional information to offset the cost of dating the sample.

If you have any questions regarding this response report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

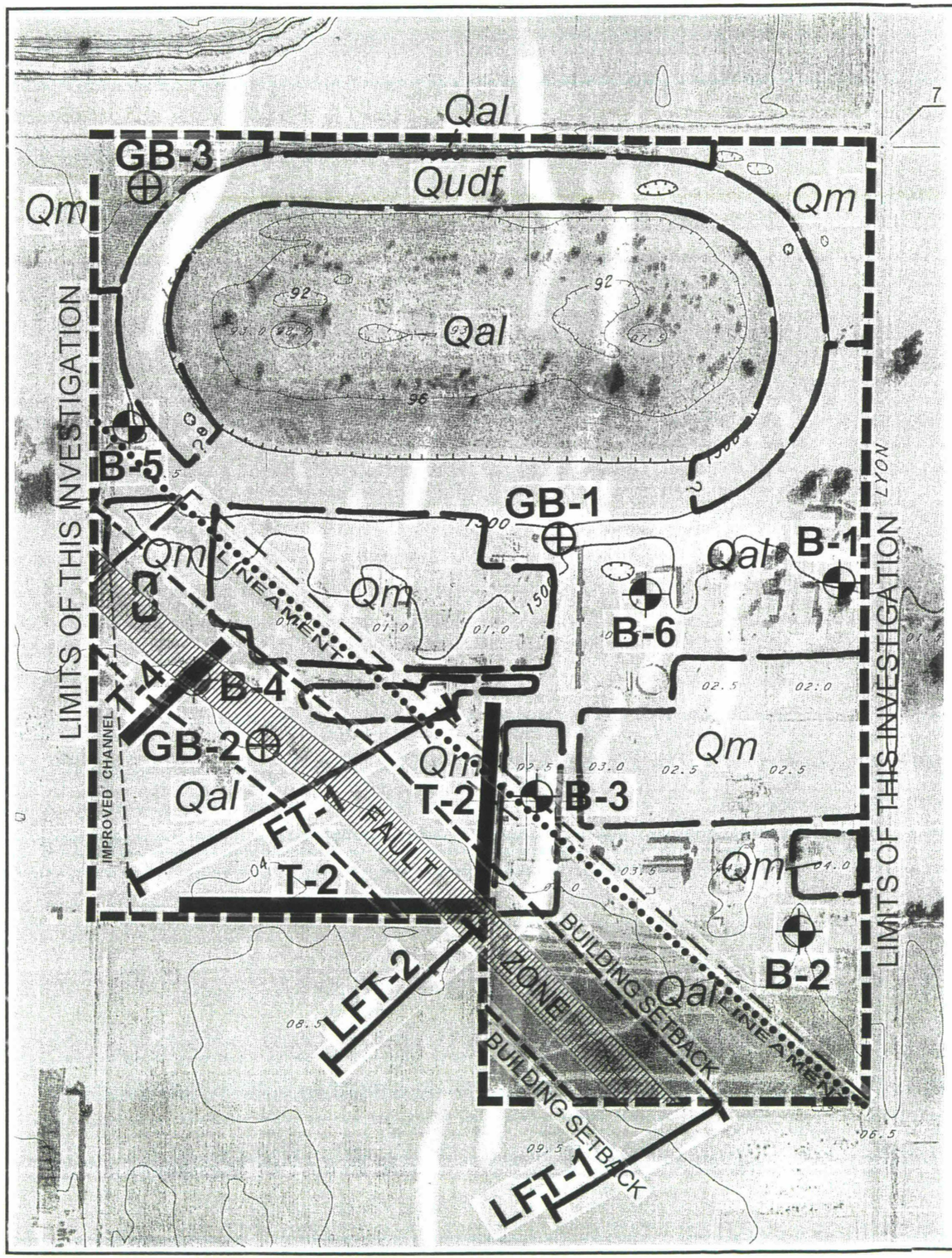
GEOCON INLAND EMPIRE, INC.

Robert R. Russell
GE 2042

Lisa A. Battiato
CEG 2316

LAB:RRR:tg
Enclosures: Figure 1 – Revised Geologic Map
Figures 2 and 3 – Revised Geocon Fault Trench Logs
Appendix A – Riverside County Review Sheet Dated July 8, 2005.
Appendix B – Leighton & Associates Fault Trench Logs, 2002

Distribution:
(6) Addressee
(3) County of Riverside Department of Building and Safety
Attention: Mr. David Jones



GEOCON LEGEND
(LOCATIONS ARE APPROXIMATE)

Qm	MANURE/ORGANIC IMPACTED SOIL
Qudf	UNDOCUMENTED FILL
Qal	ALLUVIUM
?	GEOLOGIC CONTACT (Queried Where Uncertain)
B-6	GEOCON BORING WITH RECOMMENDED REMOVAL DEPTH IN FEET
GB-3	GEOSOILS BORING, 2004
FT-1	FAULT TRENCH LOCATION
	AP ZONE BOUNDARY
T-4	GEOSOILS FAULT TRENCHES (T-2 & T-4), 1990?
LFT-2	LEIGHTON FAULT TRENCHES, 2002

SOURCE: RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT MAP, SECTION 28. T.4S., R.IW.,SBB & M, DATE OF PHOTOGRAPHY 5-30-89.

REVISED GEOLOGIC MAP
Y.H.LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE, SUITE 101 - MURRIETA, CA 92562-7065
PHONE 951 304-2300 - FAX 951 304-2392

SCALE 1"=200'	DATE 7-28-2005	
PROJECT NO. T2279-12-01		FIGURE 1
SHEET 1 OF 1		

APPENDIX A

COUNTY OF RIVERSIDE

TRANSPORTATION AND LAND MANAGEMENT AGENCY

Building and Safety Department

James J. Miller
Director

July 8, 2005

Pages 3 (including this cover)

San Jacinto Community Development Department
FAX: (951) 781-6014
Attention: Michelle Rambo, Contract Planner
(Hogle-Ireland, Inc.)

RE: Review Comments
GEO No. 1402
CITY OF SAN JACINTO CASE NO. TR33072

County Geologic Report (GEO) No. 1402, submitted for this City of San Jacinto project (TR33072), was prepared by Geocon and is entitled: "Fault Investigation, Y.H. Lyon LLC Property, APN's 431-090-035 and –044, San Jacinto, California", dated May 6, 2005.

Prior to scheduling this project for public hearing, the following clarification and/or additional information shall be submitted to the County Geologist for review and approval:

1. GEO No. 1402 references trench logs performed by Leighton and Associates and Geosoils. These logs should be provided as an appendix to the report. In addition, the consultant should provide discussion with regard to the geologic features (faults, lithology, etc.) documented in those logs and relate those features to ones observed in the Geocon trench. Furthermore, the location and trend of all faults encountered by Geocon and the other consultants should be plotted on the geologic map for GEO No. 1402.

2. GEO No. 1402 refers to tectonic subsidence rates determined from wood samples obtained in drill holes. The consultant should provide the reference for this data (i.e. when and by whom were the holes drilled).

3. GEO No. 1402 states a lineament was observed along the northeastern AP boundary during the lineament analysis. This lineament should be indicated on the geologic map. In addition, the consultant should indicate whether trenching intercepted this lineament and should provide an explanation for its existence.

4. GEO No. 1402 states at station 324, an offset bed was observed near the base of the trench. This offset is not indicated on the fault trench log. Please explain this apparent discrepancy and indicate if this is an active fault.

5. The fault trench log provided in GEO No. 1402 indicates offset bedding at station 335. However, this is not discussed in the text of the report. Please explain.

6. GEO No. 1402 indicates a third rupture zone at station 390. The consultant should indicate the trend of this rupture zone.

7. A vertical line is plotted on the trench log at station 330. The consultant should describe/define this feature.

8. GEO No. 1402 states the localized appearance of Unit M within the fault zone indicates that lateral movement was also likely to have occurred. Please explain.

9. The consultant should provide an explanation for the sand filled fracture indicated at approximate station 425.

10. The consultant should explain the line drawn on the trench log between approximate stations 182 and 187.

11. The consultant should explain the brown silty sand indicated at approximate station 113.

12. GEO No. 1402 states a continuous 2 to 3 inch thick clay layer at a depth of 13 feet was observed from station 540 to the end of the trench at station 575. This is not indicated on the trench log. Please explain.

13. The consultant should explain how they determined no additional active faults exist outside their zone of faulting (station 325-395), as trenching did not apparently extend below Holocene sediments.

14. GEO No. 1402 states that Mr. Jones stated that, a 50 foot setback on either side of the "fault zone" would be appropriate given the evidence of recent rupture. The consultant should recall that the discussion with regard to fault setbacks was centered on the fact that the setback distance typically recommended by other consultants in the area 50 feet. Discussion was also had relative to the potential for narrower setbacks requiring additional trenching. Mr. Jones never stated that 50 feet was necessarily appropriate for the faulting encountered on this site. The consultant should provide their own evaluation of the surface rupture potential and provide their own recommendations with regard to what setback distance is appropriate and protective for this project.

15. GEO No. 1402 states that Mr. Jones agreed that it would be appropriate to use the L&A trenches on Tract 30944 as offset trenches to align the setback zone. The consultant should recall that it was agreed that the consultant should review and consider the adjacent reports and the information contained in those reports could aid Geocon in decision making and in the preparation of GEO No. 1402. Hence, the consultant should review all of the pertinent information gained from their own research and that which is contained in the other reports in order formulate their own conclusions and recommendations for this project.

16. GEO No. 1402 states it has been a standard of practice within the San Jacinto Valley to extend fault trenches to a depth of 18 feet where a fairly continuous silt layer. The consultant should explain; who's standard of practice is this and for what portion of the San Jacinto Valley has this been applied? Did Geocon encounter this silt layer? The consultant should note that in recent years, trenching along the Casa Loma Fault in a portion of the Valley (East of Warren, North of Cottonwood, South of Ramona Expressway, West and East of Sanderson) has indicated a need to extend fault trench excavations to depths deeper than 10 feet, which was a common practice in earlier years. A relatively continuous clayey silt layer has been found in some of the studies performed along the main mapped trace of the Casa Loma Fault and

it has been found to be very useful for stratigraphic correlation by others. The ultimate depth of exploratory trenches should be evaluated by the consultant and should be based on site-specific data.

17. GEO No. 1402 provides age dates for 8 carbon samples. However, the report seems to indicate that a total of 16 samples may have been collected. Please explain.

Thank you for the opportunity to review this case for the City of San Jacinto. Please call me at (951) 955-2006 or David L. Jones at 955-6863 if you have any questions.

Sincerely,

RIVERSIDE COUNTY BUILDING AND SAFETY DEPARTMENT
James J. Miller, Building and Safety Director

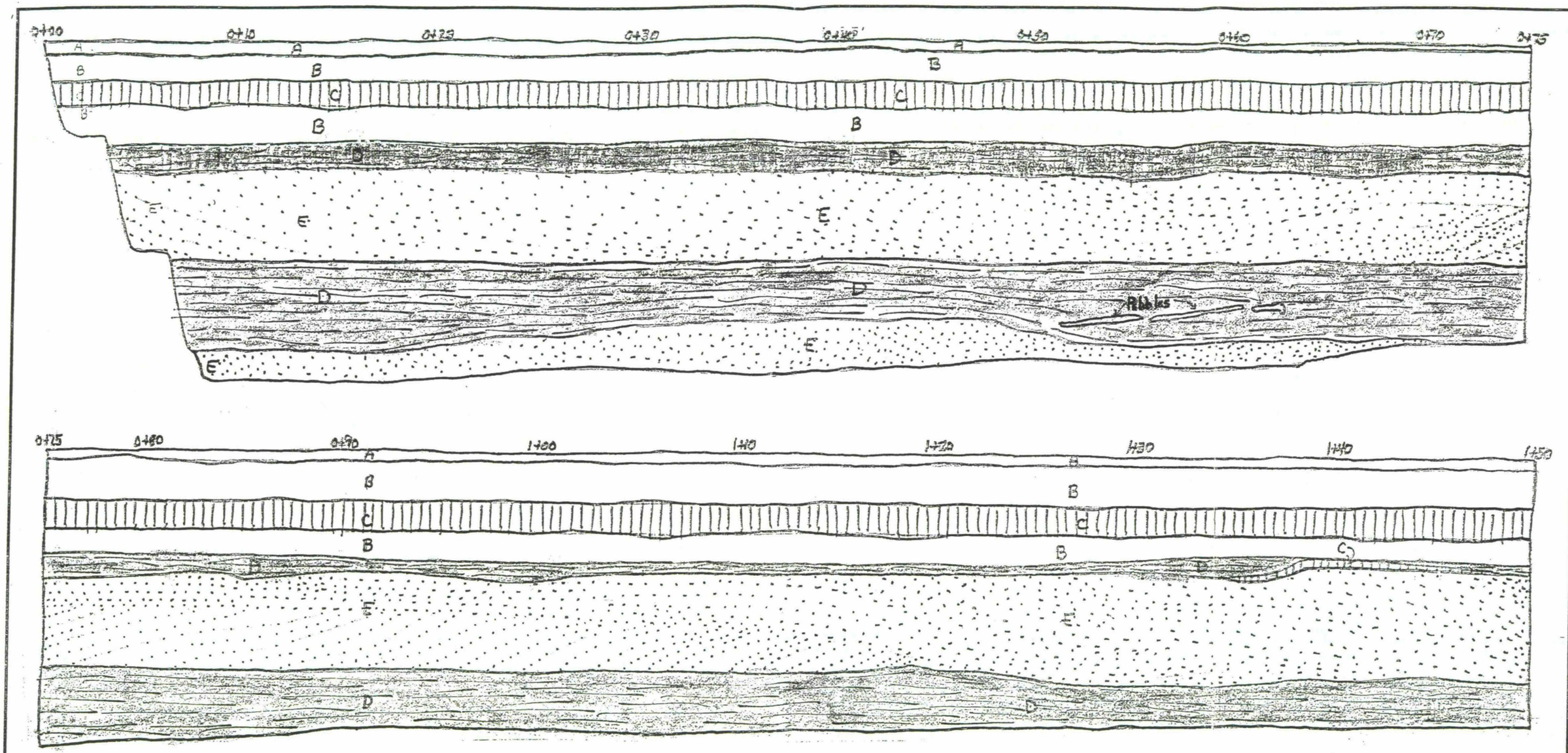
Brad Fagrell

Brad Fagrell, P.E.
Engineering Division Manager
Building and Safety Department

cc: Geotechnical Consultant: Geocon, Attn: Lisa Battiato (951) 304-2392
Applicant: Young Homes, Attn: Nikki Chumley (909) 291-7633
GEO01402

Y:\Geology\San Jacinto Reviews\GEO01402 Comments for TR33072.DOC

APPENDIX B

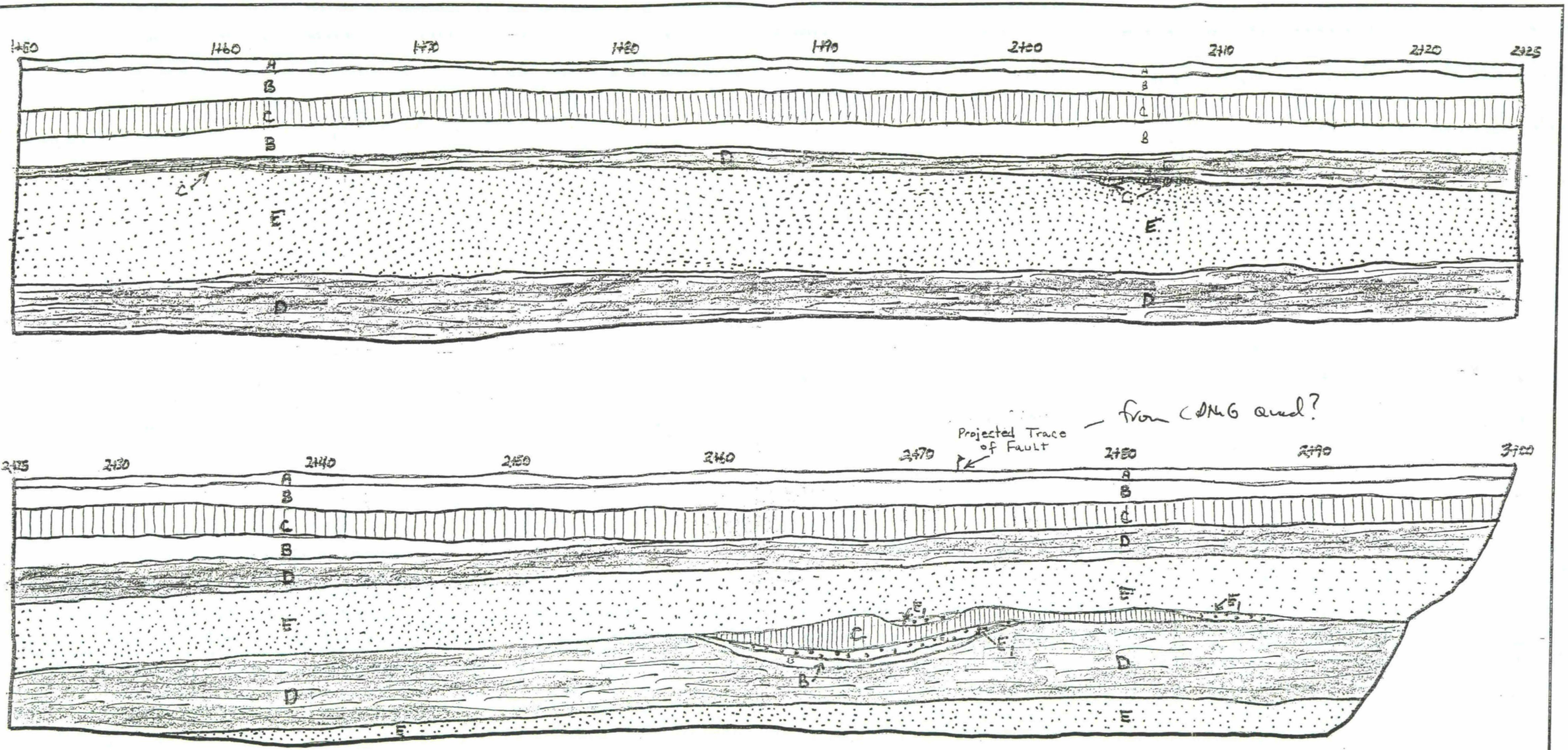


East Facing Wall
Trend S65W

FAULT TRENCH LOG LT-1
Riverside Valley Land Company
San Jacinto, California

Project No.	110808-001
Scale	1"=5'
Engr./Geol.	ATG/KAB
Drafted By	DLM
Date	November 2002

Appendix B



FAULT TRENCH LOG LT-1

Riverside Valley Land Company

San Jacinto, California

Project No.	110808-001
Scale	1"=5'
Engr./Geol.	ATG/KAB
Drafted By	DLM
Date	November 2002

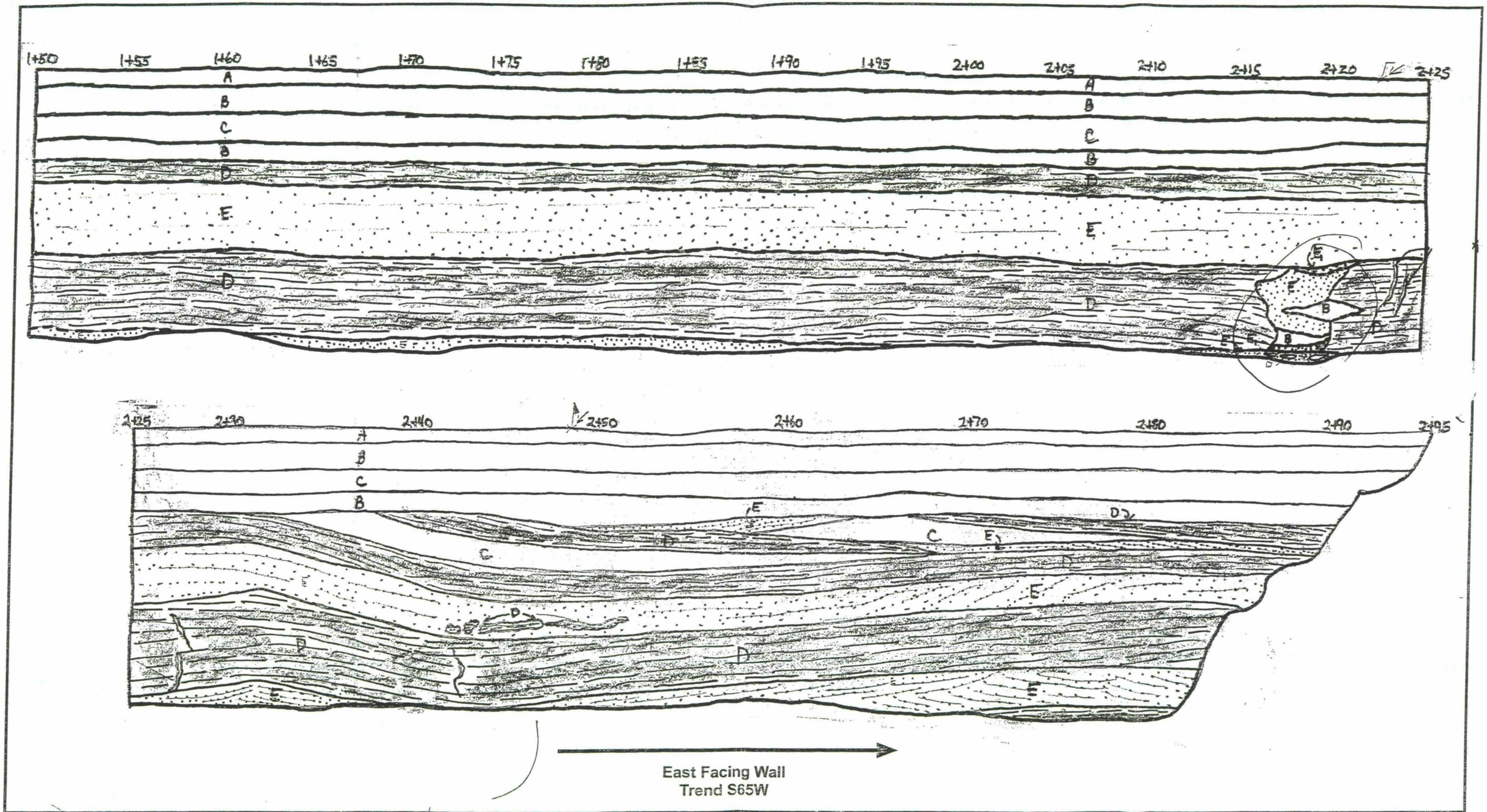
Appendix B

East Facing Wall
Trend S65W

FAULT TRENCH LOG LT-2
Riverside Valley Land Company
San Jacinto, California

Project No.	110808-001
Scale	1"=5'
Engr./Geol.	ATG/KAB
Drafted By	DLM
Date	November 2002

Appendix B



FAULT TRENCH LOG LT-2
Riverside Valley Land Company
San Jacinto, California

Project No.	110808-001
Scale	1"=5'
Engr./Geol.	ATG/KAB
Drafted By	DLM
Date	November 2002

Appendix B

GEO 1402
AP-3352 Rest. #2

RESPONSE TO COUNTY OF RIVERSIDE REVIEW COMMENTS DATED AUGUST 4, 2005

Y.H. LYON LLC PROPERTY
(GEO NO. 1402)
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL
CONSULTANTS

PREPARED FOR

Y.H. LYON, LLC
RANCHO CUCAMONGA, CALIFORNIA

AUGUST 11, 2005

Project No. T2279-12-01
August 11, 2005

Y.H. Lyon, LLC.
10370 Trademark Street
Rancho Cucamonga, California 91730

Attention: Ms. Nikki Chumley

Subject: Y.H. LYON LLC PROPERTY (GEO NO. 1402)
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA
RESPONSE TO COUNTY OF RIVERSIDE REVIEW COMMENTS
DATED AUGUST 4, 2005

References:

1. *Geotechnical Investigation, Y.H. Lyon Property, APN's 431-090-035 and -044, San Jacinto, California*, prepared by Geocon Inland Empire, Inc., dated May 2, 2005 (Project No.T2279-12-01 and Geo No. 1402).

2. *Fault Investigation, Y.H. Lyon Property, APN's 431-090-035 and -044, San Jacinto, California*, prepared by Geocon Inland Empire, Inc., dated May 6, 2005 (Project No. T2279-12-01 and Geo No. 1402).

3. *Response to County of Riverside Review Comments dated August 4, 2005, Y.H. Lyon LLC Property (GEO No. 1402), APN's 431-090-035 and -044, San Jacinto California,* prepared by Geocon Inland Empire, Inc. dated July 8, 2005 (Project No. T2279-12-01 and GEO No. 1402).

4. *Riverside County Building and Safety Department Review Comments, GEO No. 1402, City of San Jacinto Case No. TR 33072*, dated August 4, 2005

Dear Ms. Chumley:

We have prepared this response to address the comments presented in the referenced County of Riverside review letter. This response will present each review comment in *italics* followed by our response.

1. *As indicated in the County's July 8, 2005 comments letter GEO No. 1402 references trench logs performed by Leighton and Associates and Geosoils and these logs should be provided as an appendix to GEO No. 1402. Geocon's July 27, 2005 response to comments states, "the Geosoils trench logs were produced in 1990 and referred to in their 2004 report, however, they were not depicted in the 2004 report and the 1990 report was not available for our review". As these logs are critical to Geocon's interpretation of the location of the active fault on the site, the consultant should obtain*

the necessary geologic logs and provide copies of the Geosoils report, complete with logs, to the County Geologist for review. Alternatively, the consultant should conduct additional trenching on-site to accurately locate the active faults on this site.

Response: The 1990 and 2004 Geosoils reports are included in Appendix A. Leighton's logs were included in our County response dated July 27, 2005. The Leighton and Geosoils data has been plotted on the Revised Geologic Map, Figure 1. The combination of Geocon, Geosoils and Leighton trenches provide coverage across the AP Zone and cover the faults encountered within the trenches. Geocon's recommended building setback zone provides adequate building setback areas from the faulting encountered within the three consultant's trenches.

2. *Geocon's July 27, 2005 response to comments states: "Geosoils (and L&A) data correlated with our findings". However, no meaningful discussion or description of the findings and correlation is presented. The consultant should indicate specifically what data and how the data correlates with Geocon's (and L&A's) findings. The consultant should also indicate how they know the data correlates with their findings when they apparently do not have the necessary data to make such a correlation. It should be noted that no offset stratigraphy was observed in the L&A trenches and the County cannot find record of ever receiving the referenced Geosoils reports.*

Response: The L&A trenches were reviewed and were included in the initial response to County comments dated July 27, 2005. The correlation between the Leighton trenches and what Geocon observed onsite are the presence of channel-like features within both the Leighton trench (LFT-2) and the Geocon trench at depths of 10 to 15 feet. Faulting was observed below the channel-like features within the Geocon trench and Geocon believes that the channel-like features within the Leighton trench may also indicate that faulting occurred at depth at that location as well. The Geosoils trenches indicate steeply dipping to vertical faults which appear to have resulted in approximately 2 to 3 inches of vertical offset (down to the northeast. Although the offset is what would be expected along this fault (down to the northeast), the apparent offset in the Geosoils trenches could also be the result of strike-slip motion as is interpreted in the Geocon trench. Additionally, the trend of the faults project to the faulting encountered within the Geocon trench.

3. *As indicated in the County's July 8, 2005 comments letter GEO No. 1402, the location and the trend of all faults encountered by Geocon and other consultants should be plotted on the geologic map for Geo No. 1402. By plotting this data, the consultant and the reviewer can more readily evaluate whether the trenching performed, to date, provides adequate coverage for any reasonable projection of faulting across this site.*

Response: The trend of the faulting encountered within the Geocon trench has been plotted on the Revised Geologic Map, Figure 1. Leighton did not indicate the trend of the features that they encountered within their trenches. However, they correlated the features between their two trenches and projected the fault between the trenches. We have plotted Leighton's disturbed zones on the Revised Geologic Map. The fault attitudes from the Geosoils trenches are also plotted on the Revised Geologic Map, Figure 1.

4. *Geocon's July 27, 2005 response to comments provides clarification with regard to apparent mislabeled and/or mislocated geologic features within the original trench logs. However, the response creates additional confusion with regard to the actual limits of faulting at this site. Specifically, response to County comment #4 states: " the fault zone is considered to extend from this feature at Station 324 to Station 389". Response to County comment #5 states*

"...due to the probability of strike slip (lateral) movement elsewhere within the trench (at Station 345 and 394)". Response to County comment #6 states "the trend of rupture at Station 390...". The consultant should explain this apparent discrepancy, review their data and make a final determination with regard to the limits of the fault rupture potential at this site.

Response: The fault zone is 70 feet wide extending from Station 324 through 395. The two faults at stations 345 and 395 exhibit what appears to be strike slip motion. A strike-slip fault (referred to at Station 394) extends from Station 390 to 395 due to the dip of the feature.

To reiterate our interpretation of the fault zone and to further clarify any outstanding issues with respect to the fault zone it is further discussed herein: The fault zone extends from Station 324 through Station 395. A lateral discontinuity observed at the base of the trench at Station 324 was observed beneath a channel. Due to its appearance on the opposite trench wall it is interpreted as a through-going feature and considered to be the southwestern fault zone limit. A vertical fault at Station 335 appears to have offset sediments in the lower portion of the trench (6 inches down to the southwest. Because this movement is opposite of what would be expected along this fault, it is likely that this fault moved in a strike-slip fashion. A group of three somewhat sinuous vertical faults at Stations 342 to 345 appears to offset sediments a total of 12.5 inches down to the northeast. The far northeastern branch of the three faults at Station 345 separates typical sedimentary layers noted the length of the trench to the southwest (Units E, F, G, and H) from a thick silt layer (L) and relatively unique yellow brown sand (M) not noted outside of Stations 345 through 395. These unique units terminate at the northeastern end of the fault zone at Station 395. Due to the appearance of these unique units, this portion of the fault zone appears to exhibit strike-slip motion.

5. *Response to County comment #5 states: "the offset located at Station 335 appears to have resulted in 6 inches of vertical movement down on the southwest". Response to County comment #5 also states, "the lateral movement is consistent with the character of the fault as exposed within the Geocon trench". The consultant should explain how this is consistent that the apparent motion is reverse that indicated by other faults depicted in the Geocon trench log and seems to be reverse that of what would be expected in this area. The consultant should also provide the trend of this fault.*

Response: The fault located at station 335 is a vertical fault across which it appears as though a sand bed was displaced 6 inches down to the southwest. Because this movement is opposite of what we would expect along this fault, and due to its vertical inclination, it is likely a strike-slip fault. The strike slip movement is consistent with our interpretation of the faulting that occurred from Station 345 to 395. The trend of the fault at Station 335 is N51W dipping 84SW. The trend has been plotted on the trench log, Figure 3, and the Revised Geologic Map, Figure 1. See also the response to Comment #4, herein.

6. *Response to County comment #11 states: "the fracture...at Station 113..." was eliminated as a through going fault like feature. Response to County comment #11 also states "it was interpreted as a liquefaction feature similar to that observed at Station 425". The consultant should explain if the feature indicated at Station 425 was only observed on one side of the trench, as is the reasoning provided for eliminating the feature at Station 113 as fault related. It should be noted that the feature indicated at Station 425 appears to be confined to a much shallower depth than the feature at Station 113 and it also appears to be underlain by undisturbed strata. The feature indicated as Station 113 was apparently not unearthed to a deep enough depth to concluded*

undisturbed strata beneath it. Also, the trench log (Fig. 2) does not clearly indicate the material on either side of this feature is the same strata (UnitI1?). Hence, the consultant should provide additional consideration at to how it can be reasonably concluded that the feature indicated at Station 113 is not indicative of active faulting at depth.

Response: The feature at Station 425 was only observed on the southeast sidewall of the trench, it was not present within the northwest wall. Units H and F are continuous, undisturbed clay layers which overlie the Station 113 feature. No deformation of overlying layers was observed above the feature at Station 113. The material on either side of the feature is I_1 and the label has been added to the trench log, Figure 2. The features at stations 113 and 425 are at different depths. This could be due to liquefaction occurring at different times or simultaneous features which only propagated through certain layers. Therefore, it was determined that it was not necessary to deepen the trench at this location to observe the underlying strata. To reiterate: the feature located at Station 113 is not believed to be indicative of faulting at depth because: the units on either side of the feature are the same; the overlying units are continuous and undeformed; and it was not observed within the opposite trench wall and is therefore, not through-going.

If you have any questions regarding this response report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Lisa A. Battiato
CEG 2316

PROFESSIONAL GEOLOGIST
LISA A. BATTIATO
No. 2316
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

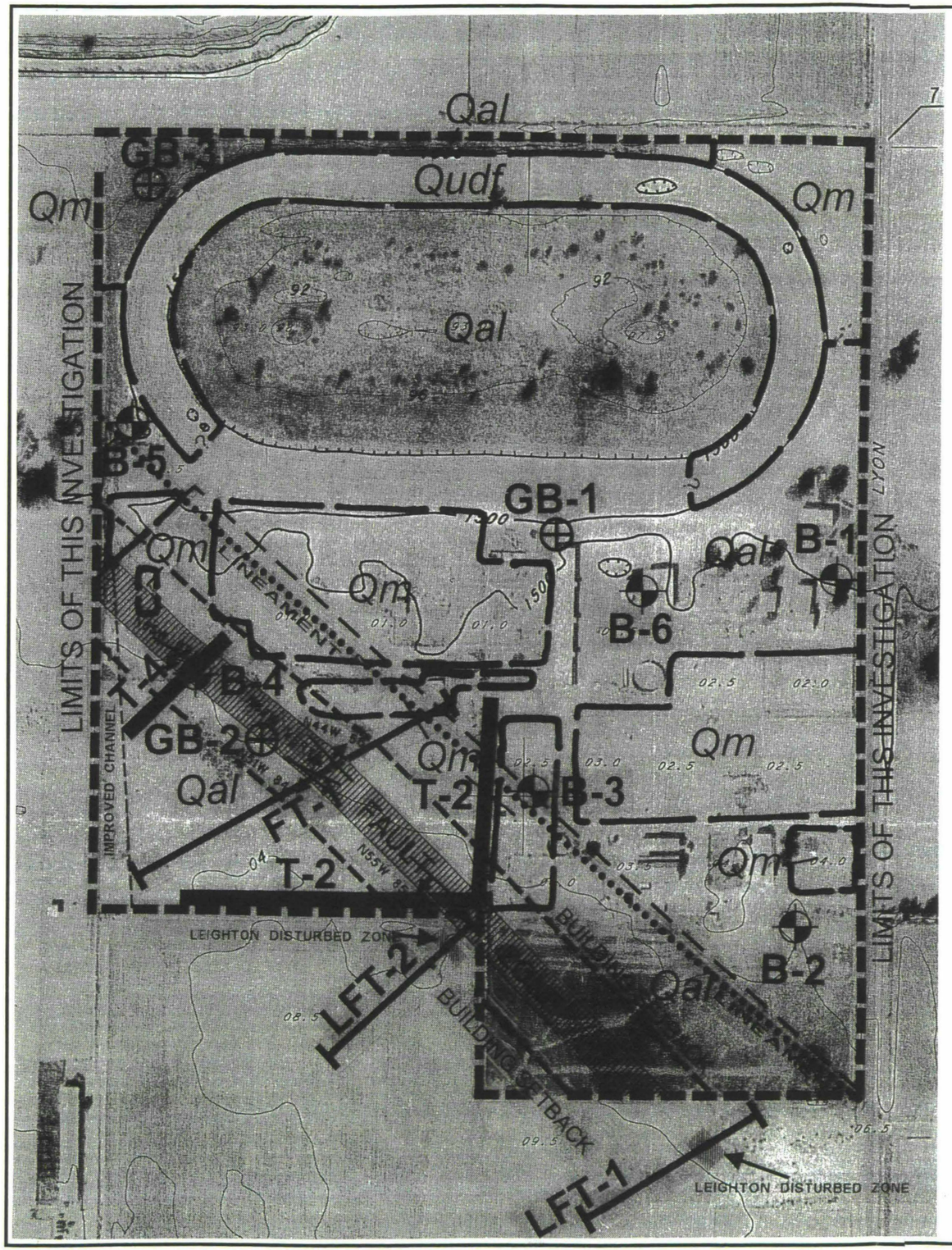
Robert R. Russell
GE 2042

REGISTERED PROFESSIONAL ENGINEER
ROBERT R. RUSSELL
No. 2042
EXP. 12/31/06
GEOTECHNICAL
STATE OF CALIFORNIA

LAB:RRR:tg

Enclosures: Appendix A –Geosoils Reports from 1990 and 2004
Figure 1 – Revised Geologic Map
Figures 2 and 3 – Revised Geocon Fault Trench Logs

(6) Addressee
(3) County of Riverside Department of Building and Safety
Attention: Mr. David Jones



GEOCON LEGEND
(LOCATIONS ARE APPROXIMATE)

Qm	MANURE/ORGANIC IMPACTED SOIL
Qudf	UNDOCUMENTED FILL
Qal	ALLUVIUM
?	GEOLOGIC CONTACT (Queried Where Uncertain)
B-6	GEOCON BORING WITH RECOMMENDED REMOVAL DEPTH IN FEET
GB-3	GEOSOILS BORING, 2004
FT-1	FAULT TRENCH LOCATION
N51W 84	FAULT ATTITUDE
	AP ZONE BOUNDARY
T-4	GEOSOILS FAULT TRENCHES (T-2 & T-4), 1990?
LFT-2	LEIGHTON FAULT TRENCHES, 2002

SOURCE: RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT MAP, SECTION 28. T.4S., R.IW.,SBB & M, DATE OF PHOTOGRAPHY 5-30-89.

N

REVISED GEOLOGIC MAP
Y.H.LYON LLC PROPERTY
APN'S 431-090-035 AND -044
SAN JACINTO, CALIFORNIA

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE, SUITE 101 - MURRIETA, CA 92562-7065
PHONE 951 304-2300 - FAX 951 304-2392

SCALE 1"=200'	DATE 08-11-2005	
PROJECT NO. T2279-12-01		FIGURE 1
SHEET 1 OF 1		

APPENDIX A

GeoSoils, Inc.

Geotechnical • Coastal • Geologic • Environmental

26590 Madison Avenue • Murrieta, California 92562 • (909) 677-9651 • FAX (909) 677-9301

March 23, 1990
W.O. 318-A-RC

Khaloghli & Associates
19600 Fairchild, Suite 240
Irvine, California 92715

Attention: Mr. Jeffrey Tartaglino

Subject: Preliminary Geologic and Soils Engineering Investigation, 100-Acre± Parcel Northeasterly of the Corner of Cottonwood Avenue and Kirby Street, San Jacinto Area, Riverside County, California

Gentlemen:

In accordance with your request and authorization, this report presents the results of our preliminary geologic and soils engineering investigation on the subject property. The primary purpose of this study was to evaluate the presence of previously mapped faults within the Alquist-Priolo Special Studies Zones and the presence of other faults outside of the Special Studies Zones. The secondary purpose of this study was to evaluate the onsite soils and geologic conditions and their effects on the proposed site development from a geotechnical viewpoint. The project site and field logs were reviewed by Dr. Roy J. Shlemon to provide a supplemental opinion on potential setback zones as well as recency of fault activity.

SCOPE OF SERVICES

The scope of our services has included the following:

1. Review of readily available geologic data for the area (Appendix A), including stereoscopic "false-color" infrared, and black and white aerial photographs and lineament analysis.

2. Geologic and geomorphic site reconnaissance.

3. Subsurface exploration consisting of the excavation by backhoe of 15 fault locating trenches and 6 borings at selected areas across the site.

4. Appropriate laboratory testing of representative soil samples collected during our subsurface exploration program.

5. Geologic and engineering analysis of the data collected.

6. Preparation of this report.

SITE DESCRIPTION

The site is an irregular-shaped parcel consisting of approximately 100 acres in the San Jacinto area of Riverside County, California (see the Site Location Map, Figure 1). The site is bounded to the south by Cottonwood Avenue and an adjoining agricultural parcel, to the west by the extension of Kirby Street and undeveloped property, to the north by the access road to the San Jacinto Reservoir, and to the east by Lyon Avenue and undeveloped and primarily agricultural property.

Residential and related agricultural structures currently occupy localized portions of the site. The southwest part of the property is currently being used for agricultural purposes. The northeast part of the site is being used for equestrian purposes. A large pile of dumped tree trimmings was observed in the west-central portion of the site. Overall the site is relatively flat and nearly level, sloping very gently to the north. A sinious slope about 4 to 6 feet in height occupies the southwesterly portion of the property. Topographic relief across the site ranges from a high of 1,516 feet MSL to a low of 1,498.7 feet MSL (17.3 feet).

PROPOSED DEVELOPMENT

It is our understanding that cut and fill grading techniques would be utilized to create design grades for the proposed residential development and associated interior roadways and utility improvements as well as "greenbelt" or park and/or flood control areas. It is also our understanding that the residential dwellings would consist of one- or two-story structures with slabs-on-grade and continuous footings, utilizing wood-frame construction. Building loads are assumed to be typical for this type of relatively light construction. The need for import soils is unknown.

FIELD STUDIES

Field studies conducted during our evaluation of the property consisted of the following:

1. Geologic reconnaissance and mapping.

2. Excavation of 15 exploratory backhoe trenches to evaluate the near surface soil and geologic conditions with respect to faulting, and the drilling of 6 small-diameter borings to evaluate the relatively deep soil and geologic conditions with respect to a geotechnical standpoint.

The trenches and borings were logged by geologists from our firm. The locations of the trenches and borings are presented on Plate 1. Logs of the trenches are presented on Plates 2 through 11. Logs of the borings are presented in Appendix B.

GEOLOGY

Regional Geologic Setting

The study area is located along the western edge of the San Jacinto Mountains, within the San Jacinto Valley (see Figure 2). The San Jacinto Valley represents a down-dropped, fault-bounded valley (graben) within the San Jacinto fault zone. The northwest trending valley is from 3200 to 4400 yards in width and is bounded on the west by the Casa Loma fault and on the east by the Claremont fault. The Hot Springs fault occurs east of the valley and joins the Claremont fault easterly of the study area. The Casa Loma fault and a splay of the Casa Loma fault cross the subject site.

Seismic and gravity surveys indicate that 6500 to 7900 feet of alluvial sediments overlie the basement bedrock in the valley (Lofgren and Rubin, 1975). In contrast, on either side of the valley, bedrock is exposed at the surface and rises to as high as 2000± feet above the valley. Studies suggest that the basement rock may be as shallow as 550 feet in depth on the westerly side of the Casa Loma fault (Bean and others, 1959).

The San Jacinto fault zone in recent years has demonstrated its active nature and potential for large magnitude earthquakes. Earthquakes attributed to this fault zone were reported in 1899 and in 1918, resulting in some destruction to the communities of San Jacinto and Hemet. Lately, lesser earthquakes have occured nearby and southerly of the site within the San Jacinto fault zone.

Recent studies have indicated that the San Jacinto Valley is also actively subsiding. Three factors acting collectively have probably been responsible for valley subsidence. These include: 1) down-faulting along the bordering fault zones (Lofgren and Rubin, 1975), 2) ground water withdrawal, and 3) hydrocompaction of low density alluvial deposits (Lofgren, 1976). The subsidence is primarily occurring along the western side of the valley.

Lineament Analysis

In order to identify possible unmapped faults and to evaluate topographic expressions of published fault traces, a lineament analysis was performed. As indicated previously, stereoscopic "false-color" infrared, and black and white aerial photographs (United States Department of Agriculture, 1980 and Riverside County Flood Control District, respectively) at a scale of approximately 1:40,000 and 1:12,000, respectively, were utilized in our lineament analysis.

Lineaments were classified according to their development as strong, moderate, or weak. A strong lineament is a well defined feature that can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well defined, somewhat discontinuous, and can be traced for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet or less. Each lineament was field checked during our reconnaissance mapping to determine possible origin. All of the lineaments observed on the site were classified as strong to moderate. The lineaments that transected the site within and without of the limits and of the Alquist-Priolo Special Studies Zones in a parallel to subparallel fashion. These lineaments trended northwest-southeast. The strong lineaments were intercepted by our trenches, as the likelihood of a moderate lineament being due to a fault could be evaluated by the presence or absence of a fault assoociated with a strong lineament.

Site Earth Materials

Earth materials within the project site consist of undocumented artificial fill, alluvium, and older alluvium. The earth materials are generally described below, and their limits are indicated on Plate 1. Supplemental descriptions are also included on Plate 2 for units encountered during our trenching operations.

Artificial Fill - Undocumented (Map Symbol - Afu)

Localized areas of undocumented fill materials were observed on the site. These materials generally consisted of dark olive brown, silty, fine-grained sand. The fill was damp and loose. These materials encountered ranged in thickness from 1 foot to 5 feet. These materials typically have a low to occasionally medium expansion potential, depending on the clay content. In addition, these materials are considered potentially compressible in their existing state and may settle appreciably under additional fill or foundation and improvement loadings, should they become saturated.

Quaternary Alluvium (Map Symbol - Qal)

Quaternary alluvium underlies the entire site. The alluvium was observed to be gray to olive gray to olive yellow, silty sands to fine- to coarse-grained sands with varying amounts of silt matrix. These materials were damp and loose to medium dense. Occasionally occurring olive gray, sandy silt beds were also encountered in the alluvium. The alluvium was thickly to massively bedded to cross bedded. This unit typically has a very low to low and occasionally medium expansion potential. The upper 3 feet (below original natural ground) is considered potentially compressible and may settle appreciably under additional fill or foundation loadings should they become saturated. Below about 3 feet, these materials were observed to be of a medium dense consistency and were poorly indurated. These sediments are estimated to be Holocene (less than 10,000± years old).

Quaternary Alluvium - Older (Map Symbol - Qalo)

Older Quaternary alluvium was encountered at depth in our trenches in the southwest portion of the site west of the sinious slope mentioned previously. These materials were light gray, fine- to coarse-grained sands with varying amounts of silt matrix. An olive gray, very fine-grained calcium carbonate layer was encountered in this unit. This older alluvial is massive to cross-bedded and grades. This unit typically has a very low to low to occasional medium expansion potential.

Geologic Structure

The geologic units on the subject property within the limits of our study were observed to be predominately thickly to massively bedded with some cross-bedded and lenticular areas. Bedding was typically faint and poorly to moderately well developed with occasional fining-upward sequences. Bedding was generally of a discontinuous nature and confined within lenses.

Jointing within the older alluvium and alluvium deposits was minimal and generally steeply inclined in a northeast direction. Faults within these units are described below. Continuous or consistent adverse bedding or joint systems were not noted during our field investigation. Based on the available data, there are no adverse geologic structures which are anticipated to adversely affect the proposed development. This should be further evaluated during site grading.

FAULTING AND REGIONAL SEISMICITY

As indicated previously, the site is situated in an area of active as well as potentially active faults. Major fault zones which could have a significant affect on the site should they experience activity would include the following:

Fault Zone	Distance from Site (Miles)
San Jacinto	0
San Andreas	13.5
Elsinore	18.5

The relationship of the site location to these major mapped faults is indicated on the Fault Map of Southern California (Figure 3). Other significant faults have been mapped in the San Jacinto-Hemet region. All of these are considered as part of the nearby San Jacinto fault zone which is characterized in this area as a relatively wide zone of faulting, consisting of a number of parallel or subparallel, en echelon fault strands or branches, which generally dip to the southwest. Faults in the San Jacinto fault zone include:

Fault	Approximate Distance from Site (Miles)
Casa Loma	0
San Jacinto	2.8±
Park Hill	3.0±
Hot Springs	3.5±
Claremont	3.7±

Since these faults are considered splays or branches of the San Jacinto fault zone, they are generally assigned equivalent potential for maximum earthquakes.

Our current study was performed in areas where faults were mapped or postulated to cross the site, where strong lineaments were observed, and within and without of the Alquist-Priolo Special Studies Zones.

In trench T-1, two steeply dipping (southwesterly) faults were encountered at approximate station number 380', trending northwesterly and vertically. About 1 1/2 to 2 1/2 inches of vertical displacement was noted at this location. These faults were located in an Alquist-Priolo Special Studies Zone and correlated with a previously mapped fault and strong lineament.

This strong lineament continues past the northwesterly limits of the Special Studies zone, and was intercepted by trenches T-4, T-8, and T-9. Steeply dipping (southwesterly) fault(s) were encountered in T-4, T-8, and T-9 at station numbers 70', 80' and 185', respectively. About 1 to 3 1/2 inches, 1 inch, and 1 inch of vertical displacement was noted in the faults in T-4, T-8, and T-9, respectively. Trench T-2 was excavated adjacent trench T-1 in order to further evaluate a suspected liquefaction feature. Trench T-2 confirmed that the feature observed in T-1 at station number 22' was due to liquefaction rather than faulting.

Trench T-3 was excavated to further evaluate the previously mapped trace of another series of faults along the western portion of the property, which lies in a separate Special Studies Zone. This trench was located near where these series of faults were projected/mapped to converge, south of a sinious break in slope (cross-section of the topography resembled a sine wave). Only one of the faults was encountered, however, at station number 275', and dipped steeply to the east. This fault was not associated with a lineament; however, the series of faults appeared to be associated with the sinious scarp. Trenches T-5 (which re-excavated, deepened, and extended the previous consultant's trench) and T-10 were located to intercept this trend. A possible fault in trench T-10 at station number 22', and continuing into T-5 at station number 18', appeared to correlate with the sinious scarp. The projection of the fault noted in T-3 was not encountered in trench T-5. Approximately 1/2 to 1 1/2 inches of vertical displacement was observed in the fault in T-3. Vertical displacement was not observed in the faults in T-5 and T-10, but bedding was dragged downward.

Trenches T-6 and T-7 were excavated in the westerly Special Studies zone to further evaluate the northerly trend of the previously mapped faults. These faults appear to diverge, however, and were only encountered in T-6, dipping steeply to the east. The western most faults appear to be associated with the sinious scarp mentioned previously, while the eastern-most fault appears to correlate with a strong northwesterly trending lineament that begins at this junction. T-12 was excavated to intercept the eastern-most fault within this zone. Evidence of faulting was not encountered in T-12.

Trench T-13 was excavated to further evaluate a previously mapped fault within the westerly Special Studies Zone, and down-strike from the fault encountered in trench T-1. A steeply dipping (easterly) fault was encountered, with about 2 to 3 inches of vertical displacement noted. This fault correlates with the faults mapped previously; however, it does not correlate with any strong lineaments.

It appears that the extensive agricultural ease of the land has obliterated any geomorphic expression of this fault in this particular area.

Trenches T-14 and T-15 were excavated along strong photolineaments outside of the Special Studies Zone, and evidence of faulting was not encountered. The lineaments are likely due to differential weathering along ancient flood channels where facies changes occur.

Discussion

As pointed out by Dr. Shlemon in the field, the liquefaction features noted in our trenches near the surface indicate that the water table was also near the surface in the recent past. As noted previously, the San Jacinto Valley is actively subsiding. It appears that the ground water withdrawal is probably responsible for the steep easterly dipping faults in trenches T-6 and T-11 and associated sinious scarp, which probably owes its configuration on the surface to a horizontal discontinuity at depth. The other faults not associated with the sinious scarp are likely due to tectonic movement and not ground water withdrawal. Although it is possible that the discontinuity and tectonic faults are related at depth, the sinious scarp appears to be the surface manifestation of this process.

Ground rupture within the site would most likely occur along these previously mentioned faults, either the tectonic or ground water withdrawal type. A setback (i.e., for habitable structures) of 50 feet is recommended for the area on each side of these faults. These setback zones are shown on Plate 1.

Seismic Parameters

Due to the proximity of the Casa Loma faults and because they are a branch of the San Jacinto fault zone, they are considered to be the "design faults" for the project area with a maximum credible earthquake of 7.5 M and a maximum probable earthquake of 7.2 M.

Peak horizontal ground acceleration from a maximum credible event could exceed 0.80 g and a maximum probable event could reach 0.70 g. More important for design criteria is the repeatable high acceleration (RHA) which is taken to be approximately 65 percent of the peak acceleration for sites less than 20+ miles from the epicenter (Ploessel and Slosson, 1974). The estimated horizontal design criteria for repeatable horizontal ground acceleration would therefore be about 0.51 g.

Numerous earthquakes have occurred in southern California. Many of these are historical in nature and lack adequate records.

Documentation is available, however, for various earthquakes which have occurred in southern California since 1912 having a magnitude of 6.0 on the Richter Scale. The possibility for ground acceleration at the site may be considered similar to the southern California region as a whole. Table I summarizes the results of a statistical analysis of southern California earthquakes data with respect to a 50-year life.

TABLE I
(after Housner)

Acceleration of Gravity	Probability of One Occurrence Per 100 Years
0.05	95%
0.10	88%
0.15	64%
0.20	40%
0.25	22%
0.35	4%

During a 50-year span, a structure on the site will likely be subjected to an earthquake of at least Richter magnitude of 6.0. Horizontal acceleration induced by an earthquake may affect earth structures and/or embankments.

Experience has shown that wood-frame structures designed in accordance with the Uniform Building Code (International Conference of Building Officials, 1988) tend to best resist earthquake effects. Earthquake effects may include lurching and/or localized ground cracking. This would be expected over other portions of southern California.

GROUND WATER AND CAVING

The regional ground water table was not encountered in the exploratory excavations. Typically, water levels within the San Jacinto Valley are on the order of several hundred feet deep. A resident on the site currently has a well that, according to the resident, has a ground water level of about 150 feet deep. Perched ground water was encountered in boring B-3 at a depth of 40 to 50 feet.

Minor caving occurred in some of our exploratory excavations at depths below three feet. Due to the non-cohesive materials that exist onsite, caving and sloughing should be anticipated in all subsurface excavations and trenching. Appropriate safety considerations for potential caving and sloughing, such as shoring or layback cuts, should be incorporated into the construction design details.

OTHER GEOLOGIC HAZARDS

Liquefaction is not anticipated to affect the site due to the absence of high ground water table. The potential for seiche (periodic oscillation of a body of water) should be considered due to the site's location with respect to the San Jacinto Reservoir and any future water storage in this facility. However, at the time of our study, water was not present in the reservoir. The effects of flooding should be evaluated by the project civil engineer.

Areas within the site were not identified as being susceptible to seismically induced landsliding or significant mass wasting. Adverse geologic structures (other than faulting) were not encountered during our subsurface investigation to the depths explored.

SUBSIDENCE

Areal subsidence in the setback zones is mitigated by the recommended setback zones for structures of human occupancy. Due to the sites location in an area of known subsidence, areal subsidence and its surface expression outside of the setback zones is considered highly unlikely, but, may not be totally precluded. At any rate, it should not be any greater at the site than for nearby and adjacent already developed properties.

However, ground subsidence is expected to occur over the site due to equipment working (vibrations) and the effect of loading of additional fill (weight). Again, both factors are variable and difficult to estimate.

Ground subsidence (consolidation) due to variations would depend upon the equipment being used, and dynamic effects of the equipment. Most of these factors cannot be determined at this time and may be beyond ordinary estimating possibilities.

Our evaluation indicates that ground subsidence, due to vibration/loading, may be on the order of 0.05-0.20 feet. In general, field subsidence should depend upon equipment, haul routes, duration of grading, and the effect of dynamic loading.

LABORATORY TESTING

Classification

Soils were classified visually according to the Unified Soils Classification System. The soil classifications are shown on the boring logs, Appendix B, and on the trench logs legend, Plate 2.

Moisture Density

The field moisture content and dry unit weight were determined for selected undisturbed samples of the soils encountered in the borings. Thee dry unit weight was determined in pounds per cubic foot and the field moisture content was determined as a percentage of the dry unit weight. The results of these tests are shown on the boring logs (Appendix B).

Laboratory Standard

The maximum density and optimum moisture content was determined for the major soil types encountered in the borings. The laboratory standard used was ASTM D-1557-78. The moisture-density relationships obtained for these soils are shown below:

	Soil Type	Location/ Depth (feet)	Maximum Dry Density-pcf	Optimum Moisture Content, %
A -	Light Olive Brown, Fine SAND	B-1 @ 4-6'	125.0	11.0
B -	Olive Brown, Silty, Fine SAND	B-3 @ 0-2'	125.0	8.0
C -	Gray, Medium to Coarse SAND	B-4 @ 4-6'	124.0	8.0
D -	Olive Brown, Sandy SILT	B-6 @ 16-18'	117.0	14.0

Expansion Testing

Expansion testing was performed for the most abundant soil type, according to UBC Standard No. 29-2 and outlined in Section 2904(b) of the Uniform Building Code (International Conference of Building Officials, 1988). The test results are indicated below as well as the expansion classification according to UBC Table No. 29.c.

	Soil Type	Expansion Index	Classification
B -	Olive Brown, Silty, Fine SAND	0	Very Low

Consolidation Testing

Consolidation testing was performed on selected undisturbed samples. The consolidation apparatus is designed to receive a 1-inch-high, soil-filled brass ring. Loads are applied in several increments in a geometric progression and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition of and release of pore fluid. Inundation of the samples was performed at a load of 1 kip/sq. ft., and the test results are shown in Appendix C.

EMBANKMENT FACTORS

Embankment factors (shrinkage) for the site have been estimated based upon our field and laboratory testing, visual site observations, and experience. It is apparent that shrinkage would vary with depth and with areal extent over the site based on previous site use. Variables include vegetation, weed control, discing, and previous filling or exporting. However, all these factors are difficult to define in a three dimensional fashion.

Therefore, the information presented below represents average shrinkage values:

Undocumented Fill	15-20% shrinkage
Alluvium	10-15% shrinkage
Older Alluvium	5-10% shrinkage

An additional shrinkage factor item would include the removal of individual large plants or trees. These plants and trees vary in size but, when pulled, they may result in a loss of 0.5 to 1.5 cubic feet to greater than 27 cubic feet of volume, respectively. This factor needs to be multiplied by the number of significant plants or trees present to determine the net loss.

The above factors indicate that earthwork balance for the site would be difficult to define and flexibility in design is essential to achieve a balanced end product.

CONCLUSIONS AND RECOMMENDATIONS

Based on our field exploration, laboratory testing, and our engineering and geologic analyses, it is our opinion that the project site is suited for the proposed use from a soils engineering and geologic viewpoint. The recommendations presented below should be incorporated in the design, grading, and construction considerations.

General

1. Soils engineering and compaction testing services should be provided during grading to aid the contractor in removing unsuitable soils and in his effort to compact the fill.

2. Geologic inspections should be performed during grading to verify and/or further evaluate geologic conditions. Although unlikely, if adverse geologic structures are encountered, supplemental recommendations and earthwork may be warranted.

3. Groundwater is not expected to be a factor in development of the site. However, caving and sloughing may be anticipated to be a factor in all subsurface excavations and trenching.

4. At the time of preparation of this report, the proposed finish pad grades, locations of any structures, types of structures and loading were unknown. The recommendations presented below should be reviewed and revised, if necessary, by the project's soils engineer and geologist when grading plans are finalized and become available prior to the start of grading.

5. General Earthwork and Grading Guidelines are provided at the end of this report as Appendix D. Specific recommendations are provided below.

Demolition/Grubbing

1. Existing shrubs, and any miscellaneous construction materials and debris should be removed from the site. If any stockpiles exist, they may be used as fill, provided that concentrations of vegetation, trash, and miscellaneous debris are removed prior to fill placement.

2. Any previous foundation, cesspools, septic tanks, leach fields, irrigation lines, standpipes, cisterns, or other subsurface structures, uncovered during the recommended removal, should be observed by GeoSoils, Inc. so that appropriate remedial recommendations can be provided.

3. In structural fill areas, cavities or loose soils (including all trenches) remaining after demolition and site clearance should be cleaned out, inspected by the soils engineer, processed, and replaced with fill which has been moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of the laboratory standard.

Treatment of Existing Ground

1. All existing fill materials should be removed to expose a natural ground surface. The underlying natural ground should then be processed as described below (Paragraph No. 2).

2. In proposed fill areas, the upper 30 to 36 inches of the underlying natural ground should be brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard. Recompaction may be obtained by a combination of surficial removals/replacement and scarification or processing from the surface if suitable compaction equipment (e.g., vibrating sheepsfoot) and adequate moisture content (optimum or greater) are utilized.

3. Existing fill and removed natural ground materials may be reused as compacted fill provided that major concentrations if vegetation and miscellaneous debris are removed prior to or during fill placement.

4. Where cuts are equal to or greater than 36 inches are proposed, the are should be cut to grade, then upper 12 inches below finish grade should be scarified, brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard.

5. Where the proposed cuts are 36 inches or less, the area should be cut to grade then the final surface should be scarified to an additional depth of 12 inches, or 36 inches minus the amount of cut, whichever is greater.

6. Localized deeper removals may be necessary due to buried drainage channel meanders or dry porous materials. The project soil engineer should determine the depth of the potentially compressible materials within the proposed fill area.

7. In order to achieve a uniform pad subgrade, cut portions of a transition (cut/fill) building pad should be overexcavated and replaced with compacted fill. Transition conditions (cut/fill) in pad areas should be mitigated by overexcavating the building pad area and 5 feet beyond in each direction to a depth of 18 inches.

Slope Consideration and Slope Design

All slopes should be designed and constructed in accordance with the minimum requirements of the local ordinances, the Uniform Building Code, the recommendations in Appendix D, and the following:

1. Fill slopes should be designed at 2:1 (horizontal to vertical) gradients and should not exceed 30 feet in height. Guidelines for slope construction are presented in Appendix D.

2. Cut slopes should be designed at gradients of 2:1 (horizontal to vertical) and should not exceed 20 feet in height. While stabilization of these slopes is not anticipated, adverse geologic conditions may be encountered which may require remedial grading, or laying back of the sloe to the angle of daylight.

3. Loose debris remaining on the face of the cut slope should be removed during grading. This can be accomplished by high pressure water washing or by hand scaling, as warranted.

4. Cut slopes should be mapped by the project engineering geologist during grading to allow amendments to the recommendations should exposed conditions warrant alteration of the design or stabilization.

Fill Placement

1. Fill materials should be brought to at least optimum moisture content, placed in thin 6 to 8 inch lifts and mechanically compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard.

2. Fill materials should be cleansed of major vegetation and debris prior to placement.

3. Any import materials should be inspected and determined suitable by the soils engineer prior to placement on the site. Foundation designs may be altered if import materials have a greater expansion value than the onsite materials encountered in this investigation.

4. Effort should be made to keep expansive soils lower than 3 feet from the finish grade.

Landscaping and Irrigation

1. The onsite materials generally consist of noncohesive sands and are subject to erosive factors such as wind, rain, and runoff. Slope surfaces should be landscaped as soon as possible. Slope vegetation should be consistent with the typical-desert varieties found in the local area.

2. Irrigation of the slope and pad area should be consistent with a desert-type landscape. Irrigation should be minimized to just support deep-rooting vegetation that is capable of surviving in an arid climate.

FOUNDATION DESIGN

1. An allowable bearing value of 1500 pounds per square foot may be used for design of continuous footings 12 inches wide and 12 inches deep. This value may be increased by 200 lbs./sq. ft. for each additional 12 inches in depth and by 100 lbs./sq. ft. for each additional 12 inches in width to a maximum value of 2,000 lbs./sq. ft.

   This value may be increased by one-third when considering short duration seismic or wind loads.

2. Soil generated from footing excavations to be used onsite should be moisture conditioned to at least optimum moisture content and compacted to 90 percent minimum relative density, whether it is to be placed inside the foundation perimeter or outside the building areas. This material must not alter positive drainage patterns that direct drainage away from the structural area and toward the street or approved open space.

3. Footings should maintain a horizontal distance, X, between any adjacent slope face and the bottom outer edge of the footing. The horizontal distance, X, may be calculated by using X=h/2, where h is the height of the slope. X should not be less than 5 feet, nor need not be greater than 10 feet. This may be accomplished by simply deepening the footing.

Lateral Pressure

1. The active earth pressure to be utilized for retaining wall design may be computed as an equivalent fluid having a density of 30 pounds per cubic foot when the slope of the backfill behind the wall is level. Where the slope of the backfill is 2:1, an equivalent fluid pressure of 45 pounds per cubic foot may be used.

2. Passive earth pressure may be computed as an equivalent fluid having a density of 250 pounds per cubic foot, with a maximum earth pressure 1500 pounds per square foot.

3. An allowable coefficient of friction between soil and concrete of 0.4 may be used with the dead load forces.

4. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

5. The above criteria assumes that hydrostatic pressure are not allowed to build up behind the wall. Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geotechnical fabric and exit pipes or adequate weep holes.

FOUNDATION CONSTRUCTION

The following foundation construction recommendations are presented as minimum criteria from a soils engineering viewpoint. Although the onsite soils expansion potentials are generally in the very low to occasional medium range, it is anticipated that soils with a low expansion potential will be the predominate soil type exposed during site grading.

Accordingly, the following foundation construction recommendations assume that the soils in the top 3 feet of finish grade will have a low expansion potential. Recommendations by the project's design-structural engineer or architect, which may exceed the soils engineer's recommendations, should take precedence over the following minimum requirements. Final foundation design will be provided based on the expansion potential of the near surface soils encountered during grading.

Expansion Index - Very Low to Low (0-50)

1. Continuous exterior footings should be founded at a minimum depth of 12 or 18 inches below the lowest adjacent ground surface, for one- or two-story structures, respectively. Continuous interior footings may be founded at a minimum depth of 12 inches below the lowest adjacent ground surface. Two-story footings should be 15 inches wide. All footings should have one No. 4 reinforcing bar placed at the top and one No. 4 reinforcing bar placed at the bottom of each footing.

2. Isolated column footings and piers should be founded at a minimum depth of 18 inches. If expansive soils are present in the top 3 feet of finish grade, column footings should not be used or should be made continuous.

3. A grade beam reinforced as above and at least 12 inches by 12 inches should be provided across the garage entrances. The base of the grade beam should be at the same elevation as the adjoining footings.

4. Concrete slabs within areas to be covered with moisture sensitive flooring should be underlain with a vapor barrier consisting of a minimum 6 mil, polyvinyl chloride membrane with all ends overlapped a minimum of 12 inches in each direction. This membrane should be covered with a minimum of 1 inch of sand to aid in uniform curing of the concrete.

5. The design engineer should determine the actual thickness of concrete slabs based upon proposed loading and use.

6. Concrete slabs, including garage areas, should be reinforced with 6-inch by 6-inch, No. 10 by No. 10, welded-wire mesh. All slab reinforcement should be supported to ensure proper positioning at mid-height in the slab during placement of concrete. Parking area or garage slabs should be poured separately from living/working area footings. A positive separation should be maintained with expansion joint material to permit relative movement.

7. Pre-moistening and/or presaturation of the slab areas is recommended for these soils conditions on a preliminary basis. The moisture content of the subgrade soils should be equal to or greater than optimum moisture and verified by GeoSoils, Inc. to a depth equivalent to the exterior footing depth in the slab areas, 48 to 72 hours prior to Visqueen placement.

Expansion Index - Medium (51 to 90)

1. Exterior footings for one- and two-story structures should be founded at a minimum depth of 18 inches below the lowest adjacent ground surface. Interior footings may be founded at a depth of 12 inches below the lowest adjacent ground surface. All footings should be reinforced with a minimum of two No. 4 reinforcing bars at the top and two No. 4 reinforcing bars at the bottom.

   Isolated interior and/or exterior piers/columns are not recommended.

2. A grade beam, reinforced as above and at least 12 inches square, should be utilized across any garage or parking area entrance and between piers/columns. The base of this reinforced grade beam should be at the same elevation as the bottom of the adjoining footings.

3. Concrete slabs in residential or moisture sensitive areas should be underlain with a total of 4 inches of washed sand or crushed rock. In addition, a vapor barrier consisting of a minimum of 6 mil, polyvinyl chloride membrane with all laps sealed or overlaid 12 inches should be provided. One inch of the sand should be placed over the membrane to aid in uniform curing of the concrete.

4. Concrete slabs, including garages or parking areas, should be reinforced with 6 inch by 6 inch, No. 6 by No. 6, welded wire mesh or its equivalent. All slab reinforcement should be supported or hook-pulled to ensure proper mid-slab positioning during placement of concrete.

5. Garage slabs should be poured separately from adjacent footings and be quartered with expansion joints or saw cuts. A positive separation from the footings should be maintained with expansion joint material to permit relative movement.

6. The design engineer should determine the actual thickness of the slabs based on loadings and use.

7. Presaturation of slab areas is recommended for these soil conditions. The moisture content of each slab area should be 120 percent or greater above optimum and verified by this office to a depth of 18 inches below adjacent ground grade in the slab areas, within 48 hours of the polyvinyl chloride placement.

8. In any additional concrete, flatwork, pools or wall designs, the expansive nature of the soils should be considered.

9. As an alternative, an engineered post-tension foundation system may be used.

TRENCH BACKFILL

1. All utility trench backfill, exterior and interior, should be brought to at least optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard. This may be accomplished by mechanical compaction or by the flooding of suitable soils; however, density testing of all materials would be required to verify the desired results.

2. Trenches paralleling a footing and extending below a 1:1 plane projected from the outside edge of the footing should be compacted to 90 percent of the laboratory standard. Imported, clean sand backfill should not be allowed in these trench backfill areas.

3. Density testing along with probing should be accomplished to verify the desired results in the backfill of all utility line trenches.

4. Due to the non-cohesive nature of the onsite materials, sloughing and caving within the subsurface trenches should be anticipated.

FAULT SETBACK ZONES

Recommended structural setbacks along the faults encountered onsite, based on the available data, are shown on the Preliminary Geotechnical Map, Plate 1. This zone should be surveyed and recorded by the Project Civil Engineer as necessary. The structural setbacks shown are subject to future studies, which may widen, decrease, or eliminate portions of the recommended setbacks.

Undetected, potentially active faults may exist within the property outside of the recommended setback zones. However, based on the available data these do not meet the "sufficiently active" or "well defined" criteria of the Alquist-Priolo Special Studies Zone Act. Although remotely possible, potentially active faults may exist or new faults possibly occur in unpredictable locations, it is impractical to zone entire fault-bounded areas for setbacks, based on the physical nature of soil and rock materials and the above criteria.

It should be noted, however, that due to the project areas location in a zone of known active faulting, although unlikely, it is remotely possible that the recommended removals and/or grading may expose fault traces that may warrant further study and/or structural setbacks. This should be considered during the planning and construction stages of the project.

PLAN REVIEW

Final project plans should be reviewed by this office prior to construction, so that construction is in accordance with this report. Based on our review, supplemental recommendations and/or further geotechnical studies may be warranted.

INVESTIGATION LIMITATIONS

The materials encountered on the project site and utilized in our laboratory are believed representative of the total area; however, soils materials may vary in characteristics between test excavations.

Since our investigation is based upon the site materials observed, selective laboratory testing, and geologic and engineering analyses, the conclusions and recommendations are professional opinions. It is possible that variations in the soil conditions could exist beyond the points explored in this investigation. Also, changes in groundwater conditions could occur at some time in the near future due to variations in temperature, regional rainfall, and other factors.

These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. This report is subject to review by the controlling authorities.

We sincerely appreciate this opportunity to be of service. If you have any questions pertaining to this report, please contact us at (714) 677-9651.

Very truly yours,

GeoSoils, Inc.

Sherry L. Eaton-Henson
Senior Geologist

John P. Franklin
Engineering Geologist, CEG 1340

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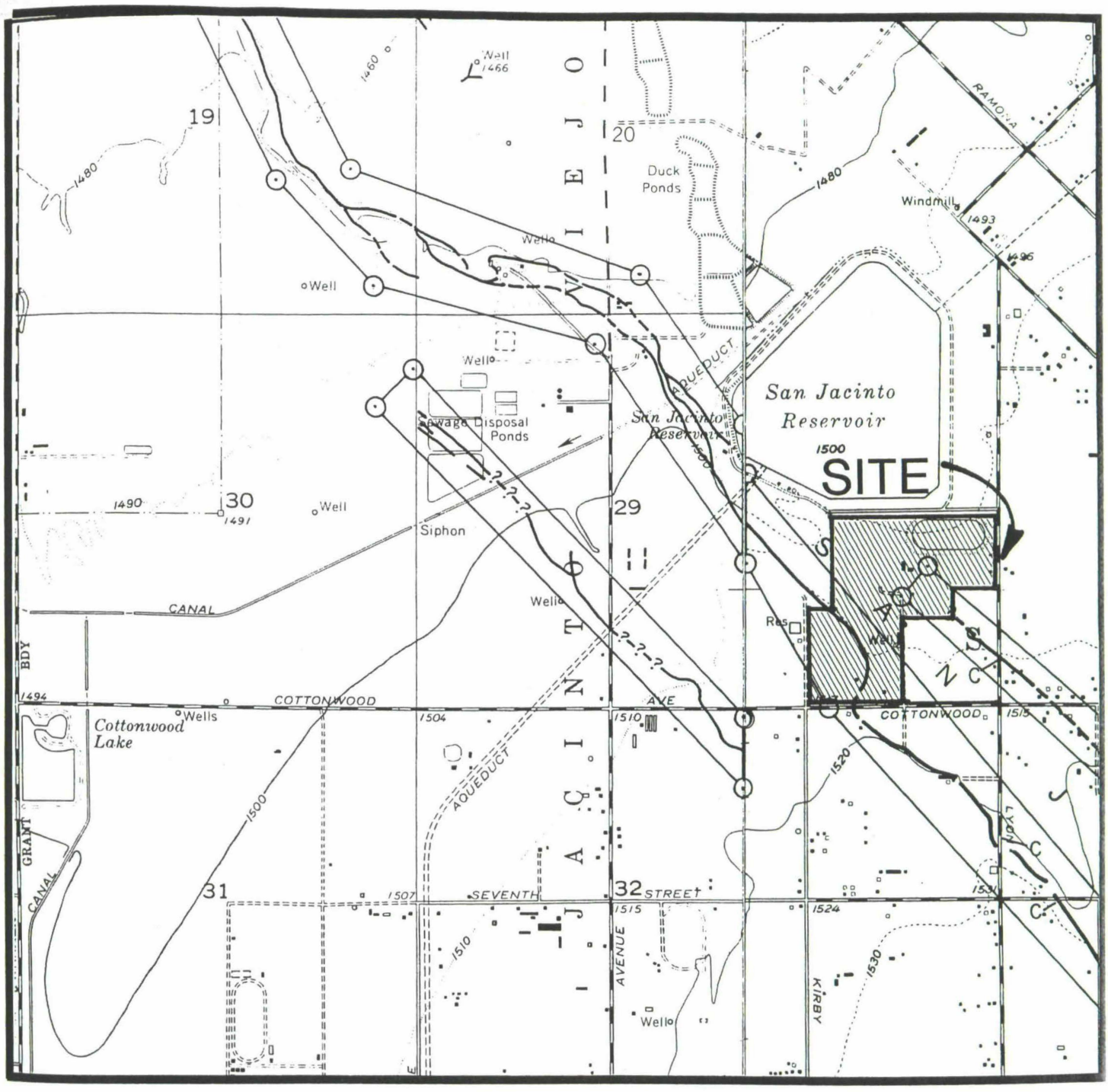
Civil Engineer, RCE 16351
Geotechnical Engineer, GE 476

SLE/JPF/ARK/slh

Enclosures:
- Figure 1 - Site Location Map
- Figure 2 - Regional Geologic Map
- Figure 3 - Fault Map of Southern California
- Appendix A - References
- Appendix B - Boring Logs
- Appendix C - Laboratory Test Results
- Appendix D - General Earthwork and Grading Guidelines
- Plate 1 - Preliminary Geotechnical Map
- Plates 2 through 11 - Trench Logs

Distribution: (6) Addressee



BASE MAP: State of California Special Studies ZONE Map,

7-1/2 Minute San Jacinto Quadragle, 1980, and Lakeview Quadragle, 1988, 1''-2000'

N

0 2000 4000

Scale Feet

GSI Inc.

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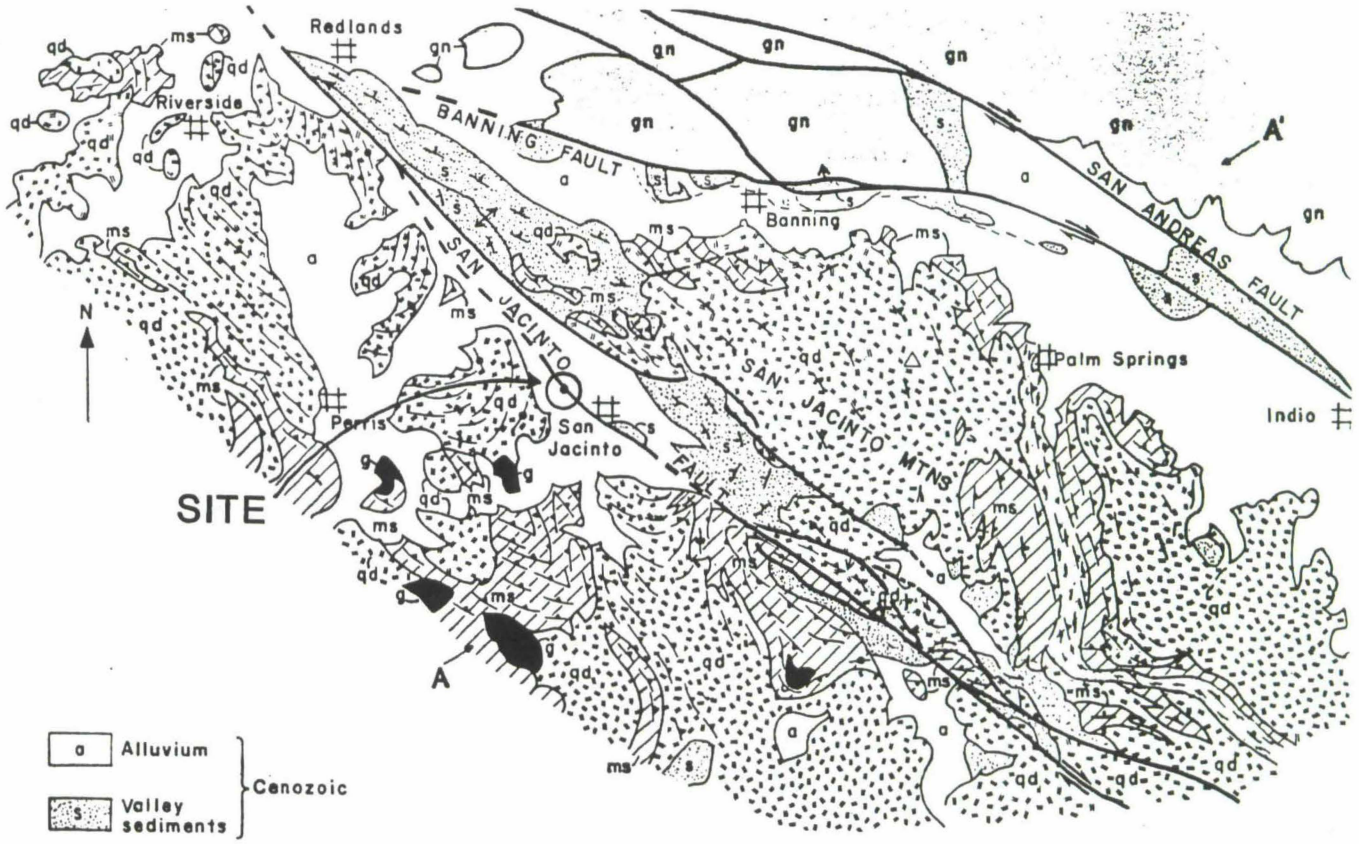
318-A-RC

SITE LOCATION MAP

Figure 1



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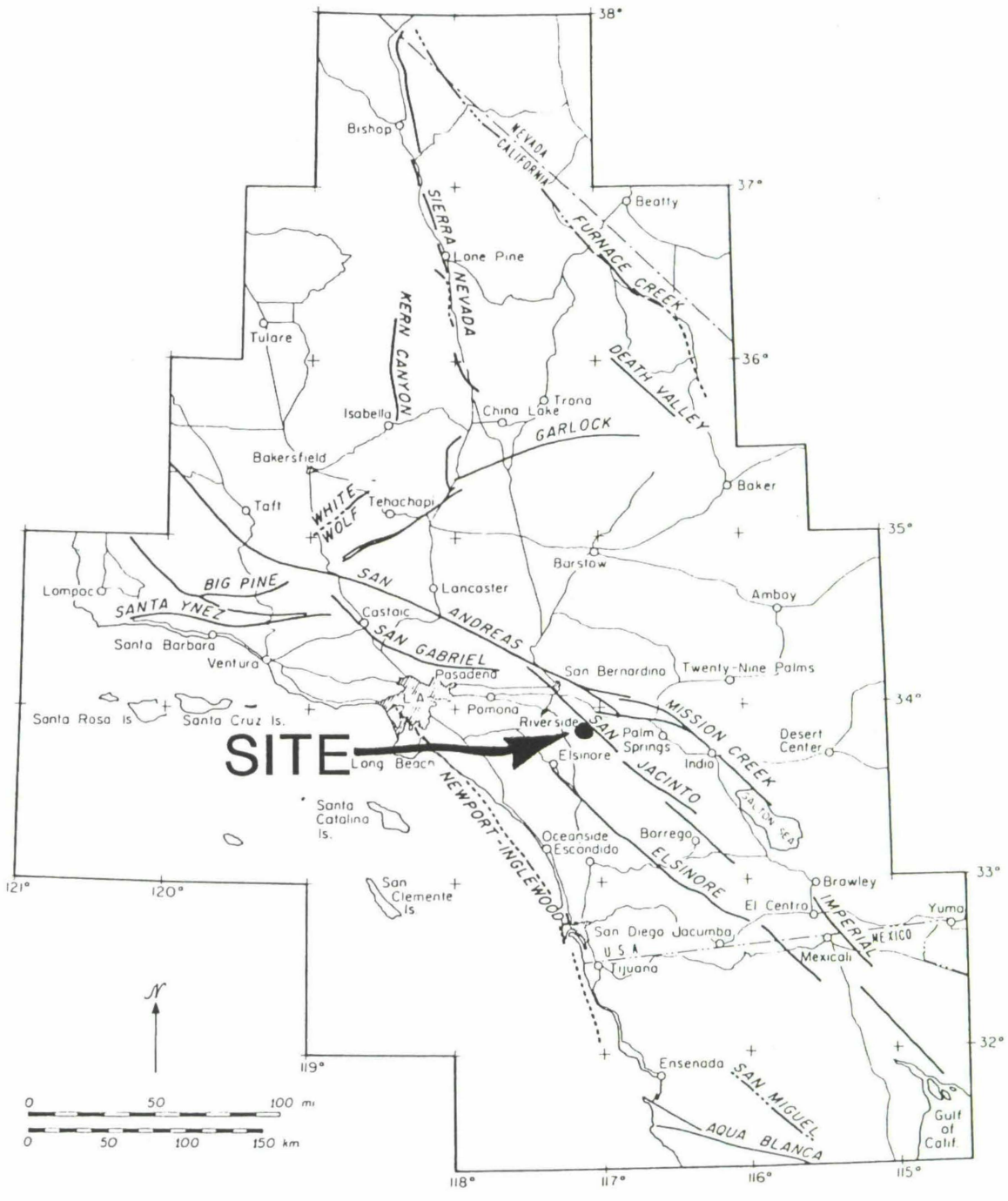
From:
GEOLOGY OF THE SAN JACINTO MOUNTAINS, Annual Field Trip Guidebook No. 9, South Coast Geological Society, 1981

REGIONAL GEOLOGIC MAP

Figure 2



Modified after Friedman and Others, 1976

Figure 3

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FAULT MAP
OF SOUTHERN CALIFORNIA

DATE 3-23-90 | W.O. NO. 318-A-RC

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FORM 89/6

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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APPENDIX B

BORING LOGS

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-1 SHEET 1 OF 1

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Blows/ft.	USCS Symbol	Dry Unit wt. (pcf)	Moisture (%)	Description of Material
			8	SM	103.8	11.0	ARTIFICIAL FILL-UNDOCUMENTED: @ 0', Silty SAND, dark olive brown, damp, moist; fine occasional coarse, rootlets
			16	SM	96.9	4.3	
			15	SP	90.6	11.0	ALLUVIUM: @ 1', Silty SAND, dark olive brown, damp, medium dense; fine, rootlets
			21		98.0	7.2	
5			20		106.3	6.2	@ 2', SAND, light olive brown, moist, medium dense, fine @ 3', Continued as @ 2', damp @ 5', Continued as @ 5', some calcium carbonate
10			10	SW	102.5	3.3	@ 10', SAND, light gray, damp, loose; medium to coarse
15			11		90.7	10.3	@ 15', SAND, light olive gray, moist, loose; medium den to medium
20			20	SM/ML	91.7	28.0	@ 20', Silty SAND to Sandy SILT, light olive gray, wet, medium dense to very stiff
25							Total Depth 21' No Ground Water Encountered Backfilled 03-05-90

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-2 SHEET 1 OF 1

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

▨ Standard Penetration Test Water Seepage into hole

▨ Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
			7	SM	98.5	10.3	ALLUVIUM: @ 0', Silty SAND, light olive brown, damp, loose; fine, rootlets
			25		91.9	3.9	@ 1', Continued as @ 0', medium dense
			10		100.8	7.5	@ 2', Continued as @ 1', loose
			9	SP			@ 3', SAND, light gray, damp, loose; fine to medium, no recovery
5			9		105.4	0.9	@ 5', Continued as @ 3', dry; medium to coarse
10			10		105.4	6.9	@ 10', Continued as @ 5', damp; fine to medium
15			14	SM/ML	100.3	19.4	@ 15', Silty SAND to Sandy SILT, olive gray, very moist medium dense to stiff; fine, micaceous
20			23	SP	96.2	2.4	@ 20', SAND, light gray, dry, medium dense; fine to medium
							Total Depth @ 21'
							No Ground Water Encountered
25							Backfilled 03-05-90

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-3 SHEET 1 OF 3

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Blows/ft.	USCS Symbol	Dry Unit wt. (pcf)	Moisture (%)	Description of Material
			5	ML	106.1	6.2	ALLUVIUM: @ 0', Sandy SILT, olive brown, damp, loose; fine, rootlets
			7				@ 1', No recovery
			7	SW	104.8	0.6	@ 2', SAND, light gray, dry, loose; fine to medium
			9		95.9	0.9	@ 3', Continued as @ 2'
5			10		96.3	1.2	@ 5', Continued as @ 3'
10			9	SM/ML	109.3	20.4	@ 10', Silty SAND to Sandy SILT, olive brown, wet, loose to medium stiff; fine, micaceous
15			7		104.9	20.5	@ 15', Continued as @ 10'
20			9		93.2	25.6	@ 20', Continued as @ 15', light olive brown, wet
25							

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-3 SHEET 2 OF 3

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
35			21	SW	106.8	2.4	@ 30', SAND, gray, dry, medium dense; medium to coarse
40			11	ML	93.0	33.6	@ 40', Sandy SILT, dark olive, saturated, stiff; micaceous
45							
50			17	SM	102.6	24.4	@ 50', Silty SAND, dark olive, saturated, medium dense; very fine to fine, micaceous
55							

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-3 SHEET 3 OF 3

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
			53	SP	103.4	13.2	@ 60', SAND, dark gray, moist, dense; fine

Total Depth @ 61'
Perched Ground Water Encountered @ 40' to 50'
Backfilled 03-05-90

65
70
75
80
85

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-4 SHEET 1 OF 1

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

▨ Standard Penetration Test Water Seepage into hole

▨ Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		▨	6	SW	101.5	3.6	ALLUVIUM: @ 0', SAND, gray, damp, loose; medium to coarse
		▨	6		102.0	2.4	@ 1', Continued as @ 0', dry
		▨	6		104.3	2.4	@ 2', Continued as @ 1'
		▨	7				@ 3', No recovery
5	■	▨	10		*	0.9	@ 5', Continued as @ 2', fine to medium
10		▨	8		101.8	1.2	@ 10', Continued as @ 5'
15		▨	11	SM	110.2	11.0	@ 15', Silty SAND, olive gray, moist, medium dense; very fine to fine, micaceous
20		▨	19	SP	103.0	5.6	@ 20', SAND, olive gray, damp, medium dense; very fine, micaceous
25							Total Depth @ 21' No Ground Water Encountered Backfilled 03-05-90 * - Indicates Disturbed

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-5 SHEET 1 OF 1

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
			12	SM	102.9	7.2	ALLUVIUM: @ 0', Silty SAND, light olive brown, damp, medium dense; fine, rootlets
			18		83.3	22.9	@ 1', Continued as @ 0', wet
			13		102.1	5.2	@ 2', Continued as @ 1', damp
			11		110.7	7.5	@ 3', Continued as @ 2'
5			9		97.9	9.6	@ 5', Continued as @ 3', moist, loose; fine to medium
10			17	SW	99.6	7.2	@ 10', No recovery, SAND, orange gray, damp, medium dense; medium to coarse
15			25		101.5	2.4	@ 15', Continued as @ 10', dry
20			22		99.5	0.9	@ 20', Continued as @ 15'
							Total Depth @ 21' No Ground Water Encountered Backfilled 03-05-90
25							

BORING LOG

GeoSoils, Inc.

W.O. 318-A-RC

PROJECT:
Khaloghli

BORING B-6 SHEET 1 OF 1

DATE EXCAVATED 3-5-90

SAMPLE METHOD: 140 lb @ 30" Drop

Standard Penetration Test Water Seepage into hole

Undisturbed, Ring Sample

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Blows/ft.	USCS Symbol	Dry Unit wt. (pcf)	Moisture (%)	Description of Material
			6	SM	104.6	14.8	ALLUVIUM: @ 0', Silty SAND, light olive brown, moist, loose; fine, rootlets
			8				@ 1', Continued as @ 0', poor recovery
			14		93.4	15.9	@ 2', Continued as @ 1', medium dense
			12		98.2	13.3	@ 3', Continued as @ 2'
5			11		100.6	10.3	@ 5', Continued as @ 3', olive brown
10			16	SW	*	1.2	@ 10', SAND, light gray, dry, medium dense; medium to coarse
15			7	ML	79.0	4.5	@ 15', Sandy SILT, olive brown, damp, medium stiff; very fine, micaceous
20			8		91.8	28.6	@ 20', Continued as @ 15', wet
							Total Depth @ 21'
							No Ground Water Encountered
							Backfilled 03-05-90
25							* - Indicates Disturbed

APPENDIX C

LABORATORY TEST RESULTS

GeoSoils, Inc. • CONSOLIDATION - PRESSURE CURVE

CLIENT Khaloghli
PROJECT
UNDISTURBED [X] REMOLDED [ ]

W.O. 318-A-RC
DATE 3-23-90
LOCATION B-1
DEPTH 5 FT.

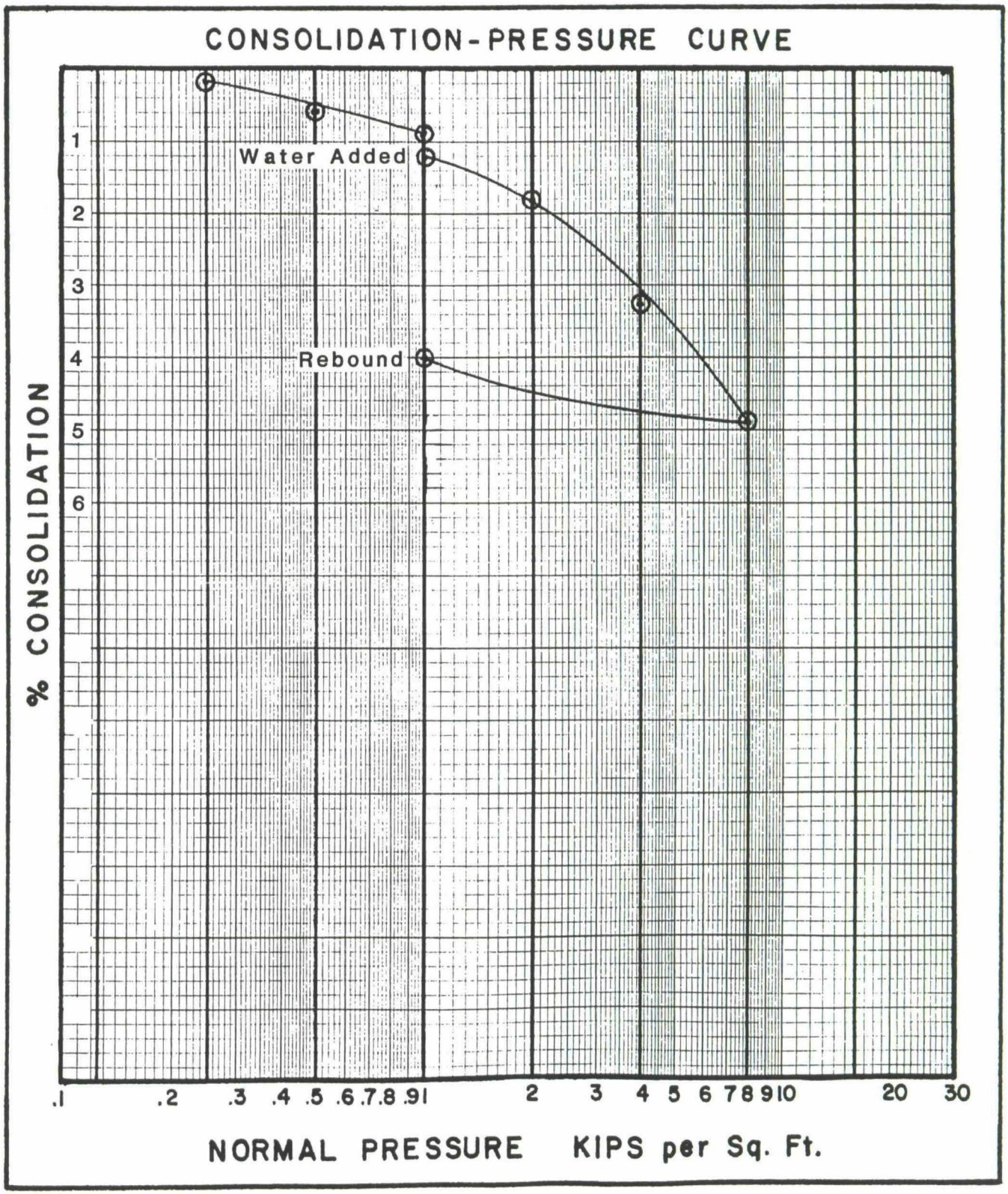

PLATE 2.1

APPENDIX D

GENERAL EARTHWORK AND GRADING GUIDELINES

GeoSoils, Inc.

Geotechnical • Coastal • Geologic • Environmental

26590 Madison Avenue • Murrieta, California 92562 • (909) 677-9651 • FAX (909) 677-9301

August 17, 2004

W.O. 4451-A2-SC

Young Homes
10370 Trademark Street
Rancho Cucamonga, California 91730

Attention: Mr. Thomas Owen

Subject: Update Geotechnical Feasibility Review, ±43-Acre Site, 532 North Lyon Avenue (Hideaway Farms), City of San Jacinto, Riverside County, California

Dear Mr. Owen:

In accordance with your request and authorization, this report presents the results of GeoSoils, Inc. (GSI's) update geotechnical feasibility review of the subject site in the City of San Jacinto, Riverside County, California. Please note that this update geotechnical feasibility report will not meet current County standards for geologic/geotechnical reports. This report should only be utilized for preliminary earthwork, shrinkage, and subsidence values, etc., and for project cost estimation and feasibility purposes. Additional field studies will be required to properly evaluate the site for residential development and to provide foundation, settlement, soil bearing values, fault evaluations, etc. Accordingly, final site geotechnical recommendations may change somewhat upon completion of the additional recommended field studies. This report should be reviewed in that context.

EXECUTIVE SUMMARY

Based on our review of data, review of previous investigations conducted onsite, and on adjoining sites, by GSI (1990 and 2004d) and Leighton and Associates, Inc. (Leighton, 2002a and 2002b), the additional advancement of three exploratory hollow stem borings, laboratory testing of representative samples, site geologic reconnaissance mapping, experience in the general site area, proprietary in-house information, and geologic and engineering analyses, the proposed site appears suitable for residential development, from a geotechnical viewpoint, provided our recommendations are properly implemented. A review of general geotechnical issues pertaining to the subject site are presented below.

- Geotechnical developmental considerations include thick, potentially compressible alluvium and seismic shaking concerns.

- Our review indicates a portion of the project site is located within an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1997). As such, a fault finding investigation was previously conducted onsite by GSI (1990), which also included portions of the adjoining site (Tract 30841). Based on our review, active faulting was encountered onsite during that investigation, and on adjoining properties. Subsequent investigations by GSI (2004d) for Tract 30841, and Leighton (2002b), for Tract 30944, adjacent to the southern and western boundary of the site, respectively, also encountered active faulting. Accordingly, fault setback zones were established for structural areas onsite and on the adjoining sites. Based on current standards of practice, the controlling authorities may require additional fault investigations to properly evaluate the site relative to residential development and active faulting/subsidence.

- Regional seismic shaking, ranging from moderate to severe, may occur on the site associated with nearby and/or regional faults. Accordingly, the proposed structures and foundations should be designed to resist seismic forces in accordance with the criteria contained in the Uniform Building Code/California Building Code ([UBC/CBC], International Conference of Building Officials [ICBO], 1997 and 2001) for Seismic Zone 4, and the seismic parameters provided herein.

- On a preliminary basis, the footings and/or slabs should be designed to accommodate a total static settlement of up to 2 inches and a differential settlement of 1 inch (i.e., at least 1 inch in a 40-foot span), or a total seismic settlement of up to 4.0 inches and a seismic differential settlement of 2 inches (i.e., at least 2 inches in a 40-foot span). The structural engineer should determine whichever condition controls design. Any post-construction settlement of the fill should be readily mitigated by post-tension design. In addition to the above, the structural engineer should also consider estimated settlements due to short duration seismic loading and applicable load combinations, as required by the controlling authorities and/or the UBC/CBC (ICBO, 1997 and 2001). Additional onsite studies (i.e., borings and/or cone penetration testing), as recommended, may serve to reduce the preliminary settlement values provided herein.

- Removal of any artificial fill, manure and/or organic matter, colluvium/topsoil deposits, and near surface weathered alluvial deposits will be necessary prior to fill placement. On a preliminary basis, if post-tensioned foundations are utilized, remedial grading is estimated to consist of the overexcavation/removal of the upper ±5 to ±7 feet of native soils, below existing grades, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils. Proof testing of a minimum 85 percent saturation would be required via test pits and field moisture content testing. On a preliminary basis, if conventional foundations can be designed for the project based on the estimated preliminary settlement values provided herein, remedial grading for use with conventional foundations is estimated to consist of the overexcavation/removal of the upper ±8 to ±10 feet of native soils, below existing

grades, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils. Proof testing of a minimum 85 percent saturation would be required via test pits and field moisture content testing. Following moisture evaluation, compaction of the removal bottom would require a vibratory sheeps-foot to aid in the inducement of hydrocollapse in the underlying materials. A minimum of 2 feet of compacted fill is recommended below all foundation elements.

- It should be noted that the UBC/CBC specifically requires that removals of unsuitable soils be performed across all areas to be graded, not just within the influence of the residential structure. Relatively deep removals may also necessitate a special zone of consideration, on perimeter, confining areas, such that this zone is approximately equal to the depth of removals, if removals cannot performed offsite. Thus, any settlement-sensitive improvements (walls, curbs, flatwork, etc.), constructed within this zone, may require deepened foundations, reinforcement, etc., or will retain some potential for settlement and associated distress. This will require proper disclosure to all homeowners and any homeowners association.

- Based on our current subsurface investigation and field reconnaissance mapping, abundant amounts of manure, wood chips/shavings (i.e., organic materials) are stockpiled and/or were spread across localized areas of the site (race track and barn areas). The excessive manure, wood chips/shavings, approximately ±1 to ±4 feet in thickness (stockpiles), should be removed and exported offsite, or to approved areas. In addition, removals of soils contaminated with manure, wood chips/shavings (i.e., organic materials) will also be required. Observation, and if deemed necessary, testing by representatives of GSI, should be conducted to evaluate that the organic materials have been properly removed from areas proposed for settlement sensitive improvements.

- Based on previous land usage (i.e., horse ranch) site specific methane studies may be required by the controlling authorities.

- Preliminary laboratory testing of representative materials indicates the expansion potential of the soils generally appear to be low. However, very low to medium expansive soils may not be entirely precluded.

- Preliminary sulfate/corrosion testing indicates that soils generally appear to have negligible sulfate contents and low saturated resistivities, per the UBC/CBC. Accordingly, the use of sulfate resistant concrete is not currently anticipated, based on the available data. The site soils were also found to be generally very strongly alkaline (pH of 9.7) and severely corrosive toward ferrous metals in a saturated state. Based on the above, consultation with a corrosion engineer is recommended to provide specific advisement for foundations, piping, etc.

- No groundwater was encountered onsite during this investigation to a depth in excess of ±51 feet below the ground surface. However, due to the nature of the alluvial deposits, the possibility of local seepage due to irrigation, excess rainfall, broken utilities, etc., may not be precluded, during or after site development, and should be anticipated. Subdrainage systems for the control of localized seepage and/or groundwater may not be precluded, both during or after site development.

- Our review indicates that the site is not within a liquefaction zone established by the County of Riverside (Envicom, 1976), or State of California.

- Based on our review, the San Jacinto Basin area is regionally subsiding due to excessive groundwater withdrawal (Morton, 1994). Considering the long-term tectonic rate of subsidence, and land subsidence due to aquifer compaction caused by groundwater withdrawal, the general rate of subsidence within the central portion of the basin is considered to be on the order of ±2.5 to ±3.0 centimeters a year (Morton, 1994). Localized subsidence due to bounding faults (i.e., Casa Loma fault) will be mitigated by the proposed structural setbacks. However, it is our opinion that aerial subsidence does not constitute a significant risk to site development, and should not be any greater than for already approved projects adjoining the site.

- The recommendations presented in this report should be incorporated into the design and construction considerations of the project. This report may be subject to the review of the controlling authorities.

We appreciate the opportunity to be of service. If you have any questions, please do not hesitate to contact the undersigned.

Respectfully submitted,

GeoSoils, Inc.

John P. Franklin
Engineering Geologist, CEG 1340

David W. Skelly
Civil Engineer, RCE 47857

Todd A. Greer
Registered Geologist, RG 7739

TAG/JPF/DWS/jk

Distribution: (4) Addressee

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ATTACHMENTS:

Appendix A - References . . . . . Rear of Text
Appendix B - Boring Logs . . . . . Rear of Text
Appendix C - Laboratory Test Results . . . . . Rear of Text
Appendix D - General Earthwork and Grading Guidelines . . . . . Rear of Text

SCOPE OF SERVICES

The scope of our services has included the following:

1. Review of available geologic maps, data, and previous soils and geologic reports, including aerial photography, for the site and site area (see Appendix A).

2. Geologic and geomorphic site reconnaissance and mapping.

3. Performance of a photo-lineament analysis for the site and vicinity.

4. Subsurface exploration consisting of the advancement of three additional exploratory hollow stem borings onsite, for geotechnical logging and sampling (see Appendix B).

5. Relevant laboratory testing of representative soil samples collected during our subsurface exploration program (see Appendix C).

6. Appropriate engineering and geologic analysis of data collected.

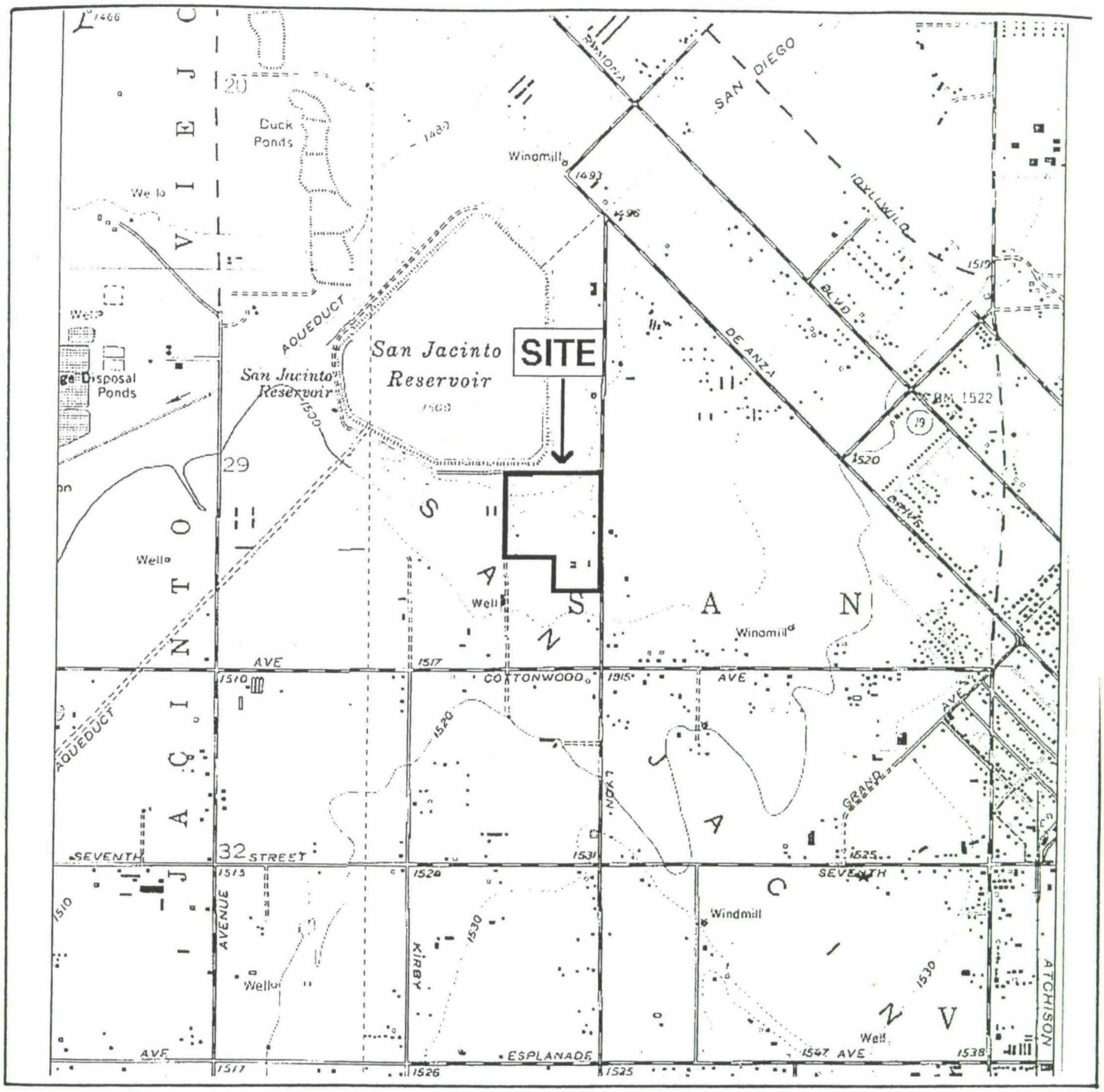
7. Preparation of this geotechnical feasibility review report, and attachments, including boring logs, laboratory test results, regional seismic evaluations, general earthwork factors, and recommendations for site grading (see Appendix D).

SITE LOCATION/CONDITIONS

The site is an irregular shaped parcel that consists of ±43-acres of developed land, located at 532 North Lyon Road in the City of San Jacinto, Riverside County, California (see Figure 1, Site Location Map). The site is currently being utilized as a thoroughbred ranch. Several residences, barns, sheds, and corrals/riding rings are located onsite. Topographically, the site is relatively flat-lying. Drainage across the site is primarily to the northwest by sheetflow, however is variable in some locations of the site.

PROPOSED DEVELOPMENT

Based on conversations with the client, it appears that typical cut and fill grading techniques would be utilized to prepare the site for residential construction, including roadway and underground utility improvements. It is also our understanding that the residential buildings would be one-and/or two-story structures, utilizing typical wood-frame



Base Map: Lakeview Quadrangle, California, Riverside Co., 7.5 minute series (topographic), 1976, photorevised 1979, USGS, and San Jacinto Quadrangle, California, Riverside Co., 7.5 minute series (topographic), 1953, photorevised 1979, USGS.

N

0 2000 4000

Scale Feet

GeoSoils, Inc.

W.O. 4451-A2-SC

SITE LOCATION MAP

GeoSoils, Inc.

Figure 1

construction with slabs-on-grade and continuous footings utilizing conventional and/or post-tensioned foundations. Building loads are assumed to be typical for this type of relatively light construction. Sewage disposal is to be accommodated by tying into the regional municipal system. The need for import soils is anticipated, as it is our understanding that grades will be raised approximately ±3 feet from native grades.

FIELD STUDIES

Field investigations conducted during our evaluation of the property for this study entailed geologic reconnaissance mapping, the advancement of three additional hollow stem exploratory borings onsite. The exploratory borings were logged by staff from our firm who collected representative bulk and undisturbed ring samples for appropriate laboratory testing. Logs of the borings are presented in Appendix B. The approximate locations of the borings are shown on Figure 2.

GEOLOGY

Regional Geologic Setting

The property is situated on the eastern margin of the Perris Block, a portion of a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. The Perris Block is a stable structural block bounded on the west by the Elsinore fault zone and on the east by the San Jacinto fault zone. The Peninsular Ranges is characterized by steep, elongated ranges and valleys that trend northwesterly. This province is typified by plutonic and metamorphic rocks (bedrock) which comprise the majority of the mountain masses, with relatively thin volcanic and sedimentary deposits discontinuously overlying the bedrock, and with Plio/Pleistocene-age to older Quaternary-age alluvial fan deposits filling in the valleys and younger alluvium filling in the incised drainages. The alluvial deposits are derived from the water borne deposition of the products of weathering and erosion of the bedrock.

Local Geology and Site Earth Materials

As mapped by Morton (1972), and Dibblee (2003a and 2003b), the general site area is surficially underlain by unconsolidated alluvial deposits consisting of sands, silty sands, and clays. These surficial deposits are mapped as Holocene-age. The geologic units encountered within the project site consist of topsoil/colluvium, and alluvial deposits. Mappable geologic units are shown on Figure 2, and these units are described as follows, from youngest to oldest:

1-800-345-7334

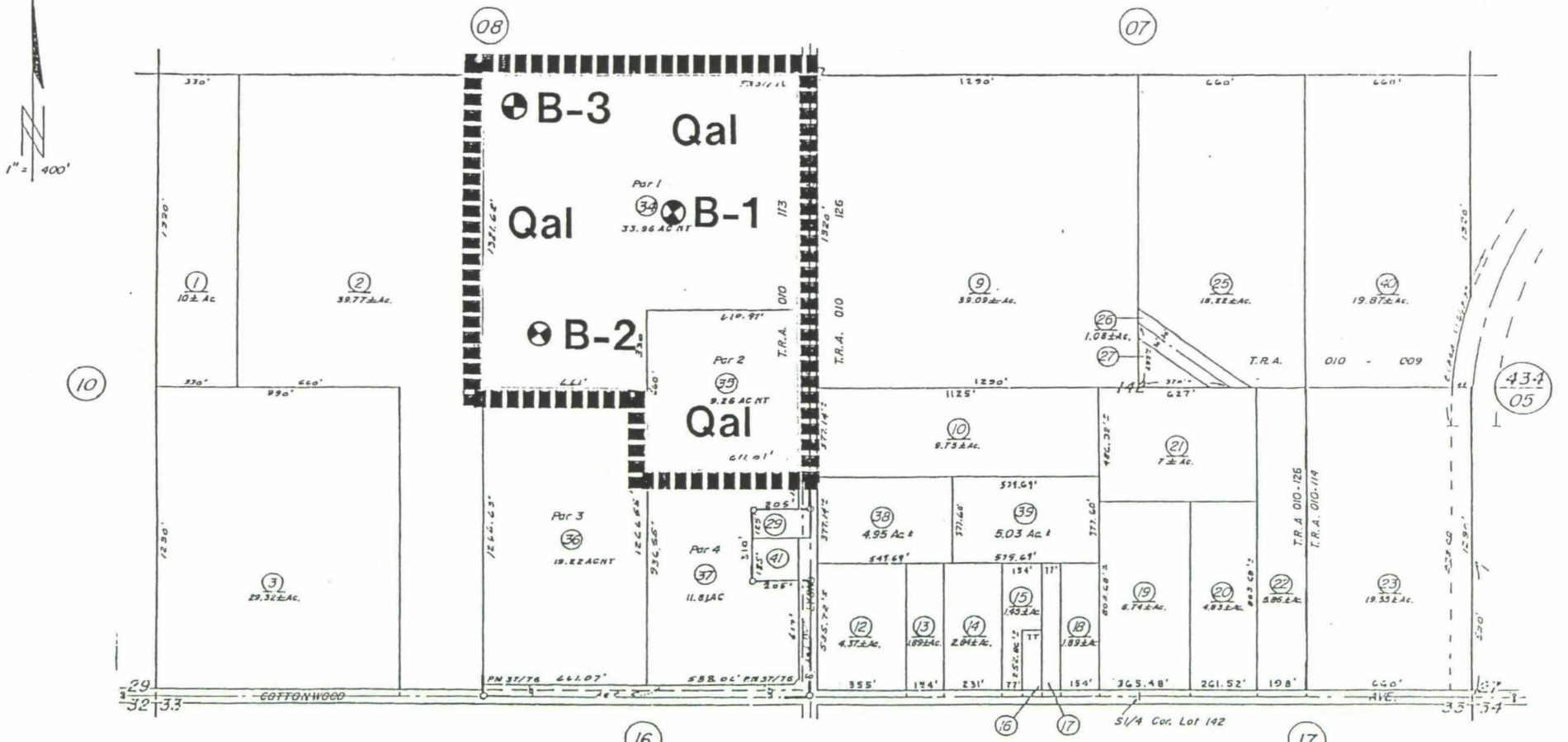
SCALE IN 1/10 OF AN INCH

431-09

T.R.A. 010-126
010-009
010-113
010-114

POR. RANCHO SAN JACINTO VIEJO
(POR. SEC. 28, T.4S., R.1W.)

THIS MAP IS FOR ASSESSMENT PURPOSES ONLY



LEGEND

Qal Quaternary alluvium

B-3 Approximate location of exploratory boring

Area under the purview of this report

GeoSoils, Inc.

RIVERSIDE CO
ORANGE CO
SAN DIEGO CO

BORING LOCATION MAP

Figure 2

W.O. 4451-A2-SC DATE 8/04 SCALE: NTS

Artificial Fill - Undocumented (Unmapped)

Relatively moderate amounts of undocumented fill materials, manure, and wood chips/shavings were observed on the site. These materials are generally associated with the current ranching operations. The soil materials likely range in thickness from ±1 foot to as much as ±5 feet. These materials typically have a low to occasionally medium expansion potential, depending on the clay content. These soil materials are considered compressible in their existing state and may settle appreciably under additional fill or foundation and improvement loadings, should they become saturated. Therefore, complete removal and recompaction is recommended. The excessive manure, wood chips/shavings, approximately ±1 to ±4 feet in thickness (stockpiles), should be removed and exported offsite.

Topsoil/Colluvium (Unmapped)

In general, the site is mantled by a relatively thin layer of topsoil/colluvium. These materials were generally observed to be brown to dark brown, dry to locally damp, loose, locally porous, silty sands. These surficial soils occasionally contained minor to locally abundant rootlets. In general, these materials typically have a very low to low, and sometimes medium expansion potential. The topsoil/colluvium was encountered ranging from ±1 to ±2 feet in thickness. Due to the potentially compressible nature of these surficial soils, they are considered unsuitable for support of structures and/or improvements in their existing state. Therefore, these soils will be need to be removed and recompacted, if not removed during planned excavation, should settlement sensitive improvements be proposed within their influence.

Quaternary Alluvium (Map Symbol - Qal)

Quaternary alluvium underlies the entire site. The alluvium was observed to be generally light grayish brown to light brown to light reddish brown, silty sand, sand, and clayey to sandy silt. These materials were generally dry to moist, and medium dense and/or stiff to very stiff. This unit typically has a very low to low and occasionally medium expansion potential. Based on our engineering analysis, if post-tensioned slabs are utilized, the upper ±5 to ±7 feet (below original natural ground) will be need to be removed and recompacted, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils. Remedial grading for conventional foundation use is estimated to consist of the overexcavation/removal of the upper ±8 to ±10 feet of native soils, below existing grades, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils, should settlement sensitive improvements be proposed within their influence. These sediments are estimated to be Holocene (less than 11,000± years old).

FAULTING AND REGIONAL SEISMICITY

The site is situated in an area of active as well as potentially-active faults. The nearby San Jacinto fault zone is considered active and is included within an Alquist-Priolo Earthquake Fault Zone. Our review indicates a portion of the project site is located within an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant, 1997). As such, an additional fault finding investigation will likely be required by County and State authorities to properly evaluate the potential for additional surface rupture onsite. Appropriate fault setback zones will need to be incorporated into project development plans.

Lineament Analysis

In order to identify possible unmapped faults, identify possible fissures, and to evaluate topographic expressions of nearby and onsite published fault and lineament traces, a lineament analysis was performed. As indicated previously, stereoscopic "false-color" infrared aerial photographs (United State Department of Agriculture, 1980), at a scale of approximately 1:40,000, were utilized in our lineament analysis. Lineaments are classified according to their development as strong, moderate, or weak. A strong lineament is a well defined feature that can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well defined, somewhat discontinuous, and can be traced for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet, or less. Two strong lineaments were observed transecting the site based on the aerial photographs reviewed for this study. Based on our review one of the lineaments has been previously intersected by the fault investigation conducted by GSI (1990). Further analysis and additional fault/lineament trenching will likely be required by the controlling authorities.

Seismic Shaking Parameters

Based on the site conditions, Chapter 16 of the UBC/CBC (ICBO, 1997 and 2001), and ICBO (1998), the following seismic parameters are provided.

CHAPTER 16 OF UBC/CBC (ICBO, 1997 & 2001)	SEISMIC PARAMETERS
Seismic zone (per Figure 16-2*)	4
Seismic zone factor Z (per Table 16-I*)	0.40
Soil Profile Types (per Table 16-J*)	S_D
Seismic Coefficient C_a (per Table 16-Q*)	0.44 N_a
Seismic Coefficient C_v (per Table 16-R*)	0.64 N_v
Near Source factor N_a (per Table 16-S*)	1.3
Near Source factor N_v (per Table 16-T*)	1.6

CHAPTER 16 OF UBC/CBC (ICBO, 1997 & 2001)	SEISMIC PARAMETERS
Distance to Seismic Source (San Jacinto/Casa Loma Faults)	0 mi. (0 km)
Seismic Source Type (per Table 16-U*)	B**
Upper Bound Earthquake (San Jacinto Fault)	M_w 6.9**
* Figure and table references from Chapter 16 of the UBC (ICBO, 1997). ** ICBO (1998).	

GROUNDWATER

Seeps, springs, mottled soils, or other indications of a high groundwater level were not noted on the subject property during the time of our field investigation to depths in excess of ±50 feet. Based on historic water well data acquired from the California Department of Water Resources, "Water Data Library" (CDWR, 2004), groundwater levels in other nearby wells were previously measured at depths ranging from ±80 to in excess of ±210 feet below the ground surface. Perched groundwater onsite may also occur after periods of above normal or heavy precipitation or irrigation. Thus, perched groundwater conditions may occur in the future, and should be anticipated. Should manifestations of perched conditions (i.e., seepage) develop in the future, GSI could assess the conditions and provide mitigative recommendations, as necessary. Additional discussions of groundwater are presented within the conclusions section of this report.

OTHER GEOLOGIC HAZARDS

Liquefaction

Seismically-induced liquefaction is a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in soils. The soils may thereby acquire a high degree of mobility, and lead to lateral movement, sliding, sand boils, consolidation and settlement of loose sediments, and other damaging deformations. This phenomenon occurs only below the water table; but after liquefaction has developed, it can propagate upward into overlying, non-saturated soil as excess pore water dissipates. Typically, liquefaction has a relatively low potential at depths greater than 45 feet and is virtually unknown below a depth of 60 feet.

Liquefaction susceptibility is related to numerous factors and the following conditions should be concurrently present for liquefaction to occur: 1) sediments must be relatively young in age and not have developed a large amount of cementation; 2) sediments generally consist of medium to fine grained relatively cohesionless sands; 3) the sediments must have low relative density; 4) free groundwater must be present in the sediment; and,

5) the site must experience a seismic event of a sufficient duration and magnitude, to induce straining of soil particles.

The condition of liquefaction has two principal effects. One is the consolidation of loose sediments with resultant settlement of the ground surface. The other effect is lateral sliding. Significant permanent lateral movement generally occurs only when there is significant differential loading, such as fill or natural ground slopes within susceptible materials. No such loading conditions exist on the site. In the site area, we found there is a potential for seismic activity and a groundwater table deeper than ±50 feet below the ground surface.

It should be noted that based on our review of previous investigations conducted onsite (GSI, 1990), relatively minor liquefaction features were previously identified onsite. Where noted, these features were generally encountered near the active splays of the Casa Loma fault system onsite. Therefore, GSI concludes that the site has been subject to minor liquefaction events in the geologic past. However, due to extensive regional groundwater pumping/withdrawal within the San Jacinto Basin area, regional groundwater levels within the valley have been drastically lowered. Previous reports indicated that much of the aquifer system within the basin had a hydraulic head of greater than ±2 meters (m) above the ground surface (Morton, 1994). By the early 1970's groundwater withdrawal within the basin had lowered the hydraulic heads by as much as ±24 to ±30 m below the land surface (Morton, 1994). Based on the continuing drought conditions experienced within southern California, continued increase of urbanization, and the continued yearly overburden extracted from the basin, it is our opinion that regional groundwater levels will likely not rise to previously documented levels, in the foreseeable future.

Based on the above, and regional groundwater levels in excess of +50 feet below the site, our evaluation indicates that the potential for liquefaction and associated adverse effects within the site is low. The site conditions will also be improved by removal and recompaction of low density near-surface soils, and the utilization of post-tensioned slab systems. Therefore, it is our opinion that the liquefaction potential does not constitute a significant risk to site development, and should not be any greater than for already approved projects adjoining the site.

Aerial Subsidence

The effects of areal subsidence generally occur at the transition or boundaries between low-lying areas and adjacent hillside terrain, where materials of substantially different engineering properties (i.e., alluvium vs. bedrock) are present. Due to the flat lying nature of the site, and the extreme depth of the underlying bedrock (basement rock), the potential for this condition does not exist onsite. However, based on our review the San Jacinto Basin area is regionally subsiding due to excessive groundwater withdrawal (Morton, 1994). Considering the long-term tectonic rate of subsidence, and land

subsidence due to aquifer compaction caused by groundwater withdrawal, the general rate of subsidence within the central portion of the basin is considered to be on the order of ±2.5 to ±3.0 centimeters a year (Morton, 1994).

In addition, our review of available data, as well as stereoscopic aerial photographs (USDA, 1980), showed no features onsite generally associated with areal subsidence (i.e., radially-directed drainages flowing into a depression(s), linearity of depressions associated with mountain fronts, etc.). Furthermore, ground fissures have been reported within the San Jacinto Basin that are generally attributed to excessive groundwater withdrawal and associated subsidence, and/or active faulting. Our review indicates that the ground fissures and associated subsidence areas documented, lie to the northwest of the site approximately ±6.5 miles away (Dibblee, 2003b). Furthermore, localized subsidence along bounding fault zones (i.e., Casa Loma fault) will inherently be mitigated by the proposed structural setback zones. Therefore, provided our recommendations are properly implemented, it is our opinion that aerial subsidence does not constitute a significant risk to site development, and should not be any greater than for already approved projects adjoining the site. However, groundwater levels may change in the future as a result of additional groundwater withdrawal/pumping, climatic change, or irrigation.

Mass Wasting

Mass wasting refers to the various processes by which earth materials are moved down slope in response to the force of gravity. Examples of these processes include slope creep, surficial failures, rockfall, deep-seated landslides, etc. Creep is the slowest form of mass wasting and generally involves the outer 5 to 10 feet of the slope surface. During heavy rains, such as those in 1969, 1978, and 1980, 1983, 1993, and 1998 creep-affected materials may become saturated, resulting in a more rapid form of down slope movement (i.e., landslides, surficial failures, and/or rockfall). The subject site consists of relatively low gradient terrain and indications of mass wasting phenomena on the site were not observed during our review of stereoscopic photographs of the area (USDA, 1980) or during our site reconnaissance.

Due to the non-cohesive materials that may exist on portions of the site, caving and sloughing should be anticipated in all subsurface excavations and trenching. Appropriate safety considerations for potential caving and sloughing, such as shoring or layback cuts, should be incorporated into the construction design details. Therefore, the potential for mass wasting phenomena within the site is considered nil. Likewise, the potential for seismically induced landsliding is considered nil.

Seiche

Our review indicates the San Jacinto Reservoir lies directly adjacent to the northern portion of the site. It is our understanding that this reservoir is utilized for the control of stormwater run-off during periods of heavy rain. Accordingly, the reservoir generally contains no appreciable amounts of water. However, based on the proximity to active faulting (i.e., Casa Loma fault) the possibility of an over-topping seiche impacting the site may not be entirely precluded, although the probability of the nearby reservoir being at full capacity and a regional seismic event large enough to breach the embankment occurring simultaneously is remote. This potential should be further evaluated by the design engineer.

LABORATORY AND FIELD TESTING

Classification

Soils were classified visually according to the Unified Soils Classification System and by supplemental index testing. The soil classifications are shown on the Boring Logs (see Appendix B).

Moisture-Density

The field moisture content and dry unit weight were determined for each undisturbed sample of the soils encountered in the borings. The dry unit weight was determined in pounds per cubic foot (pcf), and the field moisture content was determined as a percentage of the dry weight. The results of these tests are shown on the Boring Logs (see Appendix B).

Laboratory Standard

The maximum dry density and optimum moisture content was determined for the major soil type encountered in the borings. The laboratory standard used was ASTM D-1557. The moisture-density relationship obtained for this soil is shown below:

SOIL TYPE	LOCATION AND DEPTH (ft.)	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
Sandy SILT, Dark Gray	B - 3 @ 1' - 5'	121.5	12.5

Expansion Testing

Expansion Index (E.I.) testing was performed on a representative soil sample, in accordance with UBC Standard No. 18-2 of the 1997 UBC. An E.I. of 36 was determined for the sample. Site soils may therefore be generally classified as having a low expansion potential. However, very low to medium expansive soils may not be precluded. Additionally, per the 1997 UBC, Atterberg testing was performed on all soils exhibiting expansion potentials greater than 20 (E.I. >20). The test results are provided below.

Plasticity Index Testing/Atterberg Limits

For preliminary foundation planning purposes, plasticity index testing was performed where E.I. testing indicated an E.I. greater than 20. Testing was performed to evaluate the liquid limit, plastic limit and plasticity index in general accordance with ASTM D-4318-64. The test results were also utilized to evaluate the soil classification in accordance with the Unified Soil Classification System. The test result and classification are presented in the following table:

LOCATION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-6 @ 1' - 5'	33	20	13

Sulfate/Corrosion Testing

Typical samples of the site materials were analyzed for soluble sulfates, pH, and resistivity. The soluble sulfate and corrosion potential results are shown as follows:

LOCATION AND DEPTH (FT.)	SOLUBLE SULFATES PERCENTAGE BY WEIGHT	pH	RESISTIVITY (OHMS-CM)
B - 6 @ 1' - 5'	*ND	9.7	1,000

*Non-Detect

For preliminary planning purposes, based upon the soluble sulfate test results and the latest edition of the UBC, the soluble sulfate content is categorized as negligible (0.00-0.10 Water-Soluble Sulfate in Soil, percentage by weight) and sulfate-resistant concrete should not be necessary. Additionally, a modified cement to water ratio and modified concrete compressive strength should not be necessary. Based on the results of the resistivity and pH testing, the onsite soils are judged to be generally very strongly alkaline (pH of 9.7) and are considered to be severely corrosive toward ferrous metals in a saturated state.

Although the site soils are categorized as being severely corrosive to ferrous metals, no exposure conditions stated in Table 19-A-2 of the UBC are found within the subject site. It is our understanding that ferrous metals embedded in properly poured and formed Type I, II, or V concrete should be adequately protected from these conditions. Additionally, as stated above, the soluble sulfate content on the subject lots is considered negligible. Accordingly, a consulting corrosion engineer should be retained to provide specific recommendations for foundations, piping, etc.

Consolidation Testing

Consolidation testing was performed on a relatively undisturbed soil samples in general accordance with ASTM Test Method D-2435-90. The consolidation test results are presented in Appendix C.

Shear Testing

Shear testing was performed in a direct shear machine of the strain-control type. The rate of deformation is approximately 0.05 inches per minute. The sample was sheared under varying confining loads in order to determine the Coulomb shear strength parameters, angle of internal friction and cohesion. The test was performed on a remolded sample of the Quaternary alluvial deposits. The shear testing results are presented in Appendix C.

EMBANKMENT FACTORS

Embankment factors (shrinkage) for the site have been estimated based upon our field and laboratory testing, visual site observations, and experience. It is apparent that shrinkage would vary with depth and with areal extent over the site, based on previous site use. Variables include vegetation, weed control, and discing. However, all these factors are difficult to define in a three-dimensional fashion.

Therefore, the information presented below represents average shrinkage/bulking values, using certain earthwork assumptions as follows:

Range of maximum density = 129.5 to 132.0 pcf
Relative Compaction = 92%

Material	% Range
Colluvium/Topsoil Deposits	-15 to -22 (shrinkage)
Quaternary Alluvial Deposits	-12 to -18 (shrinkage)

An additional shrinkage factor item would include the removal of individual large plants or trees. The root structures/root balls of these plants and trees vary in size, but when pulled, they may result in a loss of ½ to 1½ cubic yards. This factor needs to be multiplied by the

number of significant plants or trees present to determine the net loss. Subsidence due to dynamic compaction from equipment, is estimated to be ±0.10 to ±0.20 feet, depending on haul routes etc.

The above factors indicate that earthwork balance of the site would be difficult to define and flexibility in design is essential to achieve a balanced end product.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

General

Based on our field exploration, laboratory testing and geotechnical engineering analysis, it is our opinion that the site appears suitable for the proposed development from a geotechnical engineering and geologic viewpoint, provided that the recommendations presented in the following sections are incorporated into the design and construction phases of site development. The primary geotechnical concerns with respect to the proposed development are:

- Potential for surface fault rupture, subsidence, and associated phenomena.
- Depth to suitable bearing strata.
- Potential for perimeter conditions leading to settlement and distress.
- Ongoing expansion and corrosion potential of site soils.
- Ongoing potential for perched water to occur after site development.
- Seismic settlement.
- Regional seismic activity.

The recommendations presented herein consider these as well as other aspects of the site. The engineering analyses performed concerning site preparation and the recommendations presented herein have been completed using the information provided by the client and obtained during our field work.

The conclusions and recommendations contained in this report shall not be considered valid unless the proposed development is reviewed and the recommendations of this report verified or modified in writing by this office. As indicated previously, additional field studies will need to be performed to properly evaluate the site relative to residential development. Accordingly, the design parameters presented herein are considered preliminary until the foundation design, layout, and structural loads are provided to this office for review.

1. Soil engineering, observation, and testing services should be provided during grading to aid the contractor in removing unsuitable soils and in his effort to compact the fill.

2. Geologic observations should be performed during grading to verify and/or further evaluate geologic conditions. Although unlikely, if adverse geologic structures are encountered, supplemental recommendations and earthwork may be warranted.

3. Existing topsoil/colluvial soils, and near surface alluvial deposits are considered unsuitable for the support of settlement-sensitive structures in their present condition, based on current industry standards. Moisture-density and consolidation test results indicate the materials are not uniform, are potentially subject to hydrocollapse, potentially compressible in their present condition, and may be subject to adverse differential settlement if not properly removed and recompacted.

4. In general and based upon the available data to date, groundwater is not expected to be a major factor in development of the site. However, due to the nature of the site materials, seepage may be encountered throughout the site along with seasonal perched water within any drainage areas. In addition, seepage may be encountered within the alluvial deposits. Therefore, subdrainage systems for the control of localized groundwater seepage should be anticipated both during grading, and after site development.

5. Cavities or loose soils remaining after demolition and site clearance should be cleaned out and observed by the soil engineer. The cavities should be replaced with fill materials that have been moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of the laboratory standard.

Treatment of Existing Ground

1. Removal of any artificial fill, manure and/or organic matter, colluvium/topsoil deposits, and near surface weathered alluvial deposits will be necessary prior to fill placement. On a preliminary basis, if post-tensioned foundations are utilized, remedial grading is estimated to consist of the overexcavation/removal of the upper ±5 to ±7 feet of native soils, below existing grades, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils. Proof testing of a minimum 85 percent saturation would be required via test pits and field moisture content testing. On a preliminary basis, if conventional foundations can be designed based on the estimated preliminary settlement values provided herein, remedial grading for use with conventional foundations is estimated to consist of the overexcavation/removal of the upper ±8 to ±10 feet of native soils, below existing grades, followed by flooding/saturation of an additional ±3 to ±5 feet of the native soils . Proof testing of a minimum 85 percent saturation would be required via test pits and field moisture content testing. Following moisture evaluation, compaction of the removal bottom would require a vibratory sheeps-foot to aid in the inducement of hydrocollapse in the underlying materials. A minimum of 2 feet of compacted fill is recommended below foundation elements. Variations from these thicknesses

should be anticipated. Actual depths of removals will be evaluated in the field during grading by the soil engineer.

2. Subsequent to the above removals, the upper 12 inches of the exposed alluvial deposits should be scarified, brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard.

3. Existing topsoil/colluvium, etc., and removed natural ground materials may be reused as compacted fill provided that major concentrations of vegetation and miscellaneous debris are removed prior to or during fill placement.

4. Localized deeper removal may be necessary due to buried drainage channel meanders or dry porous materials. The project soils engineer/geologist should observe all removal areas during the grading.

Fill Placement

1. Subsequent to ground preparation, fill materials should be brought to at least optimum moisture content, placed in thin 6- to 8-inch lifts and mechanically compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard.

2. Fill materials should be cleansed of major vegetation and debris prior to placement. The organic content of the compacted fills should not exceed 1 percent, based on current controlling authority standards.

3. Any oversized rock materials greater than 8 inches in diameter should be placed under the recommendations and supervision of the soils engineer and/or removed from the site. Should significant amounts of oversize rock be encountered, recommendations for rock fill placement will be provided by GSI. As per UBC/CBC (ICBO, 1997 and 2001) requirements, no oversize materials greater than 12 inches in diameter should be placed within 10 feet of finish grade.

4. Any import materials should be observed and determined suitable by the soils engineer prior to placement on the site. Foundation designs may be altered if import materials have a greater expansion/sulfate corrosion value than the onsite materials encountered in this investigation.

Transition Areas/Overexcavation/Perimeter Conditions

In order to reduce the potential for differential settlements between cut and fill materials, materials of differing expansion potentials, or dense bedrock, the entire cut portion of cut/fill transitions within proposed residential lots (per the UBC/CBC) should be

overexcavated to a minimum depth of 3 feet below finish grade, or 2 feet below foundation elements, and/or a maximum ratio of fill thickness on the lot of 3:1 (h:v), whichever is more onerous, and replaced with compacted fill. It should be noted, that the UBC/CBC specifically requires that removals of unsuitable soils be performed across all areas to be graded, not just withing the influence of the residential structure. Relatively deep removals may also necessitate a special zone of consideration, on perimeter, confining areas, such that this zone is approximately equal to the depth of removals, if removals cannot performed offsite. Thus, any settlement sensitive improvements (walls, curbs, flatwork, etc.), constructed within this zone may require deepened foundations, reenforcement, etc., or will retain some potential for settlement and associated distress. This will require proper disclosure to all homeowners and any homeowners association.

SUBDRAINS

Subdrains may be necessary where local seepage along the contact between the proposed fill and underlying alluvial deposits exist, or within the proposed fill along contrasting zones of permeabilities (e.g., sand vs. silt or clay). Owing to the generally flat nature of the site, lack of canyons, lack of gradient at flowline elevations, and the lack of suitable cover (i.e., less than about 10 feet of fill), subdrains are generally not anticipated during grading, but may not be entirely precluded. If required, where removals are below the subdrain flowline, the removal materials may be reused as compacted fill provided they are granular, and at a moisture content of at least 2 percent over optimum moisture content (or 1.2 times optimum moisture content, whichever is greater).

If necessary, actual locations of subdrains will be provided during grading, based on exposed conditions. The project civil engineer should locate and map any subdrain and outlet systems. Potential subdrain locations should be re-evaluated at the 40-scale grading plan review stage.

SLOPE CONSIDERATIONS AND SLOPE DESIGN

All slopes should be designed and constructed in accordance with the minimum requirements of the UBC/CBC (ICBO, 1997 and 2001), County of Riverside, the recommendations in Appendix D, and the following:

1. Fill slopes should be designed at a 2:1 (h:v) gradients, or flatter, and should not exceed about 15 feet in height, without a slope stability evaluation. Fill slopes should be properly built and compacted to a minimum relative compaction of 90 percent throughout, including the slope surfaces. Guidelines for slope construction are presented in Appendix D.

2. Cut slopes should be designed at gradients of 2:1 and should not exceed 15 feet in height, without a slope stability evaluation. While stabilization of such slopes is not anticipated, locally adverse geologic conditions (e.g., daylighted sandy lenses, etc.) may be encountered which may require remedial grading or laying back of the slope to an angle flatter than the adverse geologic condition.

3. Local areas of highly to severely weathered alluvial deposits may be present. Should these materials be exposed in cut slopes, the potential for long term maintenance or possible slope failure exists. Evaluation of cut slopes during grading would be necessary in order to identify any areas of severely weathered alluvial materials. Should any of these materials be exposed during construction, the soils engineer/geologist, would assess the magnitude and extent of the materials and their potential affect on long-term maintenance or possible slope failures. Recommendations would then be made at the time of the field inspection.

4. Loose debris and fines remaining on the face of the cut slopes should be removed during grading. This can be accomplished by utilizing a slope board or by hand scaling, as warranted.

5. Where loose materials are exposed on the cut slopes, the project's engineering geologist would require that the slope be cleaned as described above prior to making their final inspection. Final approval of the cut slope can only be made subsequent to the slope being fully cut and cleaned.

6. Cut slopes should be mapped by the project engineering geologist during grading to allow amendments to the recommendations should exposed conditions warrant alternation of the design or stabilization.

FOUNDATION DESIGN

Based on the limited nature of our current study (i.e., Update Geotechnical Feasibility Review), preliminary foundation designs, bearing values, etc., should be provided after the completion of the additional recommended field studies. Upon request, GSI can provide additional data/consultation regarding soil parameters as related to foundation design.

PRELIMINARY ESTIMATED FOUNDATION SETTLEMENTS

On a preliminary basis, the footings and/or slabs should be designed to accommodate a total static settlement of up to 2 inches and a differential settlement of 1 inch (i.e., at least 1 inch in a 40-foot span), or a total seismic settlement of up to 4.0 inches and a differential settlement of 2 inches (i.e., at least 2 inches in a 40-foot span). The structural engineer should determine whichever condition controls the design. Any post-construction

settlement of the fill should be readily mitigated by conventional and/or post-tension design. In addition to the above, the structural engineer should also consider estimated settlements due to short duration seismic loading and applicable load combinations, as required by the County and/or the UBC/CBC (ICBO, 1997 and 2001). Additional studies (i.e., cone penetration testing), as recommended, may serve to reduce the preliminary settlement values provided herein. These estimates are based on fill materials that have generally very low to medium expansion potential, and therefore should be considered as preliminary estimates. Final settlement estimates should be provided at the completion of rough grading, based on the actual planned fill thickness and the nature of underlying materials encountered.

WALL DESIGN PARAMETERS

Conventional Retaining Walls

The design parameters provided below assume that either non expansive soils (Class 2 permeable filter material or Class 3 aggregate base) or native materials (up to and including an E.I. of 65) are used to backfill any retaining walls. The type of backfill (i.e., select or native), should be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, should be water-proofed or damp-proofed, depending on the degree of moisture protection desired. The foundation system for the proposed retaining walls should be designed in accordance with the recommendations presented in this and preceding sections of this report, as appropriate. Footings should be embedded a minimum of 18 inches below adjacent grade (excluding landscape layer, 6 inches) and should be 24 inches in width. There should be no increase in bearing for footing width. Recommendations for specialty walls (i.e., crib, earthstone, geogrid, etc.) can be provided upon request, and would be based on site specific conditions.

Restrained Walls

Any retaining walls that will be restrained prior to placing and compacting backfill material or that have re-entrant or male corners, should be designed for an at-rest equivalent fluid pressure (EFP) of 65 pcf, plus any applicable surcharge loading. For areas of male or re-entrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall (2H) laterally from the corner.

Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Design parameters for walls less than 3 feet in height may be superceded by City and/or County standard design. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall.

Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions due to traffic, structures, seismic events or adverse geologic conditions. When wall configurations are finalized, the appropriate loading conditions for superimposed loads can be provided upon request.

SURFACE SLOPE OF RETAINED MATERIAL (HORIZONTAL:VERTICAL)	EQUIVALENT FLUID WEIGHT P.C.F. (SELECT BACKFILL)	EQUIVALENT FLUID WEIGHT P.C.F. (NATIVE BACKFILL)
Level*	35	45
2 to 1	50	60
* Level backfill behind a retaining wall is defined as compacted earth materials, properly drained, without a slope for a distance of 2H behind the wall.		

Retaining Wall Backfill and Drainage

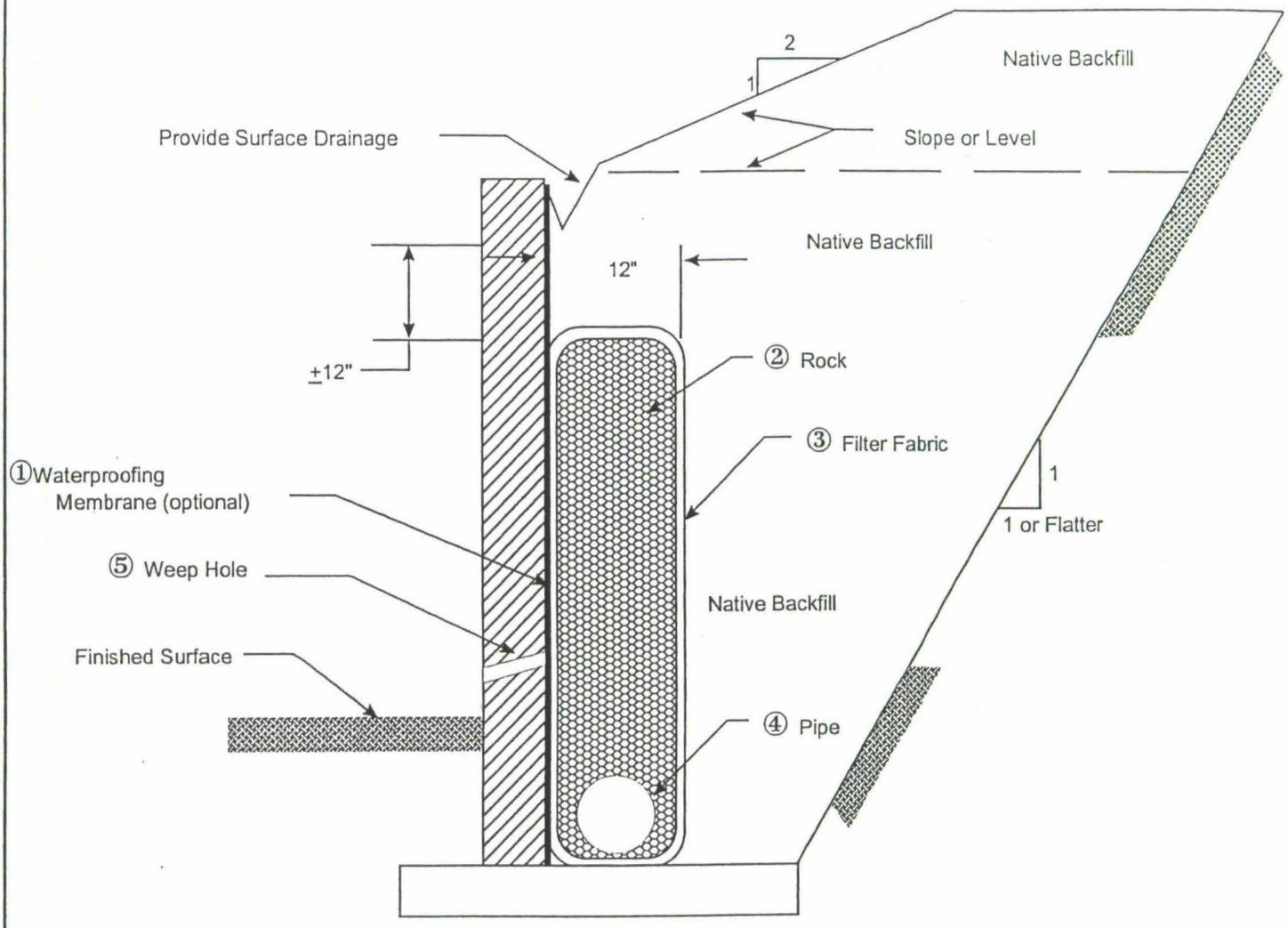
Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geofabric and outlets. A backdrain system is considered necessary for retaining walls that are 2 feet or greater in height. Details 1, 2, and 3, present the back drainage options discussed below. Backdrains should consist of a 4-inch diameter perforated PVC or ABS pipe encased in either Class 2 permeable filter material or ½-inch to ¾-inch gravel wrapped

in approved filter fabric (Mirafi 140 or equivalent). For low expansive backfill, the filter material should extend a minimum of 1 horizontal foot behind the base of the walls and upward at least 1 foot. For native backfill that has up to medium expansion potential, continuous Class 2 permeable drain materials should be used behind the wall. This material should be continuous (i.e., full height) behind the wall, and it should be constructed in accordance with the enclosed Detail 1 (Typical Retaining Wall Backfill and Drainage Detail). For limited access and confined areas, (panel) drainage behind the wall may be constructed in accordance with Detail 2 (Retaining Wall Backfill and Subdrain Detail Geotextile Drain). Materials with an E.I. potential of greater than 65 should not be used as backfill for retaining walls. For more onerous expansive situations, backfill and drainage behind the retaining wall should conform with Detail 3 (Retaining Wall And Subdrain Detail Clean Sand Backfill).

Outlets should consist of a 4-inch diameter solid PVC or ABS pipe spaced no greater than ±100 feet apart, with a minimum of two outlets, one on each end. The use of weep holes in walls higher than 2 feet should not be considered. The surface of the backfill should be sealed by pavement or the top 18 inches compacted with native soil (E.I. ≤90). Proper

DETAILS

N . T . S .



① **WATERPROOFING MEMBRANE (optional):**
Liquid boot or approved equivalent.

② **ROCK:**
3/4 to 1-1/2" (inches) rock.

③ **FILTER FABRIC:**
Mirafi 140N or approved equivalent; place fabric flap behind core.

④ **PIPE:**
4" (inches) diameter perforated PVC. schedule 40 or approved alternative with minimum of 1% gradient to proper outlet point.

⑤ **WEEP HOLE:**
Minimum 2" (inches) diameter placed at 20' (feet) on centers along the wall, and 3" (inches) above finished surface. (No weep holes for basement walls.)

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TYPICAL RETAINING WALL BACKFILL AND DRAINAGE DETAIL

DETAIL 1

Geotechnical • Geologic • Environmental

DETAILS

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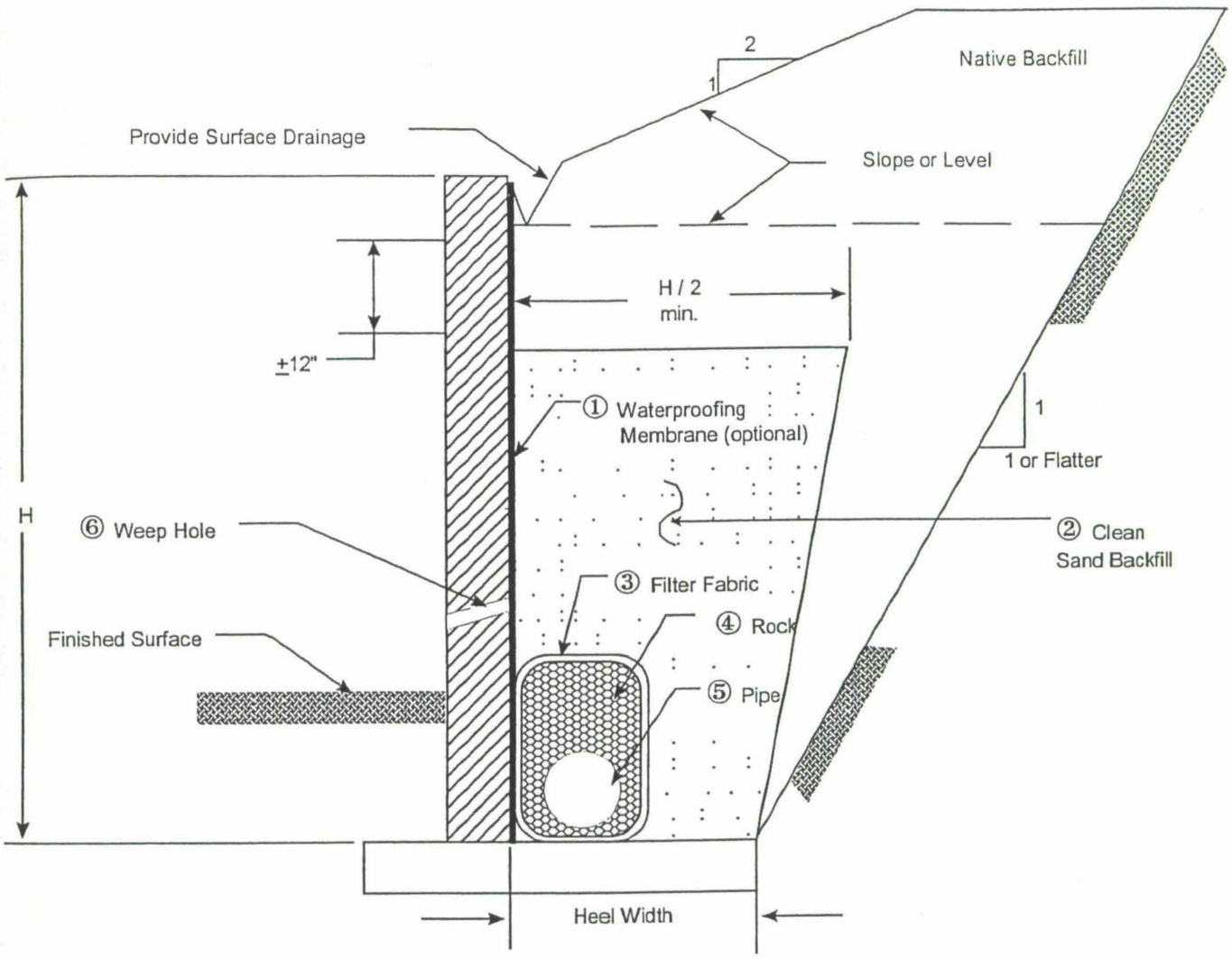

① **WATERPROOFING MEMBRANE (optional):**
Liquid boot or approved equivalent.

② **CLEAN SAND BACKFILL:**
Must have sand equivalent value of 30 or greater; can be densified by water jetting.

③ **FILTER FABRIC:**
Mirafi 140N or approved equivalent.

④ **ROCK:**
1 cubic foot per linear feet of pipe or 3/4 to 1-1/2" (inches) rock.

⑤ **PIPE:**
4" (inches) diameter perforated PVC. schedule 40 or approved alternative with minimum of 1% gradient to proper outlet point.

⑥ **WEEP HOLE:**
Minimum 2" (inches) diameter placed at 20' (feet) on centers along the wall, and 3" (inches) above finished surface. (No weep holes for basement walls.)

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RETAINING WALL AND SUBDRAIN DETAIL
CLEAN SAND BACKFILL

DETAIL 3

Geotechnical • Geologic • Environmental

surface drainage should also be provided. For additional mitigation, consideration should be given to applying a water-proof membrane to the back of all retaining structures. The use of a waterstop should be considered for all concrete and masonry joints.

Wall/Retaining Wall Footing Transitions

Site walls are anticipated to be founded on footings designed in accordance with the recommendations in this report. Should wall footings transition from cut to fill, the civil designer may specify either:

a) A minimum of a 2-foot overexcavation and recompaction of cut materials for a distance of 2H, from the point of transition.

b) Increase of the amount of reinforcing steel and wall detailing (i.e., expansion joints or crack control joints) such that a angular distortion of 1/360 for a distance of 2H on either side of the transition may be accommodated. Expansion joints should be placed no greater than 20 feet on-center, in accordance with the structural engineer's/wall designer's recommendations, regardless of whether or not transition conditions exist. Expansion joints should be sealed with a flexible, non-shrink grout.

c) Embed the footings entirely into native formational material (i.e., deepened footings).

If transitions from cut to fill transect the wall footing alignment at an angle of less than 45 degrees (plan view), then the designer should follow recommendation "a" (above) and until such transition is between 45 and 90 degrees to the wall alignment.

TOP-OF-SLOPE WALLS/FENCES/IMPROVEMENTS

Slope Creep

Soils at the site may be expansive and therefore, may become desiccated when allowed to dry. Such soils are susceptible to surficial slope creep, especially with seasonal changes in moisture content. Typically in southern California, during the hot and dry summer period, these soils become desiccated and shrink, thereby developing surface cracks. The extent and depth of these shrinkage cracks depend on many factors such as the nature and expansivity of the soils, temperature and humidity, and extraction of moisture from surface soils by plants and roots. When seasonal rains occur, water percolates into the cracks and fissures, causing slope surfaces to expand, with a corresponding loss in soil density and shear strength near the slope surface. With the passage of time and several moisture cycles, the outer 3 to 5 feet of slope materials experience a very slow, but progressive, outward and downward movement, known as slope creep. For slope heights greater than 10 feet, this creep related soil movement will

typically impact all rear yard flatwork and other secondary improvements that are located within about 15 feet from the top of slopes, such as swimming pools, concrete flatwork, etc., and in particular top of slope fences/walls. This influence is normally in the form of detrimental settlement, and tilting of the proposed improvements. The dessication/swelling and creep discussed above continues over the life of the improvements, and generally becomes progressively worse. Accordingly, the developer should provide this information to any homeowners and homeowners association.

Top of Slope Walls/Fences

Due to the potential for slope creep for slopes higher than about 10 feet, some settlement and tilting of the walls/fence with the corresponding distresses, should be expected. To mitigate the tilting of top of slope walls/fences, we recommend that the walls/fences be constructed on deepened foundations without any consideration for creep forces, where the expansion index of the materials comprising the outer 15 feet of the slope is less than 50, or a combination of grade beam and caisson foundations, for expansion indices greater than 50 comprising the slope, with creep forces taken into account. The grade beam should be at a minimum of 12 inches by 12 inches in cross section, supported by drilled caissons, 12 inches minimum in diameter, placed at a maximum spacing of 6 feet on center, and with a minimum embedment length of 7 feet below the bottom of the grade beam. The strength of the concrete and grout should be evaluated by the structural engineer of record. The proper ASTM tests for the concrete and mortar should be provided along with the slump quantities. The concrete used should be appropriate to mitigate sulfate corrosion, as warranted. The design of the grade beam and caissons should be in accordance with the recommendations of the project structural engineer, and include the utilization of the following geotechnical parameters:

Creep Zone: 5-foot vertical zone below the slope face and projected upward parallel to the slope face.

Creep Load: The creep load projected on the area of the grade beam should be taken as an equivalent fluid approach, having a density of 60 pcf. For the caisson, it should be taken as a uniform 900 pounds per linear foot of caisson's depth, located above the creep zone.

Point of Fixity: Located a distance of 1.5 times the caisson's diameter, below the creep zone.

Passive Resistance: Passive earth pressure of 300 psf per foot of depth per foot of caisson diameter, to a maximum value of 4,500 psf may be used to determine caisson depth and spacing, provided that they meet or exceed the minimum requirements stated above. To determine the total lateral resistance, the contribution of the

creep prone zone above the point of fixity, to passive resistance, should be disregarded.

Allowable Axial Capacity:

Shaft capacity : 350 psf applied below the point of fixity over the surface area of the shaft.

Tip capacity: 4,500 psf.

DRIVEWAY, FLATWORK, AND OTHER IMPROVEMENTS

The soil materials on site may be expansive. The effects of expansive soils are cumulative, and typically occur over the lifetime of any improvements. On relatively level areas, when the soils are allowed to dry, the dessication and swelling process tends to cause heaving and distress to flatwork and other improvements. The resulting potential for distress to improvements may be reduced, but not totally eliminated. To that end, it is recommended that the developer should notify any homeowners or homeowners association of this long-term potential for distress. To reduce the likelihood of distress, the following recommendations are presented for all exterior flatwork:

1. The subgrade area for concrete slabs should be compacted to achieve a minimum 90 percent relative compaction, and then be presoaked to 2 to 3 percentage points above (or 125 percent of) the soils' optimum moisture content, to a depth of 18 inches below subgrade elevation. If very low expansive soils are present, only optimum moisture content, or greater, is required and specific presoaking is not warranted. The moisture content of the subgrade should be verified within 72 hours prior to pouring concrete.

2. Concrete slabs should be cast over a non-yielding surface, consisting of a 4-inch layer of crushed rock, gravel, or clean sand, that should be compacted and level prior to pouring concrete. If very low expansive soils are present, the rock or gravel or sand may be deleted. The layer or subgrade should be wet-down completely prior to pouring concrete, to minimize loss of concrete moisture to the surrounding earth materials.

3. Exterior slabs should be a minimum of 4 inches thick. Driveway slabs and approaches should additionally have a thickened edge (12 inches) adjacent to all landscape areas, to help impede infiltration of landscape water under the slab.

4. The use of transverse and longitudinal control joints are recommended to help control slab cracking due to concrete shrinkage or expansion. Two ways to mitigate such cracking are: a) add a sufficient amount of reinforcing steel,

increasing tensile strength of the slab; and, b) provide an adequate amount of control and/or expansion joints to accommodate anticipated concrete shrinkage and expansion.

In order to reduce the potential for unsightly cracks, slabs should be reinforced at mid-height with a minimum of No. 3 bars placed at 18 inches on center, in each direction. If subgrade soils within the top 7 feet from finish grade are very low expansive soils (i.e., E.I. ≤20), then 6x6-W1.4xW1.4 welded-wire mesh may be substituted for the rebar, provided the reinforcement is placed on chairs, at slab mid-height. The exterior slabs should be scored or saw cut, ½ to ⅜ inches deep, often enough so that no section is greater than 10 feet by 10 feet. For sidewalks or narrow slabs, control joints should be provided at intervals of every 6 feet. The slabs should be separated from the foundations and sidewalks with expansion joint filler material.

5. No traffic should be allowed upon the newly poured concrete slabs until they have been properly cured to within 75 percent of design strength. Concrete compression strength should be a minimum of 2,500 psi.

6. Driveways, sidewalks, and patio slabs adjacent to the house should be separated from the house with thick expansion joint filler material. In areas directly adjacent to a continuous source of moisture (i.e., irrigation, planters, etc.), all joints should be additionally sealed with flexible mastic.

7. Planters and walls should not be tied to the house.

8. Overhang structures should be supported on the slabs, or structurally designed with continuous footings tied in at least two directions. If very low expansion soils are present, footings need only be tied in one direction.

9. Any masonry landscape walls that are to be constructed throughout the property should be grouted and articulated in segments no more than 20 feet long. These segments should be keyed or doweled together.

10. Utilities should be enclosed within a closed utilidor (vault) or designed with flexible connections to accommodate differential settlement and expansive soil conditions.

11. Positive site drainage should be maintained at all times. Finish grade on the lots should provide a minimum of 1 to 2 percent fall to the street, as indicated herein. It should be kept in mind that drainage reversals could occur, including post-construction settlement, if relatively flat yard drainage gradients are not periodically maintained by the homeowner or homeowners association.

12. Air conditioning (A/C) units should be supported by slabs that are incorporated into the building foundation or constructed on a rigid slab with flexible couplings for plumbing and electrical lines. A/C waste water lines should be drained to a suitable non-erosive outlet.

13. Shrinkage cracks could become excessive if proper finishing and curing practices are not followed. Finishing and curing practices should be performed per the Portland Cement Association Guidelines. Mix design should incorporate rate of curing for climate and time of year, sulfate content of soils, corrosion potential of soils, and fertilizers used on site.

DEVELOPMENT CRITERIA

Slope Deformation

Compacted fill slopes designed using customary factors of safety for gross or surficial stability and constructed in general accordance with the design specifications should be expected to undergo some differential vertical heave or settlement in combination with differential lateral movement in the out-of-slope direction, after grading. This post-construction movement occurs in two forms: slope creep, and lateral fill extension (LFE). Slope creep is caused by alternate wetting and drying of the fill soils which results in slow downslope movement. This type of movement is expected to occur throughout the life of the slope, and is anticipated to potentially affect improvements or structures (i.e., separations and/or cracking), placed near the top-of-slope, up to a maximum distance of approximately 15 feet from the top-of-slope, depending on the slope height. This movement generally results in rotation and differential settlement of improvements located within the creep zone. LFE occurs due to deep wetting from irrigation and rainfall on slopes comprised of expansive materials. Although some movement should be expected, long-term movement from this source may be minimized, but not eliminated, by placing the fill throughout the slope region, wet of the fill's optimum moisture content.

It is generally not practical to attempt to eliminate the effects of either slope creep or LFE. Suitable mitigative measures to reduce the potential of lateral deformation typically include: setback of improvements from the slope faces (per the 1997 UBC and/or CBC), positive structural separations (i.e., joints) between improvements, and stiffening and deepening of foundations. Expansion joints in walls should be placed no greater than 20 feet on-center, in accordance with the structural engineer's recommendations. All of these measures are recommended for design of structures and improvements. The ramifications of the above conditions, and recommendations for mitigation, should be provided to each homeowner and/or any homeowners association.

Slope Maintenance and Planting

Water has been shown to weaken the inherent strength of all earth materials. Slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Over-watering should be avoided as it can adversely affect site improvements, and cause perched groundwater conditions. Graded slopes constructed utilizing onsite materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Compaction to the face of fill slopes would tend to minimize short-term erosion until vegetation is established. Plants selected for landscaping should be light weight, deep rooted types that require little water and are capable of surviving the prevailing climate. Jute-type matting or other fibrous covers may aid in allowing the establishment of a sparse plant cover. Utilizing plants other than those recommended above will increase the potential for perched water, staining, mold, etc., to develop. A rodent control program to prevent burrowing should be implemented. Irrigation of natural (ungraded) slope areas is generally not recommended. These recommendations regarding plant type, irrigation practices, and rodent control should be provided to each homeowner. Over-steepening of slopes should be avoided during building construction activities and landscaping.

Drainage

Adequate lot surface drainage is a very important factor in reducing the likelihood of adverse performance of foundations, hardscape, and slopes. Surface drainage should be sufficient to prevent ponding of water anywhere on a lot, and especially near structures and tops of slopes. Lot surface drainage should be carefully taken into consideration during fine grading, landscaping, and building construction. Therefore, care should be taken that future landscaping or construction activities do not create adverse drainage conditions. Positive site drainage within lots and common areas should be provided and maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. In general, the area within 5 feet around a structure should slope away from the structure. We recommend that unpaved lawn and landscape areas have a minimum gradient of 1 percent sloping away from structures, and whenever possible, should be above adjacent paved areas. Consideration should be given to avoiding construction of planters adjacent to structures (buildings, pools, spas, etc.). Pad drainage should be directed toward the street or other approved area(s). Although not a geotechnical requirement, roof gutters, down spouts, or other appropriate means may be utilized to control roof drainage. Down spouts, or drainage devices should outlet a minimum of 5 feet from structures or into a subsurface drainage system. Areas of seepage may develop due to irrigation or heavy rainfall, and should be anticipated. Minimizing irrigation will lessen this potential. If areas of seepage develop, recommendations for minimizing this effect could be provided upon request.

Toe of Slope Drains/Toe Drains

Where significant slopes intersect pad areas, surface drainage down the slope allows for some seepage into the subsurface materials, sometimes creating conditions causing or contributing to perched and/or ponded water. Toe of slope/toe drains may be beneficial in the mitigation of this condition due to surface drainage. The general criteria to be utilized by the design engineer for evaluating the need for this type of drain is as follows:

- Is there a source of irrigation above or on the slope that could contribute to saturation of soil at the base of the slope?

- Are the slopes hard rock and/or impermeable, or relatively permeable, or; do the slopes already have or are they proposed to have subdrains (i.e., stabilization fills, etc.)?

- Was the lot at the base of the slope overexcavated or is it proposed to be overexcavated? Overexcavated lots located at the base of a slope could accumulate subsurface water along the base of the fill cap.

- Are the slopes north facing? North facing slopes tend to receive less sunlight (less evaporation) relative to south facing slopes and are more exposed to the currently prevailing seasonal storm tracks.

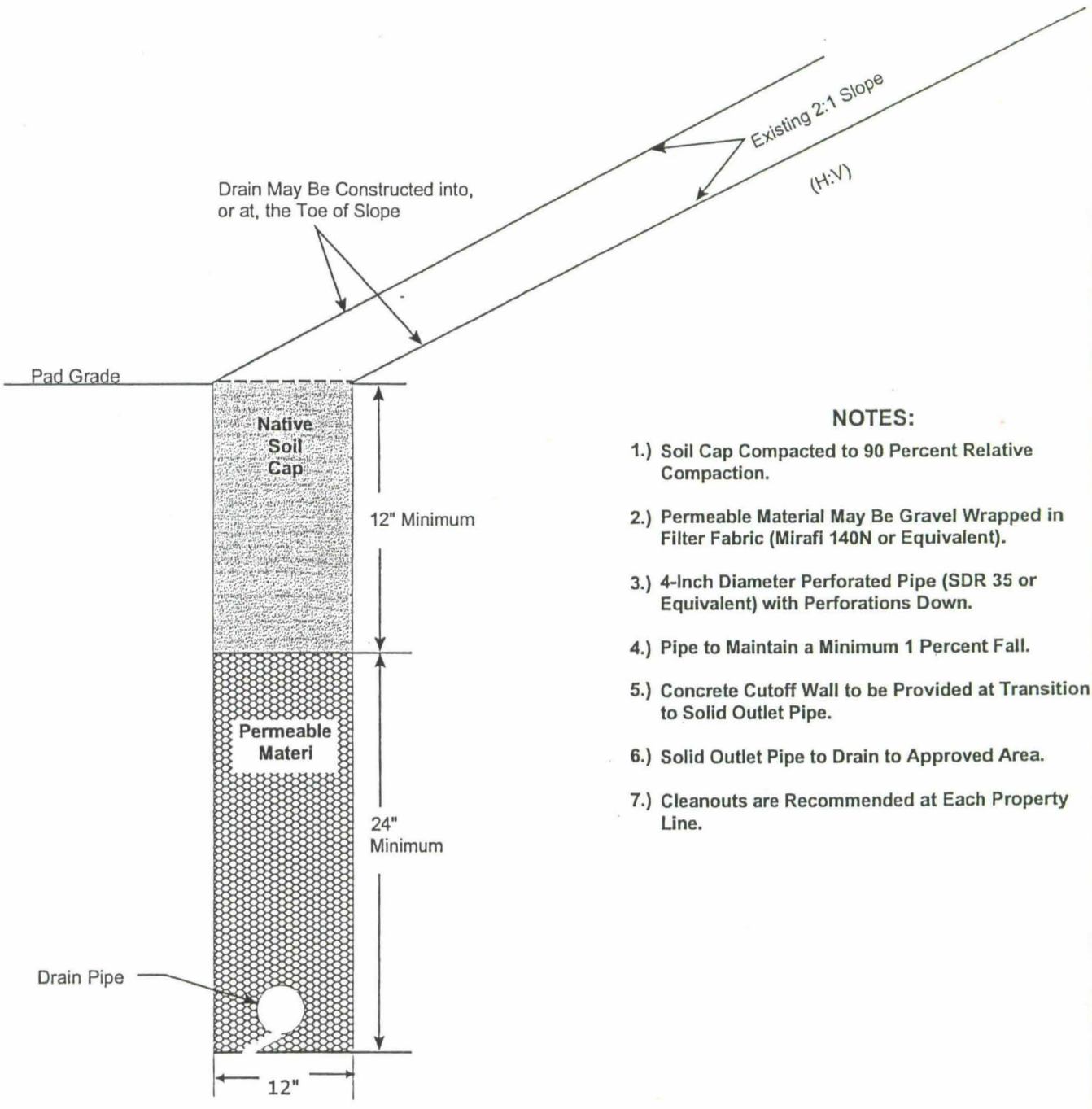
- What is the slope height? It has been our experience that slopes with heights in excess of approximately 10 feet tend to have more problems due to storm runoff and irrigation than slopes of a lesser height.

- Do the slopes "toe out" into a residential lot or a lot where perched or ponded water may adversely impact its proposed use?

Based on these general criteria, the construction of toe drains may be considered by the design engineer along the toe of slopes, or at retaining walls in slopes, descending to the rear of such lots. Following are Detail 4 (Schematic Toe Drain Detail) and Detail 5 (Subdrain Along Retaining Wall Detail). Other drains may be warranted due to unforeseen conditions, homeowner irrigation, or other circumstances. Where drains are constructed during grading, including subdrains, the locations/elevations of such drains should be surveyed, and recorded on the final as-built grading plans by the design engineer. It is recommended that the above be disclosed to all interested parties, including homeowners and any homeowners association.

DETAILS
N . T . S .

SCHEMATIC TOE DRAIN DETAIL



NOTES:

1.) Soil Cap Compacted to 90 Percent Relative Compaction.

2.) Permeable Material May Be Gravel Wrapped in Filter Fabric (Mirafi 140N or Equivalent).

3.) 4-Inch Diameter Perforated Pipe (SDR 35 or Equivalent) with Perforations Down.

4.) Pipe to Maintain a Minimum 1 Percent Fall.

5.) Concrete Cutoff Wall to be Provided at Transition to Solid Outlet Pipe.

6.) Solid Outlet Pipe to Drain to Approved Area.

7.) Cleanouts are Recommended at Each Property Line.

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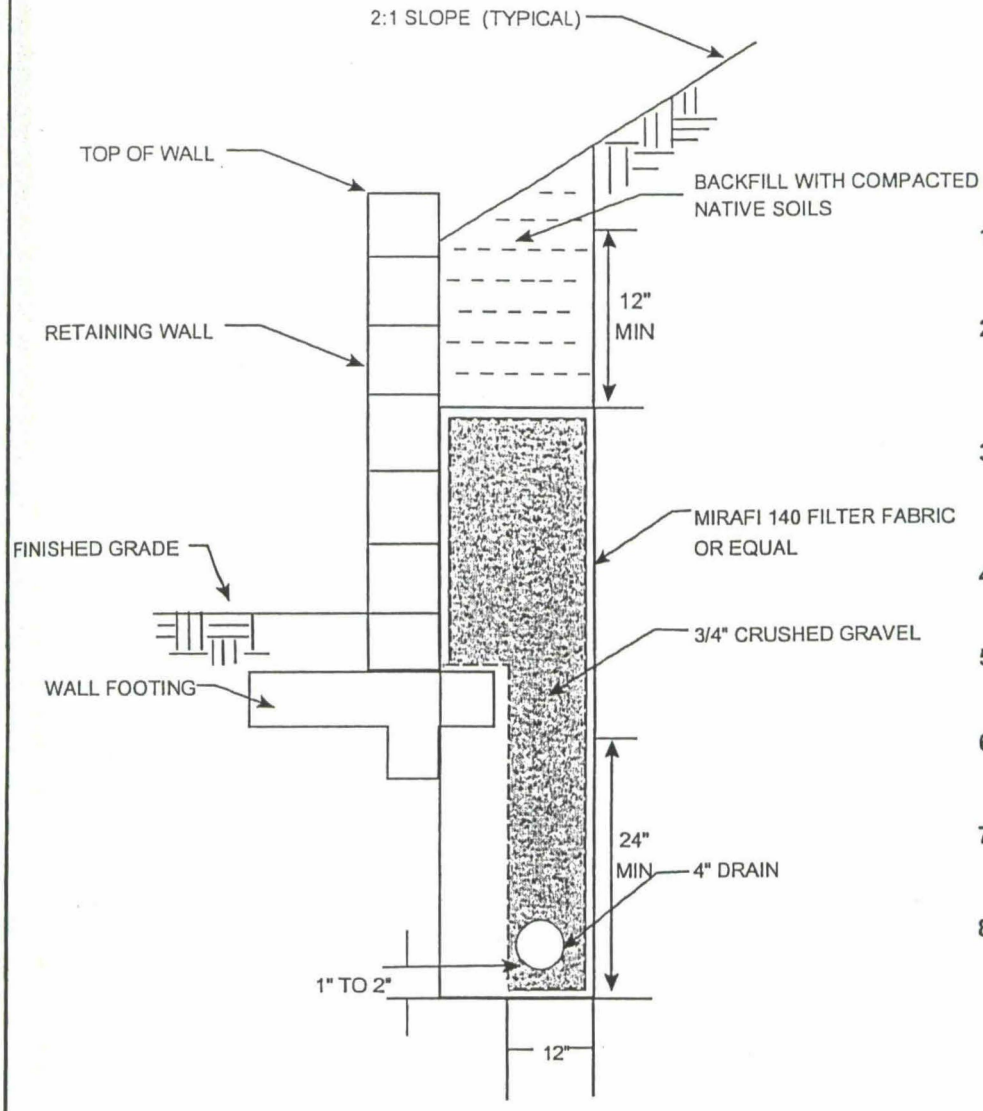
SCHEMATIC TOE DRAIN DETAIL

DETAIL 4

Geotechnical • Coastal • Geologic • Environmental

DETAILS

N . T . S .



NOTES:

1.) **Soil Cap Compacted to 90 Percent Relative Compaction.**

2.) **Permeable Material May Be Gravel Wrapped in Filter Fabric (Mirafi 140N or Equivalent).**

3.) **4-Inch Diameter Perforated Pipe (SDR-35 of Equivalent) with Perforations Down.**

4.) **Pipe to Maintain a Minimum 1 Percent Fall.**

5.) **Concrete Cutoff Wall to be Provided at Transition to Solid Outlet Pipe.**

6.) **Solid Outlet Pipe to Drain to Approved Area.**

7.) **Cleanouts are Recommended at Each Property Line.**

8.) **Compacted Effort Should Be Applied to Drain Rock.**

SUBDRAIN ALONG RETAINING WALL DETAIL

NOT TO SCALE

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SUBDRAIN ALONG RETAINING WALL DETAIL

DETAIL 5

Geotechnical • Coastal • Geologic • Environmental

Erosion Control

Cut and fill slopes will be subject to surficial erosion during and after grading. Onsite earth materials have a moderate to high erosion potential. Consideration should be given to providing hay bales and silt fences for the temporary control of surface water, from a geotechnical viewpoint.

Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Over-watering the landscape areas will adversely affect proposed site improvements. We would recommend that any proposed open-bottom planters adjacent to proposed structures be eliminated for a minimum distance of 10 feet. As an alternative, closed-bottom type planters could be utilized. An outlet placed in the bottom of the planter, could be installed to direct drainage away from structures or any exterior concrete flatwork. If planters are constructed adjacent to structures, the sides and bottom of the planter should be provided with a moisture barrier to prevent penetration of irrigation water into the subgrade. Provisions should be made to drain the excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Graded slope areas should be planted with drought resistant vegetation. Consideration should be given to the type of vegetation chosen and their potential effect upon surface improvements (i.e., some trees will have an effect on concrete flatwork with their extensive root systems). From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils are processed for the purpose of adding amendments, they should be recompacted to 90 percent minimum relative compaction.

Gutters and Downspouts

As previously discussed in the drainage section, the installation of gutters and downspouts should be considered to collect roof water that may otherwise infiltrate the soils adjacent to the structures. If utilized, the downspouts should be drained into PVC collector pipes or non-erosive devices that will carry the water away from the house. Downspouts and gutters are not a requirement; however, from a geotechnical viewpoint, provided that positive drainage is incorporated into project design (as discussed previously).

Subsurface and Surface Water

Subsurface and surface water are not anticipated to affect site development, provided that the recommendations contained in this report are incorporated into final design and construction and that prudent surface and subsurface drainage practices are incorporated into the construction plans. Perched groundwater conditions along zones of contrasting permeabilities may not be precluded from occurring in the future due to site irrigation, poor drainage conditions, or damaged utilities, and should be anticipated. Should perched groundwater conditions develop, this office could assess the affected area(s) and provide

the appropriate recommendations to mitigate the observed groundwater conditions. Groundwater conditions may change with the introduction of irrigation, rainfall, or other factors.

Site Improvements

Recommendations for exterior concrete flatwork design and construction can be provided upon request. If in the future, any additional improvements (e.g., pools, spas, etc.) are planned for the site, recommendations concerning the geological or geotechnical aspects of design and construction of said improvements could be provided upon request. This office should be notified in advance of any fill placement, grading of the site, or trench backfilling after rough grading has been completed. This includes any grading, utility trench, and retaining wall backfills.

Tile Flooring

Tile flooring can crack, reflecting cracks in the concrete slab below the tile, although small cracks in a conventional slab may not be significant. Therefore, the designer should consider additional steel reinforcement for concrete slabs-on-grade where tile will be placed. The tile installer should consider installation methods that reduce possible cracking of the tile such as slipsheets. Slipsheets or a vinyl crack isolation membrane (approved by the Tile Council of America/Ceramic Tile Institute) are recommended between tile and concrete slabs on grade.

Additional Grading

This office should be notified in advance of any fill placement, supplemental regrading of the site, or trench backfilling after rough grading has been completed. This includes completion of grading in the street and parking areas and utility trench and retaining wall backfills.

Footing Trench Excavation

All footing excavations should be observed by a representative of this firm subsequent to trenching and prior to concrete form and reinforcement placement. The purpose of the observations is to verify that the excavations are made into the recommended bearing material and to the minimum widths and depths recommended for construction. If loose or compressible materials are exposed within the footing excavation, a deeper footing or removal and recompaction of the subgrade materials would be recommended at that time. Footing trench spoil and any excess soils generated from utility trench excavations should be compacted to a minimum relative compaction of 90 percent, if not removed from the site.

Trenching

Considering the nature of the onsite soils, it should be anticipated that caving or sloughing could be a factor in subsurface excavations and trenching. Shoring or excavating the trench walls at the angle of repose (typically 25 to 45 degrees) may be necessary and should be anticipated. All excavations should be observed by one of our representatives and minimally conform to CAL-OSHA and local safety codes.

Utility Trench Backfill

1. All interior utility trench backfill should be brought to at least 2 percent above optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard. As an alternative for shallow (12-inch to 18-inch) under-slab trenches, sand having a sand equivalent value of 30 or greater may be utilized and jetted or flooded into place. Observation, probing and testing should be provided to verify the desired results.

2. Exterior trenches adjacent to, and within areas extending below a 1:1 plane projected from the outside bottom edge of the footing, and all trenches beneath hardscape features and in slopes, should be compacted to at least 90 percent of the laboratory standard. Sand backfill, unless excavated from the trench, should not be used in these backfill areas. Compaction testing and observations, along with probing, should be accomplished to verify the desired results.

3. All trench excavations should conform to CAL-OSHA and local safety codes.
4. Utilities crossing grade beams, perimeter beams, or footings should either pass below the footing or grade beam utilizing a hardened collar or foam spacer, or pass through the footing or grade beam in accordance with the recommendations of the structural engineer.

SUMMARY OF RECOMMENDATIONS REGARDING GEOTECHNICAL OBSERVATION AND TESTING

We recommend that observation and/or testing be performed by GSI at each of the following construction stages:

- During grading/recertification.
- During significant excavation (i.e., higher than 4 feet).
- During placement of subdrains, toe drains, or other subdrainage devices, prior to placing fill and/or backfill.

- After excavation of building footings, retaining wall footings, and free standing walls footings, prior to the placement of reinforcing steel or concrete.

- Prior to pouring any slabs or flatwork, after presoaking/presaturation of building pads and other flatwork subgrade, before the placement of concrete, reinforcing steel, capillary break (i.e., sand, pea-gravel, etc.), or vapor barriers (i.e., visqueen, etc.).

- During retaining wall subdrain installation, prior to backfill placement.

- During placement of backfill for area drain, interior plumbing, utility line trenches, and retaining wall backfill.

- During slope construction/repair.

- When any unusual soil conditions are encountered during any construction operations, subsequent to the issuance of this report.

- When any developer or homeowner improvements, such as flatwork, spas, pools, walls, etc., are constructed.

- A report of geotechnical observation and testing should be provided at the conclusion of each of the above stages, in order to provide concise and clear documentation of site work, and/or to comply with code requirements.

- GSI should review project sales documents to homeowners/homeowners associations for geotechnical aspects, including irrigation practices, the conditions outlined above, etc., prior to any sales. At that stage, GSI will provide homeowners maintenance guidelines which should be incorporated into such documents.

OTHER DESIGN PROFESSIONALS/CONSULTANTS

The design civil engineer, structural engineer, post-tension designer, architect, landscape architect, wall designer, etc., should review the recommendations provided herein, incorporate those recommendations into all their respective plans, and by explicit reference, make this report part of their project plans. This report presents minimum design criteria for the design of slabs, foundations and other elements possibly applicable to the project. These criteria should not be considered as substitutes for actual designs by the structural engineer/designer. The structural engineer/designer should analyze actual soil-structure interaction and consider, as needed, bearing, expansive soil influence, and strength, stiffness and deflections in the various slab, foundation, and other elements in order to develop appropriate, design-specific details. As conditions dictate, it is possible that other influences will also have to be considered. The structural engineer/designer

should consider all applicable codes and authoritative sources where needed. If analyses by the structural engineer/designer result in less critical details than are provided herein as minimums, the minimums presented herein should be adopted. It is considered likely that some, more restrictive details will be required. If the structural engineer/designer has any questions or requires further assistance, they should not hesitate to call or otherwise transmit their requests to GSI. In order to mitigate potential distress, the foundation and/or improvement's designer should confirm to GSI and the governing agency, in writing, that the proposed foundations and/or improvements can tolerate the amount of differential settlement and/or expansion characteristics and design criteria specified herein.

PLAN REVIEW

Final project plans should be reviewed by this office prior to construction, so that construction is in accordance with the conclusions and recommendations of this report. Based on our review, supplemental recommendations and/or further geotechnical studies may be warranted.

LIMITATIONS

The materials encountered on the project site and utilized for our analysis are believed representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors.

Inasmuch as our study is based upon our review and engineering analyses and laboratory data, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. GSI assumes no responsibility or liability for work or testing performed by others, or their inaction; or work performed when GSI is not requested to be onsite, to evaluate if our recommendations have been properly implemented. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place. In addition, this report may be subject to review by the controlling authorities. Thus, this report brings to completion our scope of services for this portion of the project.

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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APPENDIX B

BORING LOGS

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-1 SHEET 1 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
				ML				**ARTIFICIAL FILL:** @ 0' SANDY SILT, brown to dark brown, damp to moist, medium stiff; fine grained, wood chips in upper ½'.
			17	SM/ML	101.8	15.5	65.9	**COLLUVIUM/TOPSOIL:** @ 1½' SANDY SILT and SILTY SAND, medium brown to brown, moist, stiff and medium dense; fine grained.
5			17	SM	93.1	12.9	43.9	**QUATERNARY ALLUVIUM:** @ 4' SILTY SAND, light reddish brown to medium brown, damp, medium dense; fine to medium grained.
10			27	SW	104.6	2.2	9.8	@ 10' SAND w/trace GRAVEL, light grayish brown, dry, medium dense; fine to coarse grained.
15			34	SP	103.5	1.6	7.0	@ 15' SAND, light reddish brown to light brown, dry, medium dense; fine to medium grained.
20			34	SW	110.5	1.6	8.4	@ 20' SAND, light grayish brown to light brown, dry, medium dense; fine to coarse grained.
25			46		109.1	1.9	9.7	@ 25' SAND w/trace GRAVEL, light grayish brown to light brown, dry, dense; fine to coarse grained.

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-1 SHEET 2 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
			78	SW	109.4	1.8	9.3	@ 30' SAND w/trace GRAVEL, light reddish brown to light grayish brown to light brown, dry, very dense; fine to coarse grained.
35			34	SP		3.5		@ 35' SAND, light grayish brown to light brown, dry, dense; fine to medium grained.
40			92		110.0	2.6	13.6	@ 40' SAND, light grayish brown to light brown, dry, very dense; fine to medium grained.
45			9	ML		23.8		@ 45' CLAYEY to SANDY SILT, medium brown to dark brown, wet, stiff; fine grained.
50			31		101.1	24.4	101.6	@ 50' CLAYEY to SANDY SILT, medium brown to dark brown, saturated, very stiff; fine grained.
								Total Depth = 51½' No Groundwater Encountered Backfilled 7-28-2004
55								

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-2 SHEET 1 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
				SM				**COLLUVIUM/TOPSOIL:** @ 0' SILTY SAND, brown to dark brown, dry to damp, loose; fine to medium grained, trace roots.
			22	SM	108.2	3.1	15.5	**QUATERNARY ALLUVIUM:** @ 2' SILTY SAND w/trace GRAVEL, medium brown, dry, medium dense; fine to medium grained.
5			21	ML/SM	104.7	8.6	39.4	@ 5' CLAYEY to SILTY SAND and SANDY SILT, medium brown, damp, medium dense and very stiff; fine to medium grained.
10			21	SM/ML	102.9	18.4	80.4	@ 10' CLAYEY to SANDY SILT and SILTY SAND, light to medium brown, wet, very stiff and medium dense; fine to medium grained.
15			18	ML/SM	98.0	18.6	71.5	@ 15' SILTY SAND and SANDY SILT, light reddish brown to light to medium brown, moist to locally wet, medium dense and stiff; fine to medium grained.
20			32	SM	104.5	16.0	72.8	@ 20' SILTY SAND, light reddish brown to light to medium brown, moist, medium dense; fine to medium grained.
25			21	ML	112.2	15.7	87.6	@ 25' CLAYEY to SANDY SILT, dark to medium brown, wet, very stiff; fine grained.

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-2 SHEET 2 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
		▨	21	SM	101.0	16.4	68.0	@ 30' CLAYEY to SILTY SAND, light to medium brown, moist, medium dense; fine to medium grained.
								Total Depth = 31'
								No Groundwater Encountered
								Backfilled 7-28-2004
35								
40								
45								
50								
55								

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-3 SHEET 1 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
								ARTIFICIAL FILL:
								@ 0' WOOD CHIPS and DRIED MANURE.
				ML				**QUATERNARY ALLUVIUM:**
			21		105.6	4.8	22.5	@ 1' SANDY SILT, light brownish gray to grayish brown, dry, medium stiff to stiff; fine grained.
								@ 3' SANDY SILT, light grayish brown to medium brown, dry, very stiff; fine grained.
5			23					@ 6' No recovery, very stiff.
10			21	SM	98.7	6.9	27.1	@ 10' SILTY SAND w/minor inlayered SILTY CLAY (2" seam), light to dark brown, damp, medium dense to very stiff; dominantly fine grained with occasional medium grained sands.
15			24	SM/SC /CL	114.5	8.5	50.5	@ 15' SANDY CLAY and CLAYEY to SILTY SAND, light to medium to dark brown, moist, medium dense and very stiff; fine to medium grained.
20			6	ML/SM		21.8		@ 20' SILTY SAND and SANDY SILT, medium brown, wet, loose and medium stiff; fine grained.
25			66	SW	112.7	3.7	21.2	@ 25' SAND, light reddish brown to light grayish brown, dry, dense; fine to coarse grained.

BORING LOG

GeoSoils, Inc.

W.O. 4451-A2-SC

PROJECT: YOUNG HOMES
±43-Acre Parcel, "Hideway Farms", 532 N. Lyon Ave., San Jacinto

BORING B-3 SHEET 2 OF 2

DATE EXCAVATED 7-28-04

SAMPLE METHOD: 8" HOLLOW STEM AUGER, 140 LB @ 30" DROP

Standard Penetration Test

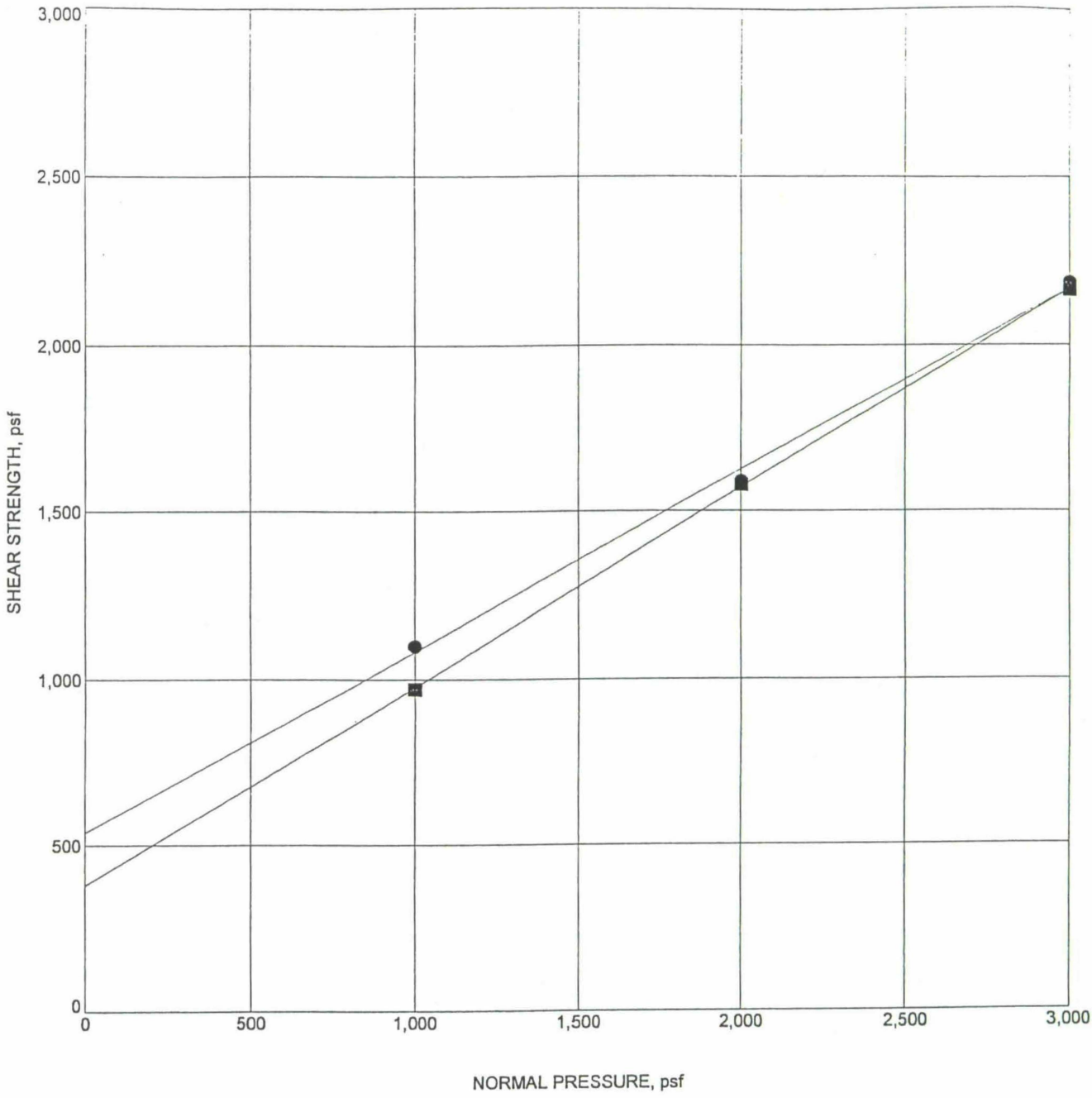
Undisturbed, Ring Sample

Groundwater

Depth (ft.)	Sample: Bulk	Sample: Undis-turbed	Sample: Blows/ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Description of Material
			22	SW		11.2		@ 30' SAND w/trace SILT and trace GRAVEL, light to medium brown, dry to damp, medium dense; fine to coarse grained.
								Total Depth = 31½' No Groundwater Encountered Backfilled 7-28-2004
35								
40								
45								
50								
55								

APPENDIX C

LABORATORY TEST RESULTS



	Sample	Depth/El.	Primary/Residual Shear	Sample Type	γ_d	MC%	c	ϕ
●	B-3	1.0	Primary Shear	Remolded	109.4	12.5	539	29
■	B-3	1.0	Residual Shear	Remolded	109.4	12.5	379	31

Note: Sample Innundated prior to testing

GeoSoils, Inc.
5741 Palmer Way
Carlsbad, CA 92008
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Fax: (760) 931-0915

DIRECT SHEAR TEST

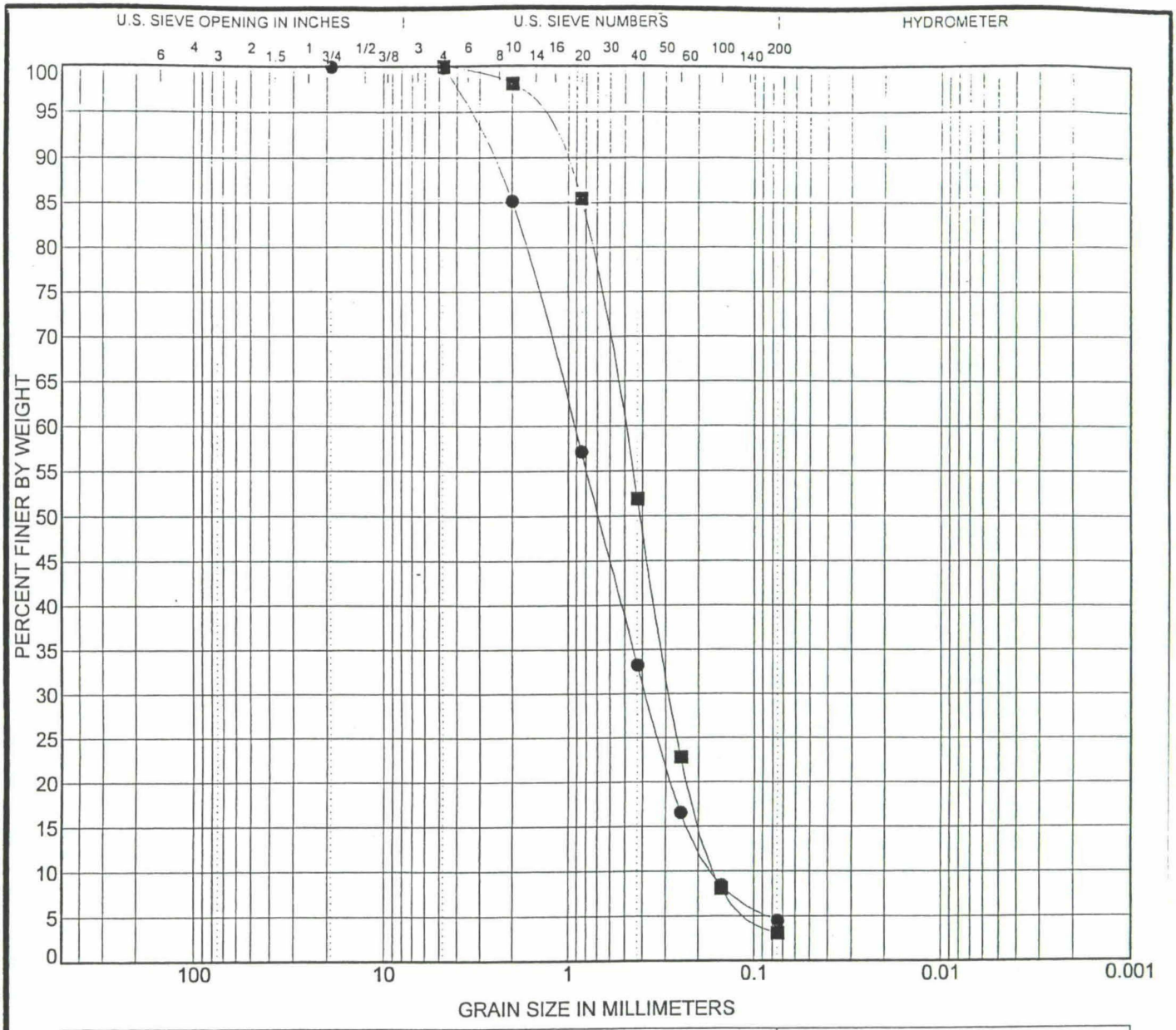
Project: YOUNG HOMES

Number: 4451-A2-SC

Date: August 2004

Plate: C - 1

US DIRECT SHEAR 4451A2.GPJ US LAB.GDT 8/18/04



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth	Classification	LL	PL	PI	Cc	Cu
●	B-1	10.0	POORLY GRADED SAND(SP)	NP	NP	NP	0.96	5.60
■	B-1	15.0	POORLY GRADED SAND(SP)	NP	NP	NP	1.01	3.13

	Sample	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	10.0	19	0.927	0.383	0.165	0.1	95.4	4.5	
■	B-1	15.0	4.75	0.502	0.285	0.16	0.0	96.9	3.1	

US GRAIN SIZE 4451A2.GPJ US_LAB.GDT 8/18/04

GeoSoils, Inc.
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Carlsbad, CA 92008
Telephone: (760) 438-3155
Fax: (760) 931-0915

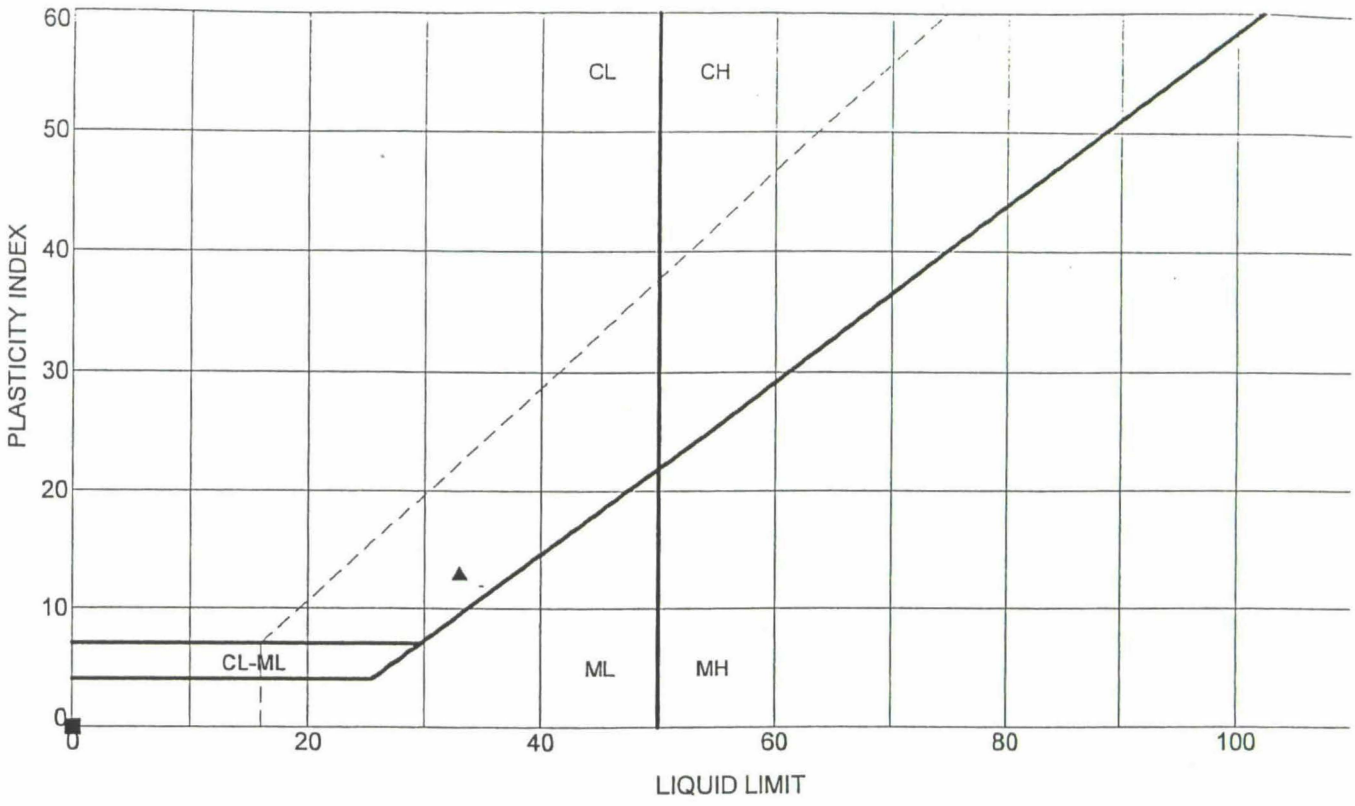
GRAIN SIZE DISTRIBUTION

Project: YOUNG HOMES

Number: 4451-A2-SC

Date: August 2004

Plate: C - 3



	Sample	Depth/El.	LL	PL	PI	Fines	Classification
●	B-1	10.0	NP	NP	NP	5	POORLY GRADED SAND(SP)
■	B-1	15.0	NP	NP	NP	3	POORLY GRADED SAND(SP)
▲	B-3	1.0	33	20	13		

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ATTERBERG LIMITS' RESULTS

Project: YOUNG HOMES

Number: 4451-A2-SC

Date: August 2004

Plate: C - 4

US ATTERBERG LIMITS 4451A2.GPJ US_LAB.GDT 8/18/04

APPENDIX D

GENERAL EARTHWORK AND GRADING GUIDELINES

GENERAL EARTHWORK AND GRADING GUIDELINES

General

These guidelines present general procedures and requirements for earthwork and grading as shown on the approved grading plans, including preparation of areas to filled, placement of fill, installation of subdrains and excavations. The recommendations contained in the geotechnical report are part of the earthwork and grading guidelines and would supercede the provisions contained hereafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supercede these guidelines or the recommendations contained in the geotechnical report.

The contractor is responsible for the satisfactory completion of all earthwork in accordance with provisions of the project plans and specifications. The project soil engineer and engineering geologist (geotechnical consultant) or their representatives should provide observation and testing services, and geotechnical consultation during the duration of the project.

EARTHWORK OBSERVATIONS AND TESTING

Geotechnical Consultant

Prior to the commencement of grading, a qualified geotechnical consultant (soil engineer and engineering geologist) should be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report, the approved grading plans, and applicable grading codes and ordinances.

The geotechnical consultant should provide testing and observation so that determination may be made that the work is being accomplished as specified. It is the responsibility of the contractor to assist the consultants and keep them apprised of anticipated work schedules and changes, so that they may schedule their personnel accordingly.

All clean-outs, prepared ground to receive fill, key excavations, and subdrains should be observed and documented by the project engineering geologist and/or soil engineer prior to placing and fill. It is the contractors's responsibility to notify the engineering geologist and soil engineer when such areas are ready for observation.

Laboratory and Field Tests

Maximum dry density tests to determine the degree of compaction should be performed in accordance with American Standard Testing Materials test method ASTM designation D-1557-78. Random field compaction tests should be performed in accordance with test method ASTM designation D-1556-82, D-2937 or D-2922 and D-3017, at intervals of approximately 2 feet of fill height or every 100 cubic yards of fill placed. These criteria

would vary depending on the soil conditions and the size of the project. The location and frequency of testing would be at the discretion of the geotechnical consultant.

Contractor's Responsibility

All clearing, site preparation, and earthwork performed on the project should be conducted by the contractor, with observation by geotechnical consultants and staged approval by the governing agencies, as applicable. It is the contractor's responsibility to prepare the ground surface to receive the fill, to the satisfaction of the soil engineer, and to place, spread, moisture condition, mix and compact the fill in accordance with the recommendations of the soil engineer. The contractor should also remove all major non-earth material considered unsatisfactory by the soil engineer.

It is the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the earthwork in accordance with applicable grading guidelines, codes or agency ordinances, and approved grading plans. Sufficient watering apparatus and compaction equipment should be provided by the contractor with due consideration for the fill material, rate of placement, and climatic conditions. If, in the opinion of the geotechnical consultant, unsatisfactory conditions such as questionable weather, excessive oversized rock, or deleterious material, insufficient support equipment, etc., are resulting in a quality of work that is not acceptable, the consultant will inform the contractor, and the contractor is expected to rectify the conditions, and if necessary, stop work until conditions are satisfactory.

During construction, the contractor shall properly grade all surfaces to maintain good drainage and prevent ponding of water. The contractor shall take remedial measures to control surface water and to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed.

SITE PREPARATION

All major vegetation, including brush, trees, thick grasses, organic debris, and other deleterious material should be removed and disposed of off-site. These removals must be concluded prior to placing fill. Existing fill, soil, alluvium, colluvium, or rock materials determined by the soil engineer or engineering geologist as being unsuitable in-place should be removed prior to fill placement. Depending upon the soil conditions, these materials may be reused as compacted fills. Any materials incorporated as part of the compacted fills should be approved by the soil engineer.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, or other structures not located prior to grading are to be removed or treated in a manner recommended by the soil engineer. Soft, dry, spongy, highly fractured, or otherwise unsuitable ground extending to such a depth that surface

processing cannot adequately improve the condition should be overexcavated down to firm ground and approved by the soil engineer before compaction and filling operations continue. Overexcavated and processed soils which have been properly mixed and moisture conditioned should be re-compacted to the minimum relative compaction as specified in these guidelines.

Existing ground which is determined to be satisfactory for support of the fills should be scarified to a minimum depth of 6 inches or as directed by the soil engineer. After the scarified ground is brought to optimum moisture content or greater and mixed, the materials should be compacted as specified herein. If the scarified zone is grater that 6 inches in depth, it may be necessary to remove the excess and place the material in lifts restricted to about 6 inches in compacted thickness.

Existing ground which is not satisfactory to support compacted fill should be overexcavated as required in the geotechnical report or by the on-site soils engineer and/or engineering geologist. Scarification, disc harrowing, or other acceptable form of mixing should continue until the soils are broken down and free of large lumps or clods, until the working surface is reasonably uniform and free from ruts, hollow, hummocks, or other uneven features which would inhibit compaction as described previously.

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical), the ground should be stepped or benched. The lowest bench, which will act as a key, should be a minimum of 15 feet wide and should be at least 2 feet deep into firm material, and approved by the soil engineer and/or engineering geologist. In fill over cut slope conditions, the recommended minimum width of the lowest bench or key is also 15 feet with the key founded on firm material, as designated by the Geotechnical Consultant. As a general rule, unless specifically recommended otherwise by the Soil Engineer, the minimum width of fill keys should be approximately equal to ½ the height of the slope.

Standard benching is generally 4 feet (minimum) vertically, exposing firm, acceptable material. Benching may be used to remove unsuitable materials, although it is understood that the vertical height of the bench may exceed 4 feet. Pre-stripping may be considered for unsuitable materials in excess of 4 feet in thickness.

All areas to receive fill, including processed areas, removal areas, and the toe of fill benches should be observed and approved by the soil engineer and/or engineering geologist prior to placement of fill. Fills may then be properly placed and compacted until design grades (elevations) are attained.

COMPACTED FILLS

Any earth materials imported or excavated on the property may be utilized in the fill provided that each material has been determined to be suitable by the soil engineer. These materials should be free of roots, tree branches, other organic matter or other deleterious materials. All unsuitable materials should be removed from the fill as directed by the soil engineer. Soils of poor gradation, undesirable expansion potential, or substandard strength characteristics may be designated by the consultant as unsuitable and may require blending with other soils to serve as a satisfactory fill material.

Fill materials derived from benching operations should be dispersed throughout the fill area and blended with other bedrock derived material. Benching operations should not result in the benched material being placed only within a single equipment width away from the fill/bedrock contact.

Oversized materials defined as rock or other irreducible materials with a maximum dimension greater than 12 inches should not be buried or placed in fills unless the location of materials and disposal methods are specifically approved by the soil engineer. Oversized material should be taken off-site or placed in accordance with recommendations of the soil engineer in areas designated as suitable for rock disposal. Oversized material should not be placed within 10 feet vertically of finish grade (elevation) or within 20 feet horizontally of slope faces.

To facilitate future trenching, rock should not be placed within the range of foundation excavations, future utilities, or underground construction unless specifically approved by the soil engineer and/or the developers representative.

If import material is required for grading, representative samples of the materials to be utilized as compacted fill should be analyzed in the laboratory by the soil engineer to determine its physical properties. If any material other than that previously tested is encountered during grading, an appropriate analysis of this material should be conducted by the soil engineer as soon as possible.

Approved fill material should be placed in areas prepared to receive fill in near horizontal layers that when compacted should not exceed 6 inches in thickness. The soil engineer may approve thick lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer should be spread evenly and blended to attain uniformity of material and moisture suitable for compaction.

Fill layers at a moisture content less than optimum should be watered and mixed, and wet fill layers should be aerated by scarification or should be blended with drier material. Moisture condition, blending, and mixing of the fill layer should continue until the fill materials have a uniform moisture content at or above optimum moisture.

After each layer has been evenly spread, moisture conditioned and mixed, it should be uniformly compacted to a minimum of 90 percent of maximum density as determined by ASTM test designation, D-1557-78, or as otherwise recommended by the soil engineer. Compaction equipment should be adequately sized and should be specifically designed for soil compaction or of proven reliability to efficiently achieve the specified degree of compaction.

Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture is in evidence, the particular layer or portion shall be re-worked until the required density and/or moisture content has been attained. No additional fill shall be placed in an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements, and is approved by the soil engineer.

Compaction of slopes should be accomplished by over-building a minimum of 3 feet horizontally, and subsequently trimming back to the design slope configuration. Testing shall be performed as the fill is elevated to evaluate compaction as the fill core is being developed. Special efforts may be necessary to attain the specified compaction in the fill slope zone. Final slope shaping should be performed by trimming and removing loose materials with appropriate equipment. A final determination of fill slope compaction should be based on observation and/or testing of the finished slope face. Where compacted fill slopes are designed steeper than 2:1 (horizontal to vertical), specific material types, a higher minimum relative compaction, and special grading procedures, may be recommended.

If an alternative to over-building and cutting back the compacted fill slopes is selected, then special effort should be made to achieve the required compaction in the outer 10 feet of each lift of fill by undertaking the following:

1. An extra piece of equipment consisting of a heavy short shanked sheepsfoot should be used to roll (horizontal) parallel to the slopes continuously as fill is placed. The sheepsfoot roller should also be used to roll perpendicular to the slopes, and extend out over the slope to provide adequate compaction to the face of the slope.

2. Loose fill should not be spilled out over the face of the slope as each lift is compacted. Any loose fill spilled over a previously completed slope face should be trimmed off or be subject to re-rolling.

3. Field compaction tests will be made in the outer (horizontal) 2 to 8 feet of the slope at appropriate vertical intervals, subsequent to compaction operations.

4. After completion of the slope, the slope face should be shaped with a small tractor and then re-rolled with a sheepsfoot to achieve compaction to near the slope face. Subsequent to testing to verify compaction, the slopes should be grid-rolled to

achieve compaction to the slope face. Final testing should be used to confirm compaction after grid rolling.

5. Where testing indicates less than adequate compaction, the contractor will be responsible to rip, water, mix and re-compact the slope material as necessary to achieve compaction. Additional testing should be performed to verify compaction.

6. Erosion control and drainage devices should be designed by the project civil engineer in compliance with ordinances of the controlling governmental agencies, and/or in accordance with the recommendation of the soil engineer or engineering geologist.

SUBDRAIN INSTALLATION

Subdrains should be installed in approved ground in accordance with the approximate alignment and details indicated by the geotechnical consultant. Subdrain locations or materials should not be changed or modified without approval of the geotechnical consultant. The soil engineer and/or engineering geologist may recommend and direct changes in subdrain line, grade and drain material in the field, pending exposed conditions. The location of constructed subdrains should be recorded by the project civil engineer.

EXCAVATIONS

Excavations and cut slopes should be examined during grading by the engineering geologist. If directed by the engineering geologist, further excavations or overexcavation and re-filling of cut areas should be performed and/or remedial grading of cut slopes should be performed. When fill over cut slopes are to be graded, unless otherwise approved, the cut portion of the slope should be observed by the engineering geologist prior to placement of materials for construction of the fill portion of the slope.

The engineering geologist should observe all cut slopes and should be notified by the contractor when cut slopes are started. If, during the course of grading, unforeseen adverse or potential adverse geologic conditions are encountered, the engineering geologist and soil engineer should investigate, evaluate and make recommendations to treat these problems. The need for cut slope buttressing or stabilizing should be based on in-grading evaluation by the engineering geologist, whether anticipated or not.

Unless otherwise specified in soil and geological reports, no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies. Additionally, short-term stability of temporary cut slopes is the contractors responsibility.

Erosion control and drainage devices should be designed by the project civil engineer and should be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the soil engineer or engineering geologist.

COMPLETION

Observation, testing and consultation by the geotechnical consultant should be conducted during the grading operations in order to state an opinion that all cut and filled areas are graded in accordance with the approved project specifications.

After completion of grading and after the soil engineer and engineering geologist have finished their observations of the work, final reports should be submitted subject to review by the controlling governmental agencies. No further excavation or filling should be undertaken without prior notification of the soil engineer and/or engineering geologist.

All finished cut and fill slopes should be protected from erosion and/or be planted in accordance with the project specifications and/or as recommended by a landscape architect. Such protection and/or planning should be undertaken as soon as practical after completion of grading.

JOB SAFETY

General

At GeoSoils, Inc. (GSI) getting the job done safely is of primary concern. The following is the company's safety considerations for use by all employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading and construction projects. GSI recognizes that construction activities will vary on each site and that site safety is the prime responsibility of the contractor; however, everyone must be safety conscious and responsible at all times. To achieve our goal of avoiding accidents, cooperation between the client, the contractor and GSI personnel must be maintained.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of field personnel on grading and construction projects:

Safety Meetings: GSI field personnel are directed to attend contractors regularly scheduled and documented safety meetings.

Safety Vests: Safety vests are provided for and are to be worn by GSI personnel at all times when they are working in the field.

Safety Flags: Two safety flags are provided to GSI field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

Flashing Lights: All vehicles stationary in the grading area shall use rotating or flashing amber beacon, or strobe lights, on the vehicle during all field testing. While operating a vehicle in the grading area, the emergency flasher on the vehicle shall be activated.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. A primary concern should be the technicians's safety. Efforts will be made to coordinate locations with the grading contractors authorized representative, and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative (dump man, operator, supervisor, grade checker, etc.) should direct excavation of the pit and safety during the test period. Of paramount concern should be the soil technicians safety and obtaining enough tests to represent the fill.

Test pits should be excavated so that the spoil pile is placed away form oncoming traffic, whenever possible. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates the fill be maintained in a driveable condition. Alternatively, the contractor may wish to park a piece of equipment in front of the test holes, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits. No grading equipment should enter this zone during the testing procedure. The zone should extend approximately 50 feet outward from the center of the test pit. This zone is established for safety and to avoid excessive ground vibration which typically decreased test results.

When taking slope tests the technician should park the vehicle directly above or below the test location. If this is not possible, a prominent flag should be placed at the top of the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g., 50 feet) away from the slope during this testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location, well away from the equipment traffic pattern. The contractor should inform our personnel of all changes to haul roads, cut and fill areas or other factors that may affect site access and site safety.

In the event that the technicians safety is jeopardized or compromised as a result of the contractors failure to comply with any of the above, the technician is required, by company policy, to immediately withdraw and notify his/her supervisor. The grading contractors representative will eventually be contacted in an effort to effect a solution. However, in the interim, no further testing will be performed until the situation is rectified. Any fill place can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor brings this to his/her attention and notify this office. Effective communication and coordination between the contractors representative and the soils technician is strongly encouraged in order to implement the above safety plan.

Trench and Vertical Excavation

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed.

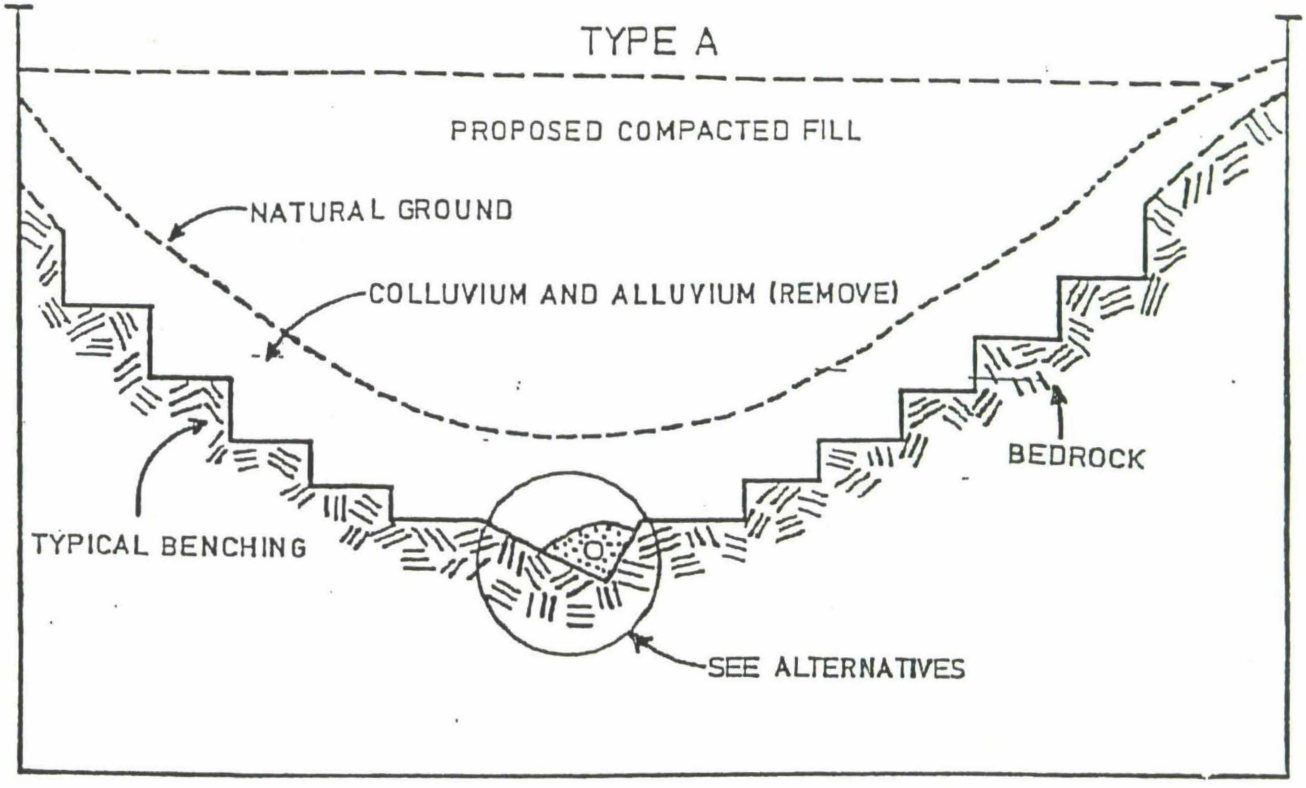
Our personnel are directed not to enter any excavation or vertical cut which: 1) is 5 feet or deeper unless shored or laid back; 2) displays any evidence of instability, has any loose rock or other debris which could fall into the trench; or 3) displays any other evidence of any unsafe conditions regardless of depth.

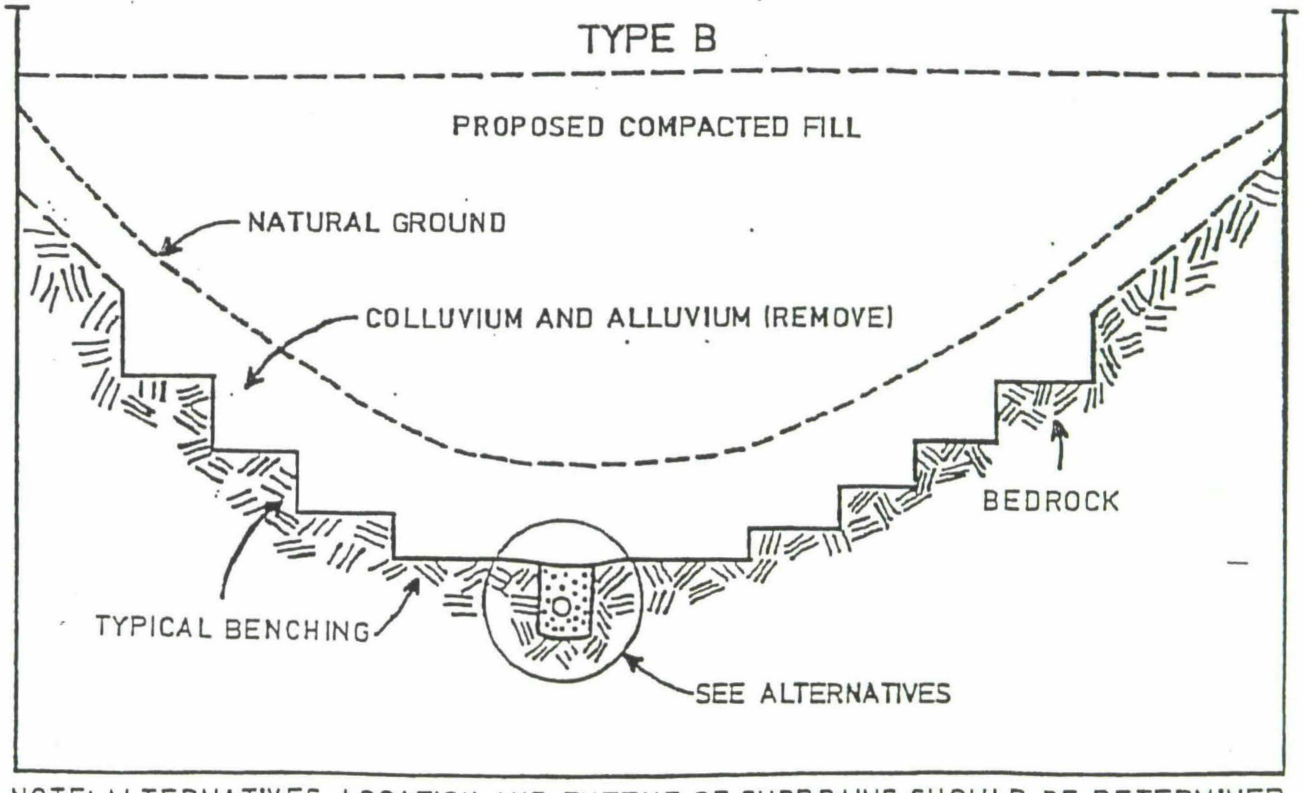
All trench excavations or vertical cuts in excess of 5 feet deep, which any person enters, should be shored or laid back. Trench access should be provided in accordance with CAL-OSHA and/or state and local standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraw and notify his/her supervisor. The contractors representative will eventually be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons could be subject to reprocessing and/or removal.

If GSI personnel become aware of anyone working beneath an unsafe trench wall or vertical excavation, we have a legal obligation to put the contractor and owner/developer on notice to immediately correct the situation. If corrective steps are not taken, GSI then has an obligation to notify CAL-OSHA and/or the proper authorities.

CANYON SUBDRAIN DETAIL





NOTE: ALTERNATIVES, LOCATION AND EXTENT OF SUBDRAINS SHOULD BE DETERMINED BY THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST DURING GRADING.

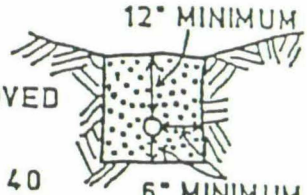
PLATE EG-1

CANYON SUBDRAIN ALTERNATE DETAILS

ALTERNATE 1: PERFORATED PIPE AND FILTER MATERIAL

A–1

FILTER MATERIAL: MINIMUM VOLUME OF 9 FT.³ /LINEAR FT. 6" ø ABS OR PVC PIPE OR APPROVED SUBSTITUTE WITH MINIMUM 8 (1/4" ø) PERFS. LINEAR FT. IN BOTTOM HALF OF PIPE.
ASTM D2751, SDR 35 OR ASTM D1527, SCHD. 40
ASTM D3034, SDR 35 OR ASTM D1785, SCHD. 40
FOR CONTINUOUS RUN IN EXCESS OF 500 FT. USE 8" ø PIPE

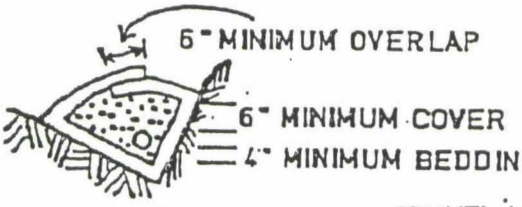


B–1

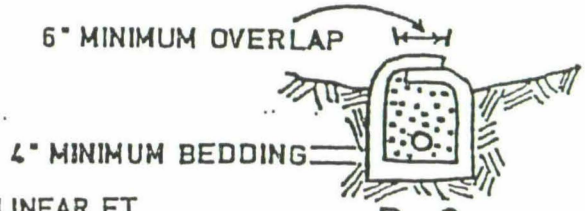
FILTER MATERIAL

SIEVE SIZE	PERCENT PASSING
1 INCH	100
3/4 INCH	90–100
3/8 INCH	40–100
NO. 4	25–40
NO. 8	18–33
NO. 30	5–15
NO. 50	0–7
NO. 200	0–3

ALTERNATE 2: PERFORATED PIPE, GRAVEL AND FILTER FABRIC



A–2

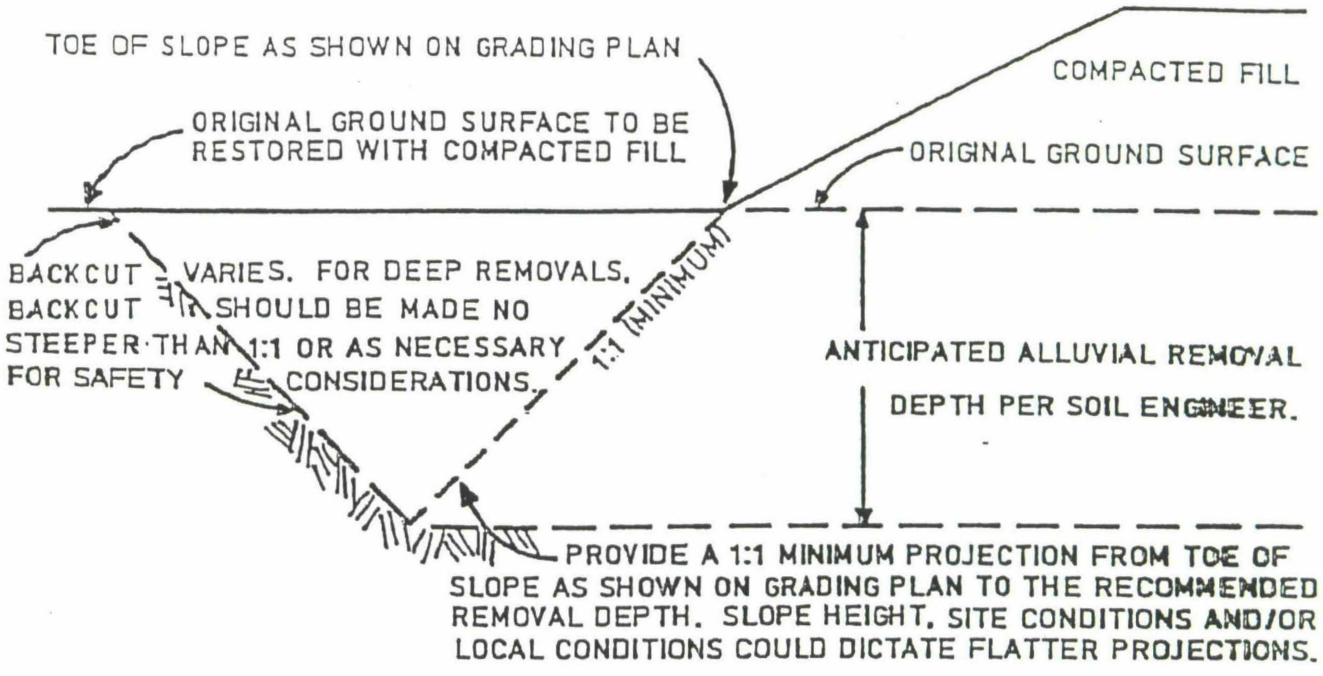


B–2

GRAVEL MATERIAL 9 FT³/LINEAR FT.
PERFORATED PIPE: SEE ALTERNATE 1
GRAVEL: CLEAN 3/4 INCH ROCK OR APPROVED SUBSTITUTE
FILTER FABRIC: MIRAFI 140 OR APPROVED SUBSTITUTE

PLATE EG–2

DETAIL FOR FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON



REMOVAL ADJACENT TO EXISTING FILL

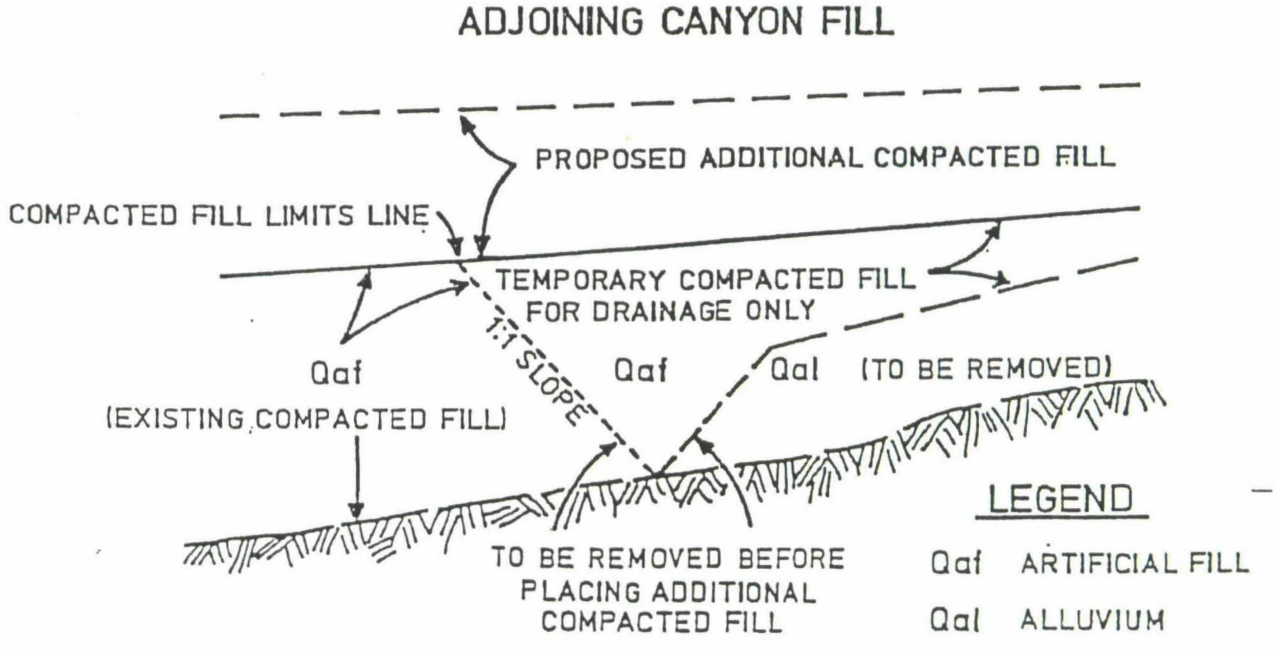


PLATE EG—3

TYPICAL STABILIZATION / BUTTRESS FILL DETAIL

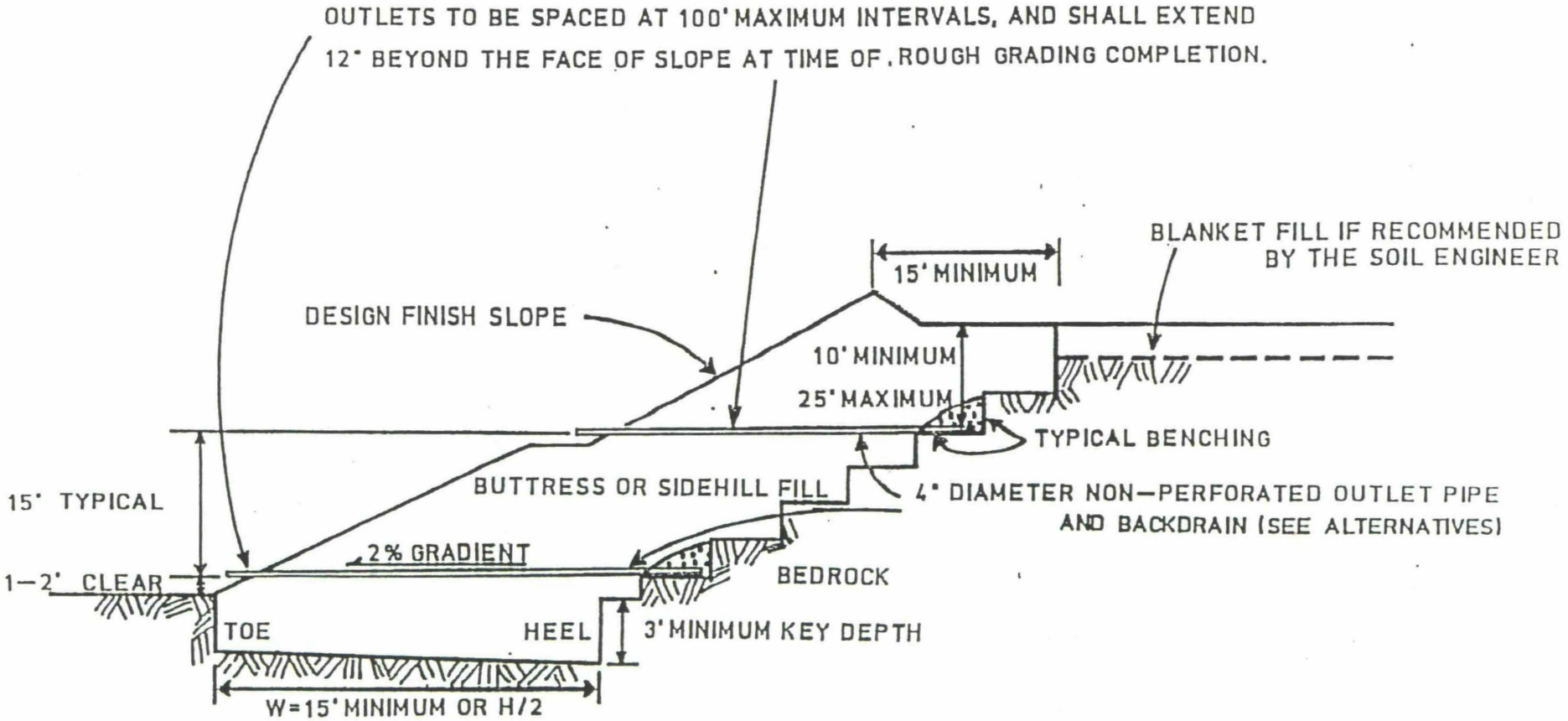
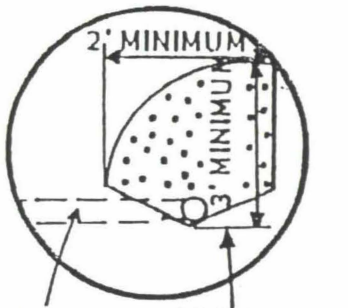
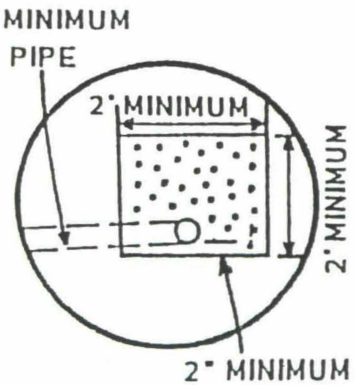


PLATE EG-4

TYPICAL STABILIZATION / BUTTRESS SUBDRAIN DETAIL





FILTER MATERIAL: MINIMUM OF FIVE Ft^3/LINEAR Ft OF PIPE OR FOUR Ft^3/LINEAR Ft OF PIPE WHEN PLACED IN SQUARE CUT TRENCH.

ALTERNATIVE IN LIEU OF FILTER MATERIAL: GRAVEL MAY BE ENCASED IN APPROVED FILTER FABRIC. FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12" ON ALL JOINTS.

MINIMUM 4" DIAMETER PIPE: ABS—ASTM D—2751, SDR 35 OR ASTM D—1527 SCHEDULE 40 PVC—ASTM D—3034, SDR 35 OR ASTM D—1785 SCHEDULE 40 WITH A CRUSHING STRENGTH OF 1,000 POUNDS MINIMUM, AND A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS OF BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2% TO OUTLET PIPE. OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW.

NOTE: 1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON—SITE SOIL.

2. BACKDRAINS AND LATERAL DRAINS SHALL BE LOCATED AT ELEVATION OF EVERY BENCH DRAIN. FIRST DRAIN LOCATED AT ELEVATION JUST ABOVE LOWER LOT GRADE. ADDITIONAL DRAINS MAY BE REQUIRED AT THE DISCRETION OF THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST.

FILTER MATERIAL SHALL BE OF THE FOLLOWING SPECIFICATION OR AN APPROVED EQUIVALENT:

SIEVE SIZE	PERCENT PASSING
1 INCH	100
3/4 INCH	90—100
3/8 INCH	40—100
NO. 4	25—40
NO. 8	18—33
NO. 30	5—15
NO. 50	0—7
NO. 200	0—3

GRAVEL SHALL BE OF THE FOLLOWING SPECIFICATION OR AN APPROVED EQUIVALENT:

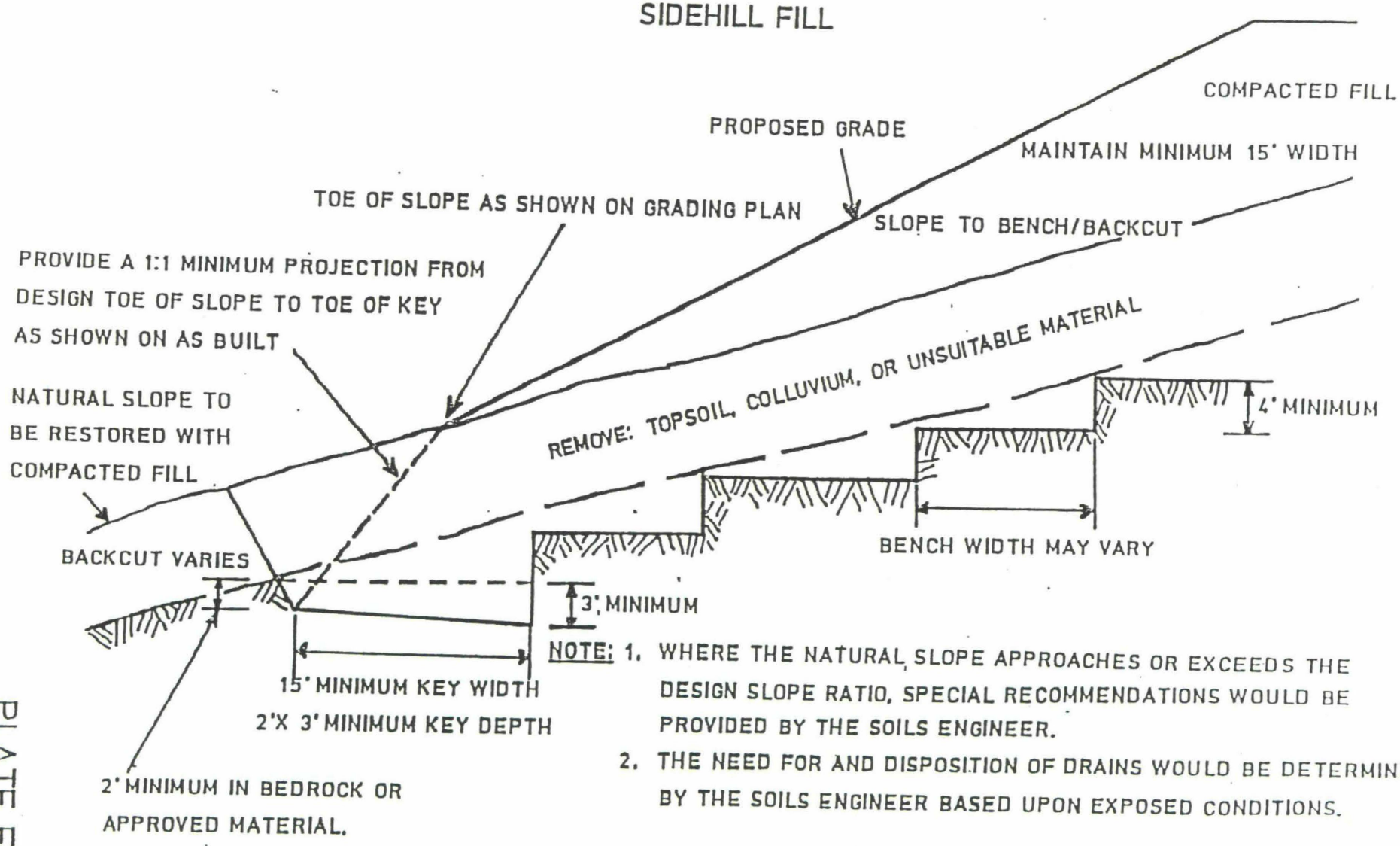
SIEVE SIZE	PERCENT PASSING
1 1/2 INCH	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT: MINIMUM OF 51

PLATE EG—5

FILL OVER NATURAL DETAIL

SIDEHILL FILL

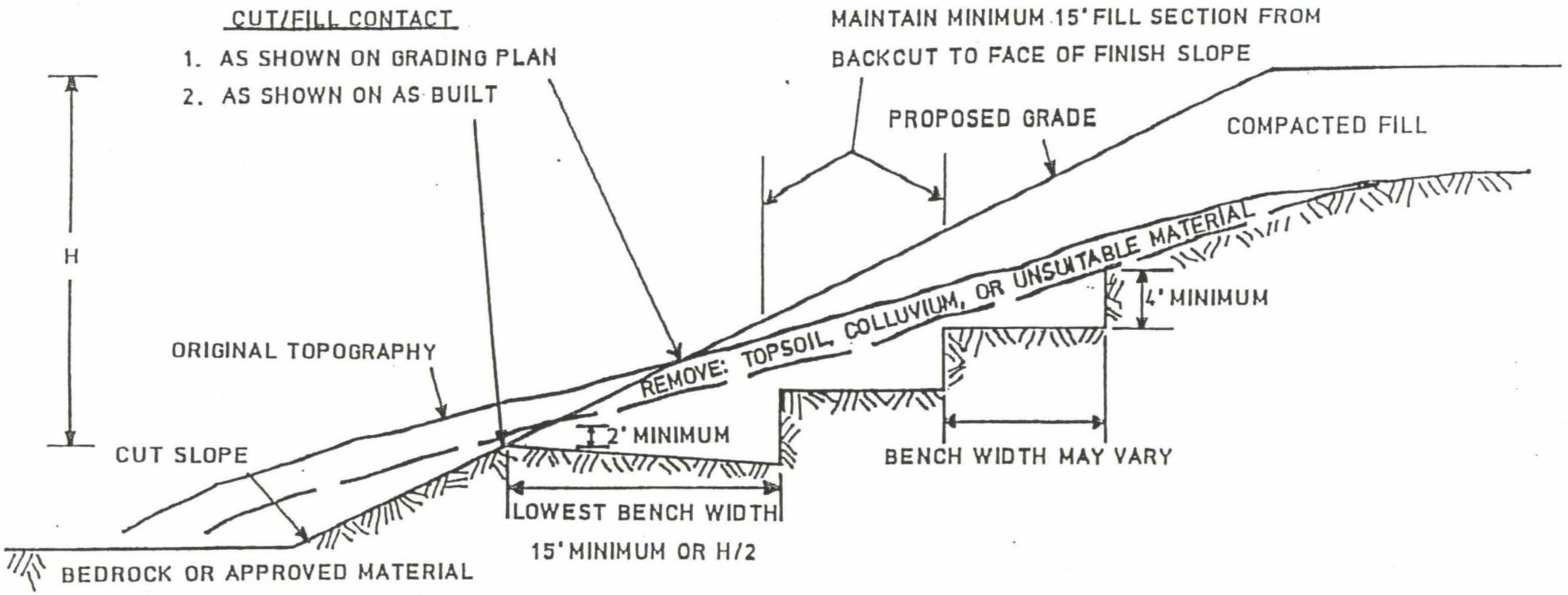


NOTE: 1. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WOULD BE PROVIDED BY THE SOILS ENGINEER.

2. THE NEED FOR AND DISPOSITION OF DRAINS WOULD BE DETERMINED BY THE SOILS ENGINEER BASED UPON EXPOSED CONDITIONS.

PLATE EG—6

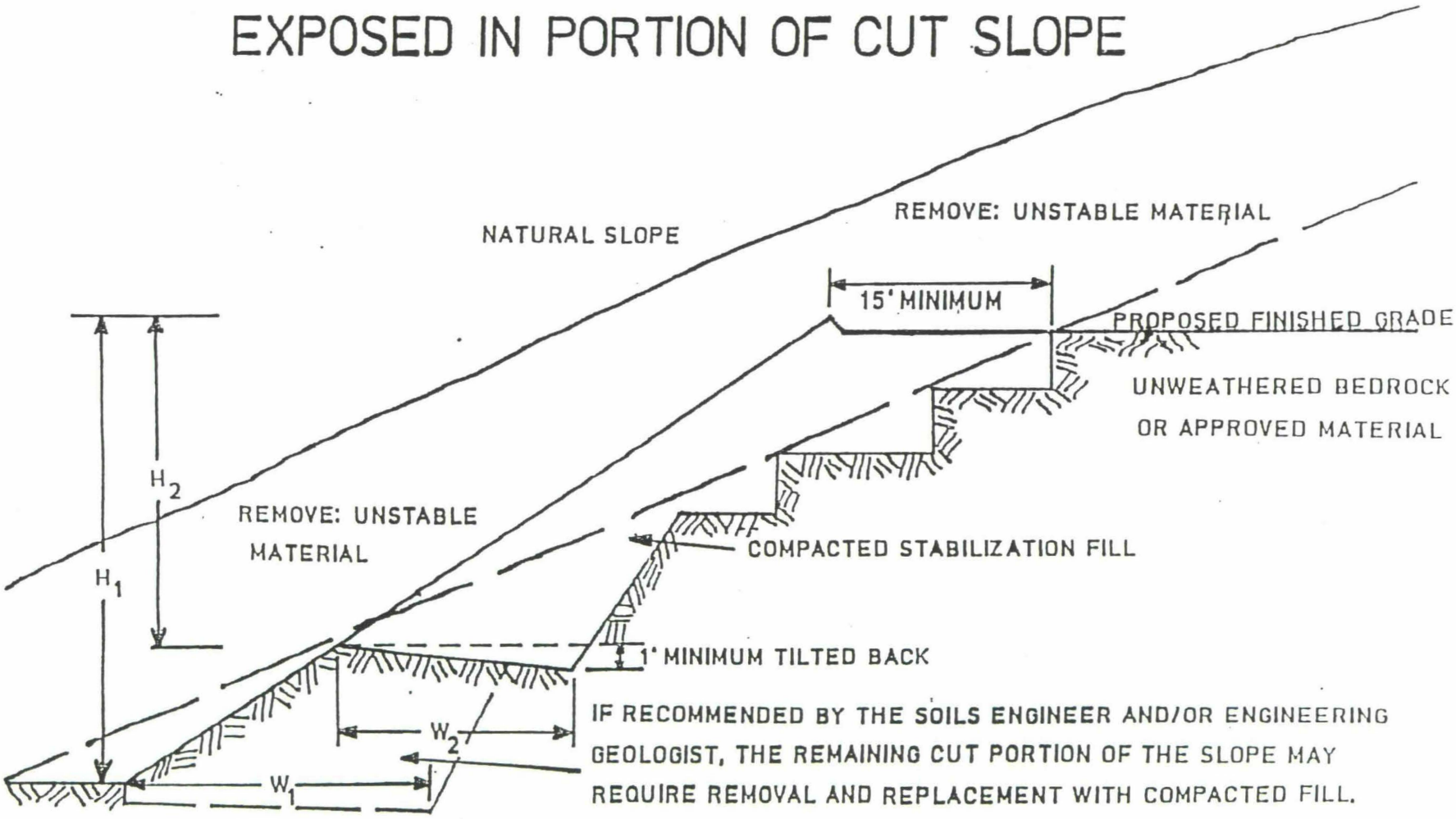
FILL OVER CUT DETAIL



NOTE: THE CUT PORTION OF THE SLOPE SHOULD BE EXCAVATED AND EVALUATED BY THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST PRIOR TO CONSTRUCTING THE FILL PORTION.

PLATE EG-7

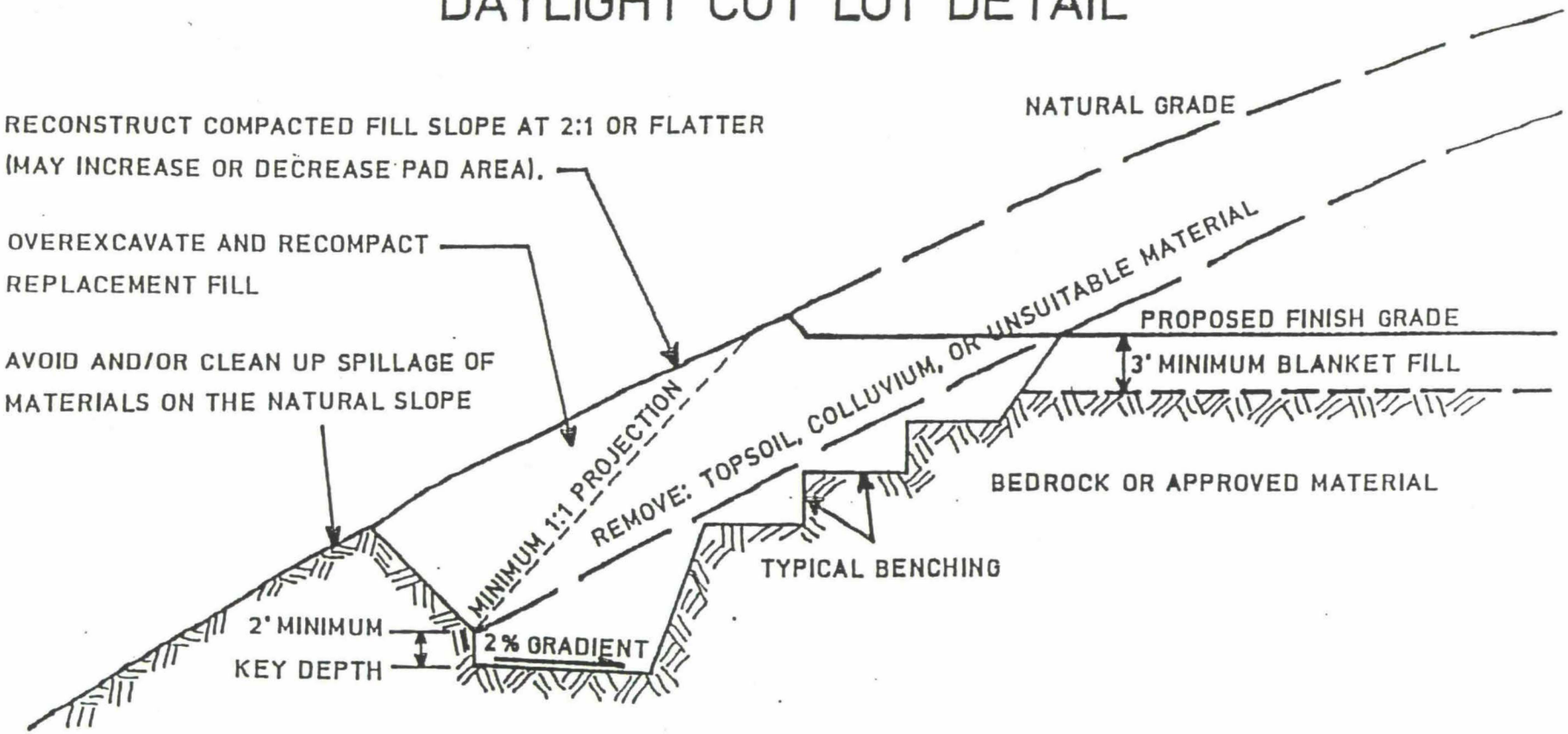
STABILIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE



NOTE: 1. SUBDRAINS ARE NOT REQUIRED UNLESS SPECIFIED BY SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST,

2. "W" SHALL BE EQUIPMENT WIDTH (15') FOR SLOPE HEIGHTS LESS THAN 25 FEET. FOR SLOPES GREATER THAN 25 FEET "W" SHALL BE DETERMINED BY THE PROJECT SOILS ENGINEER AND /OR ENGINEERING GEOLOGIST. AT NO TIME SHALL "W" BE LESS THAN H/2.

DAYLIGHT CUT LOT DETAIL



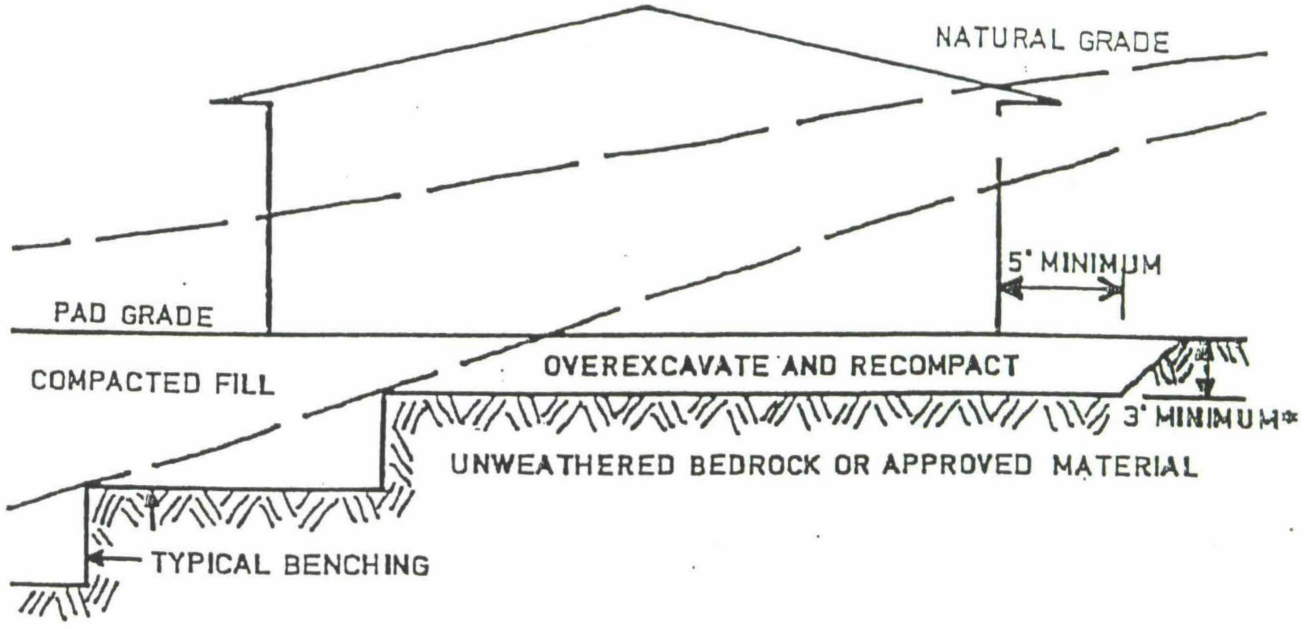
NOTE: 1. SUBDRAIN AND KEY WIDTH REQUIREMENTS WILL BE DETERMINED BASED ON EXPOSED SUBSURFACE CONDITIONS AND THICKNESS OF OVERBURDEN.

2. PAD OVER EXCAVATION AND RECOMPACTION SHOULD BE PERFORMED IF DETERMINED NECESSARY BY THE SOILS ENGINEER AND/OR THE ENGINEERING GEOLOGIST.

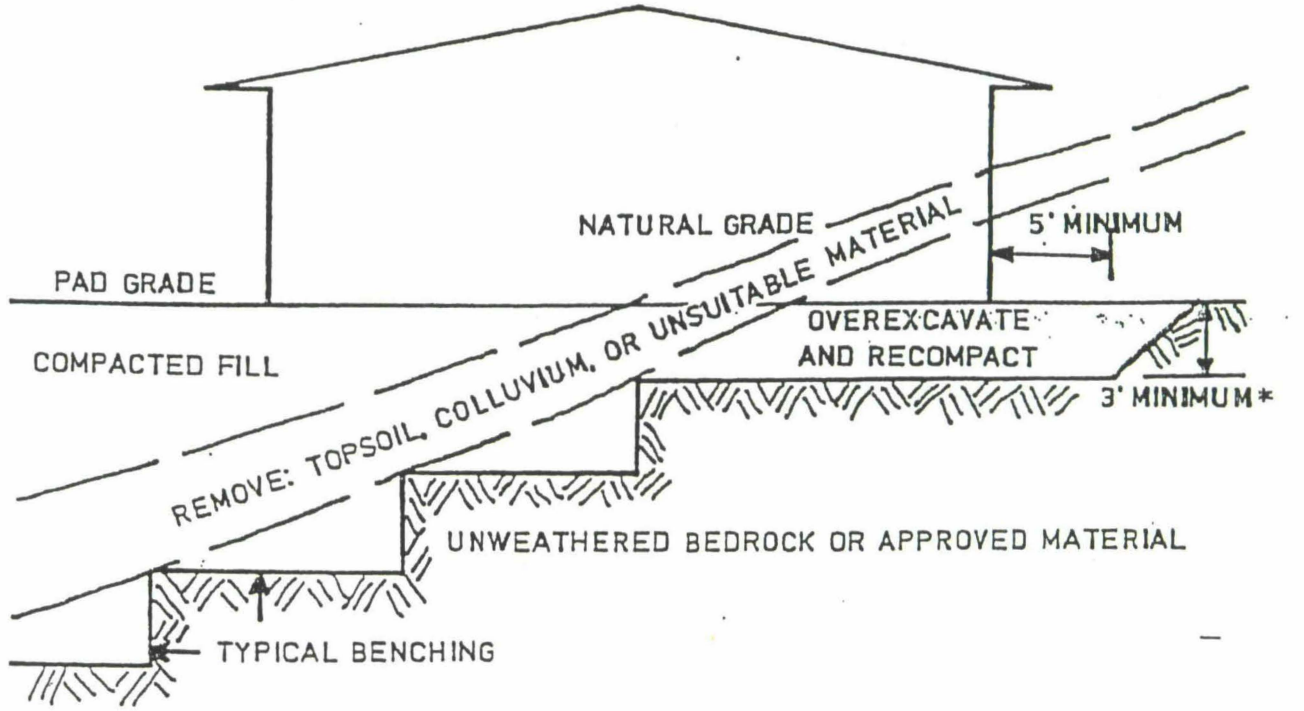
PLATE EG—10

TRANSITION LOT DETAIL

CUT LOT (MATERIAL TYPE TRANSITION)



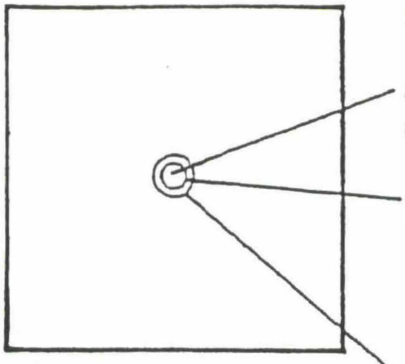
CUT—FILL LOT (DAYLIGHT TRANSITION)



NOTE: * DEEPER OVEREXCAVATION MAY BE RECOMMENDED BY THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST IN STEEP CUT—FILL TRANSITION AREAS.

PLATE EG—11

SETTLEMENT PLATE AND RISER DETAIL

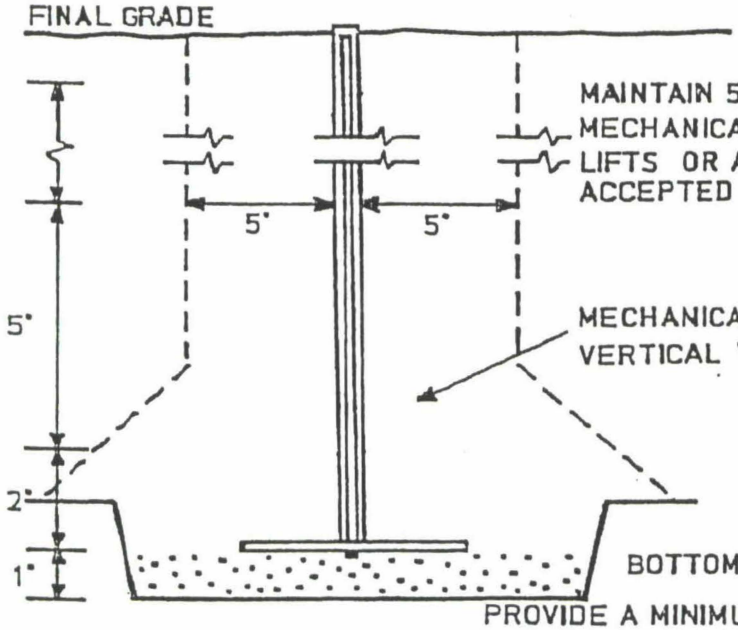


2'X 2'X 1/4" STEEL PLATE

STANDARD 3/4" PIPE NIPPLE WELDED TO TOP OF PLATE.

3/4" X 5' GALVANIZED PIPE, STANDARD PIPE THREADS TOP AND BOTTOM. EXTENSIONS THREADED ON BOTH ENDS AND ADDED IN 5' INCREMENTS.

3 INCH SCHEDULE 40 PVC PIPE SLEEVE, ADD IN 5' INCREMENTS WITH GLUE JOINTS.



MAINTAIN 5' CLEARANCE OF HEAVY EQUIPMENT. MECHANICALLY HAND COMPACT IN 2' VERTICAL LIFTS OR ALTERNATIVE SUITABLE TO AND ACCEPTED BY THE SOILS ENGINEER.

MECHANICALLY HAND COMPACT THE INITIAL 5' VERTICAL WITHIN A 5' RADIUS OF PLATE BASE.

BOTTOM OF CLEANOUT

PROVIDE A MINIMUM 1' BEDDING OF COMPACTED SAND

NOTE:

1. LOCATIONS OF SETTLEMENT PLATES SHOULD BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.
2. CONTRACTOR SHOULD MAINTAIN CLEARANCE OF A 5' RADIUS OF PLATE BASE AND WITHIN 5' (VERTICAL) FOR HEAVY EQUIPMENT. FILL WITHIN CLEARANCE AREA SHOULD BE HAND COMPACTED TO PROJECT SPECIFICATIONS OR COMPACTED BY ALTERNATIVE APPROVED BY THE SOILS ENGINEER.
3. AFTER 5' (VERTICAL) OF FILL IS IN PLACE, CONTRACTOR SHOULD MAINTAIN A 5' RADIUS EQUIPMENT CLEARANCE FROM RISER.
4. PLACE AND MECHANICALLY HAND COMPACT INITIAL 2' OF FILL PRIOR TO ESTABLISHING THE INITIAL READING.
5. IN THE EVENT OF DAMAGE TO THE SETTLEMENT PLATE OR EXTENSION RESULTING FROM EQUIPMENT OPERATING WITHIN THE SPECIFIED CLEARANCE AREA, CONTRACTOR SHOULD IMMEDIATELY NOTIFY THE SOILS ENGINEER AND SHOULD BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.
6. AN ALTERNATE DESIGN AND METHOD OF INSTALLATION MAY BE PROVIDED AT THE DISCRETION OF THE SOILS ENGINEER.

PLATE EG—14

TYPICAL SURFACE SETTLEMENT MONUMENT

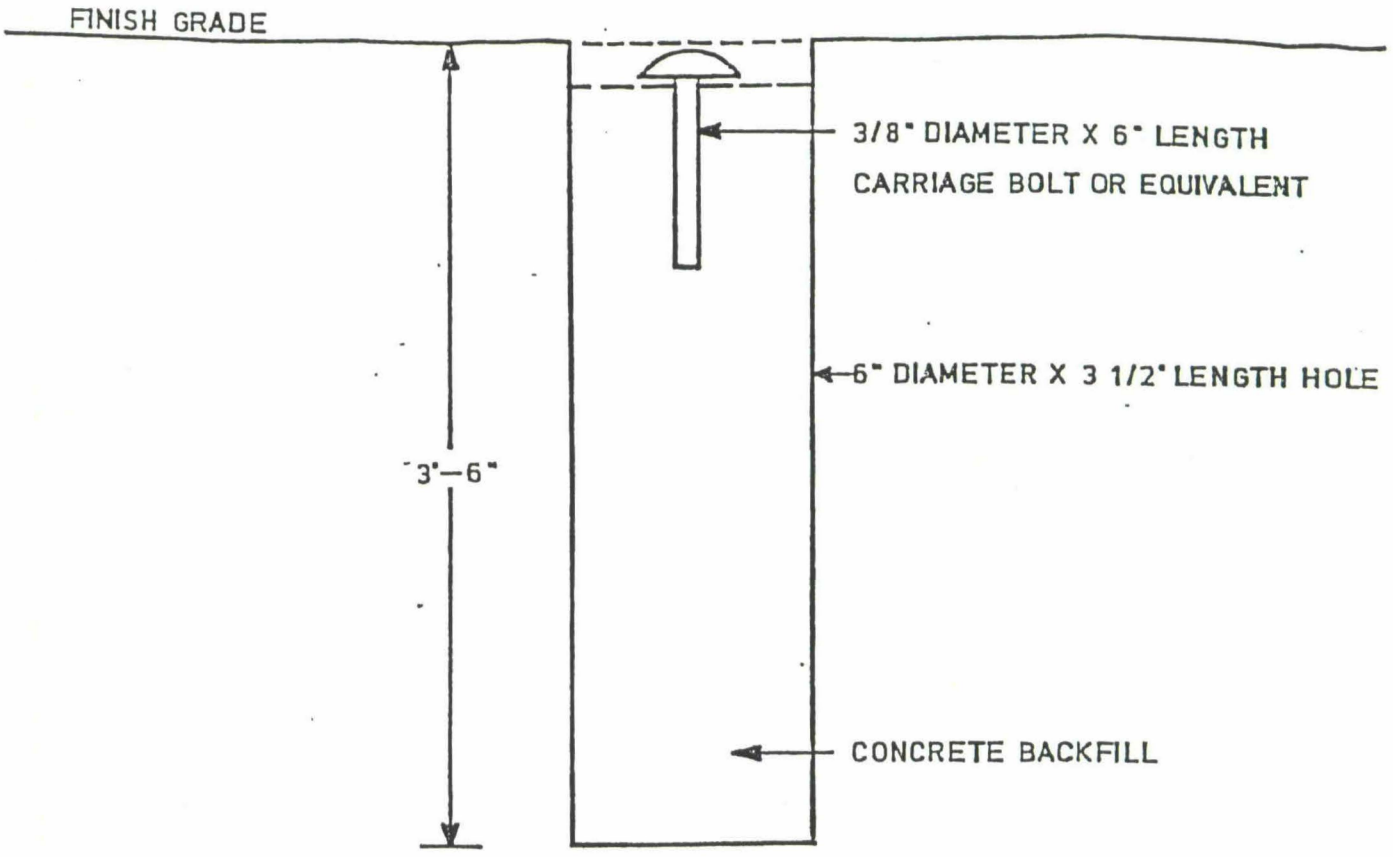
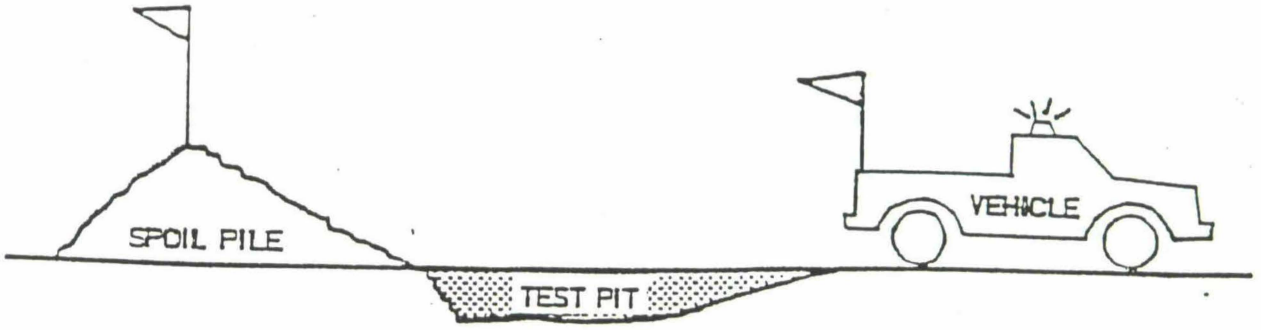


PLATE EG-15

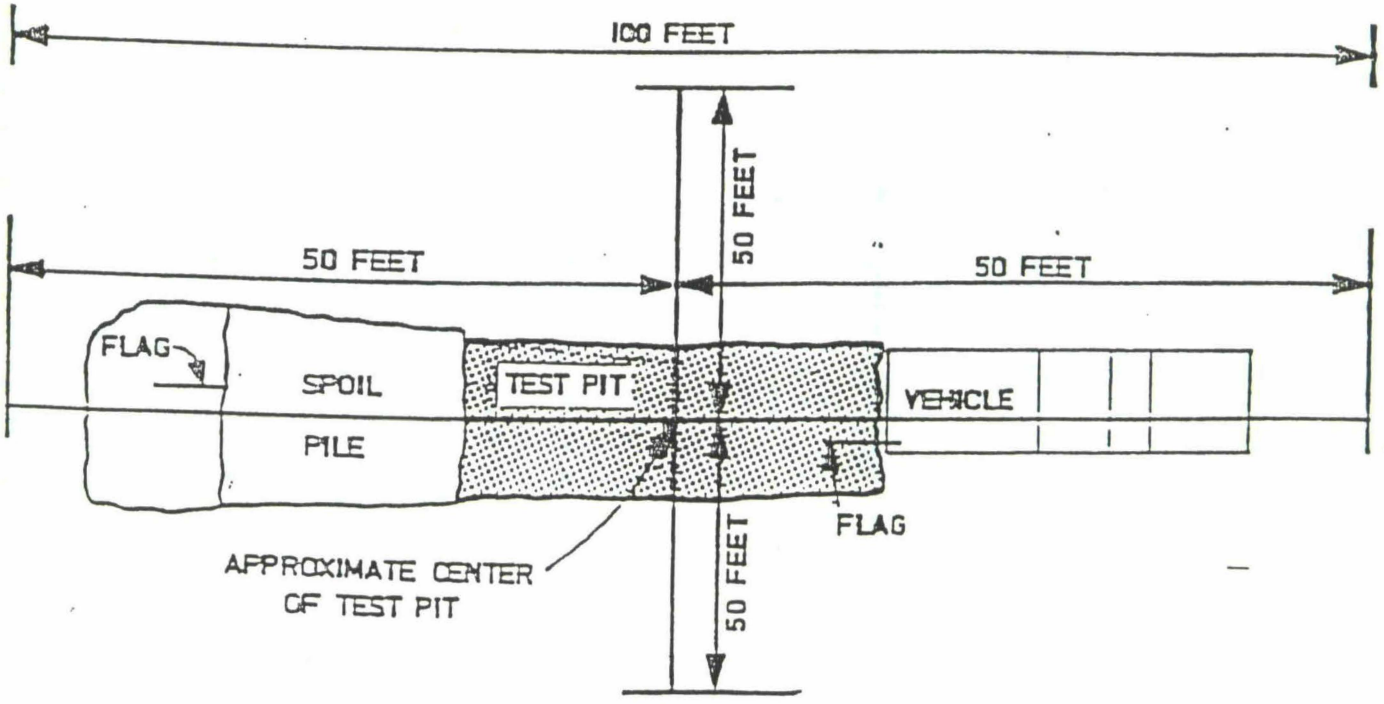
TEST PIT SAFETY DIAGRAM

SIDE VIEW



(NOT TO SCALE)

TOP VIEW

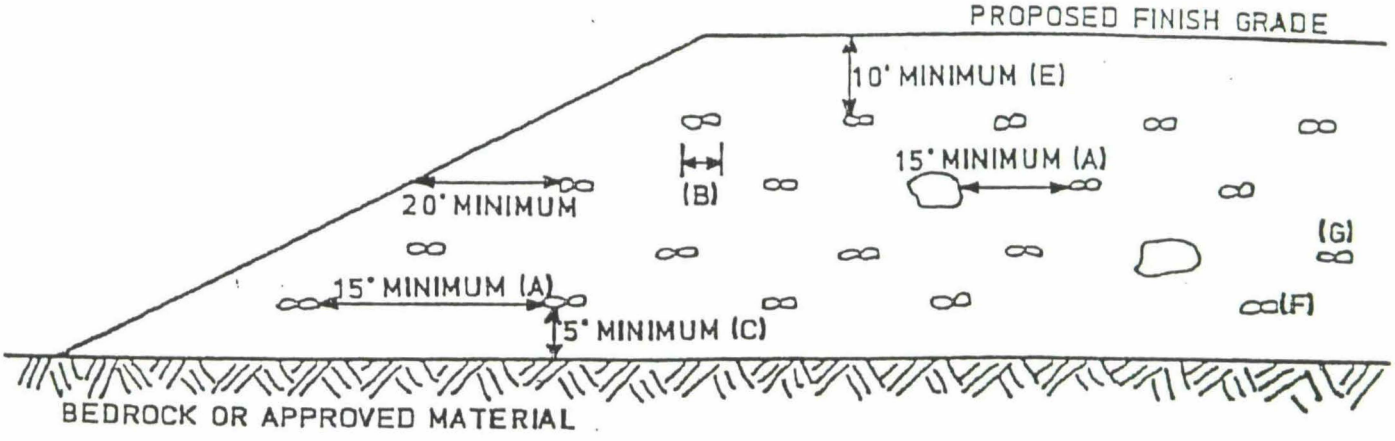


(NOT TO SCALE)

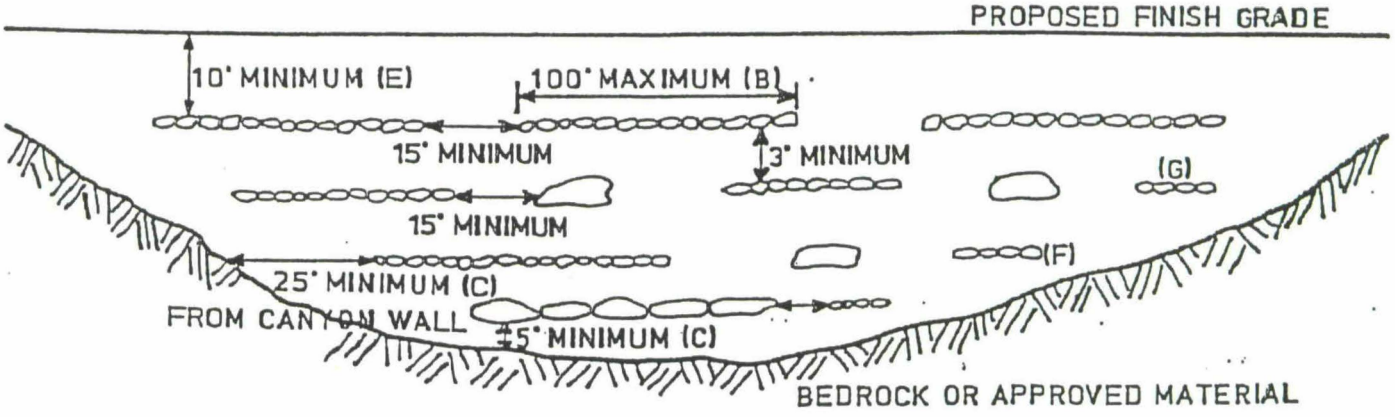
PLATE EG—16

OVERSIZE ROCK DISPOSAL

VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE

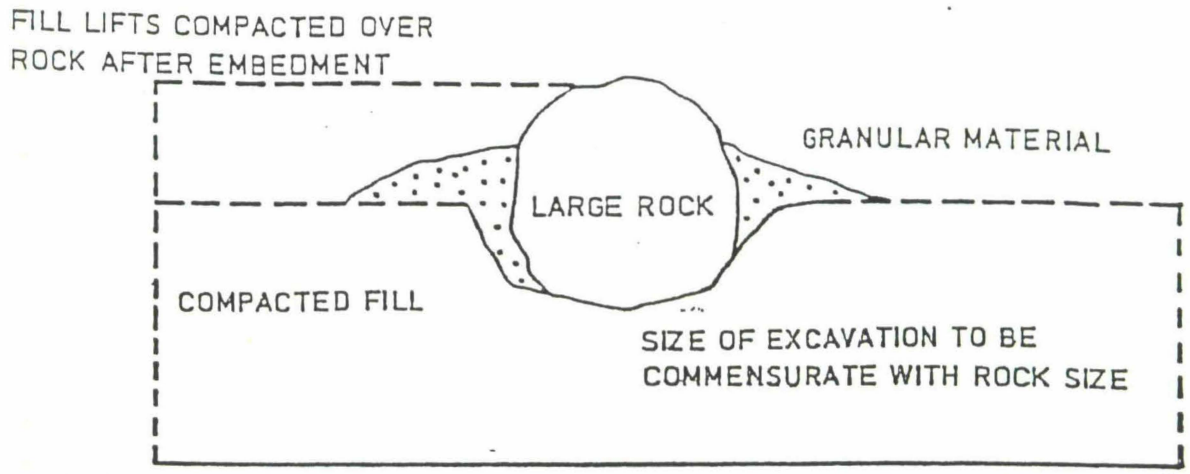


NOTE: (A) ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.
(B) HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE AND TYPE OF EQUIPMENT. LENGTH OF WINDROW SHALL BE NO GREATER THAN 100' MAXIMUM.
(C) IF APPROVED BY THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST, WINDROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIAL OR BEDROCK PROVIDED ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.
(D) ORIENTATION OF WINDROWS MAY VARY BUT SHOULD BE AS RECOMMENDED BY THE SOILS ENGINEER AND/OR ENGINEERING GEOLOGIST. STAGGERING OF WINDROWS IS NOT NECESSARY UNLESS RECOMMENDED.
(E) CLEAR AREA FOR UTILITY TRENCHES, FOUNDATIONS AND SWIMMING POOLS.
(F) ALL FILL OVER AND AROUND ROCK WINDROW SHALL BE COMPACTED TO 90% RELATIVE COMPACTION OR AS RECOMMENDED.
(G) AFTER FILL BETWEEN WINDROWS IS PLACED AND COMPACTED WITH THE LIFT OF FILL COVERING WINDROW, WINDROW SHOULD BE PROOF ROLLED WITH A D-9 DOZER OR EQUIVALENT.
VIEWS ARE DIAGRAMMATIC ONLY. ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN.

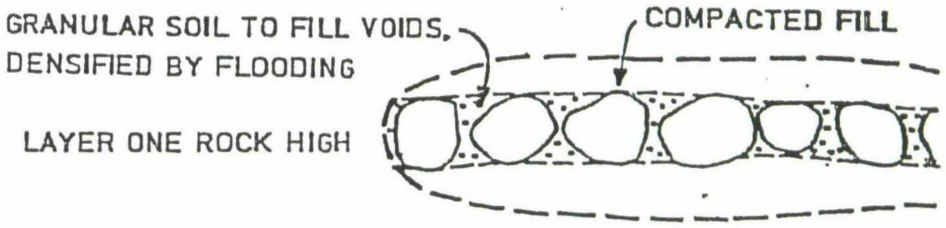
PLATE RD-1

ROCK DISPOSAL PITS

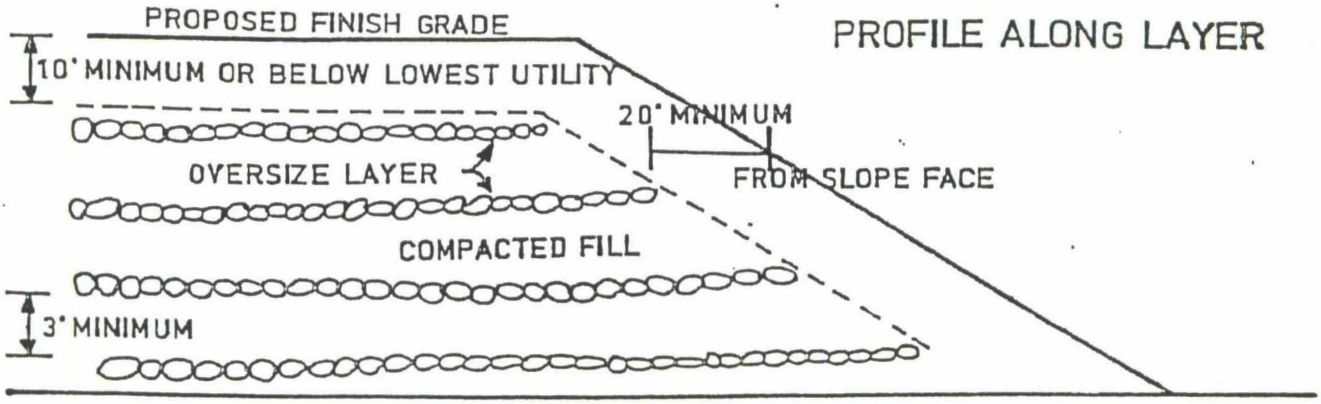
VIEWS ARE DIAGRAMMATIC ONLY. ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN.

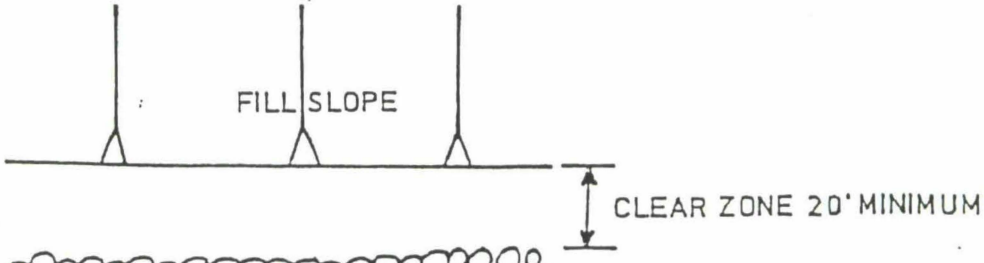


ROCK DISPOSAL LAYERS



PROFILE ALONG LAYER





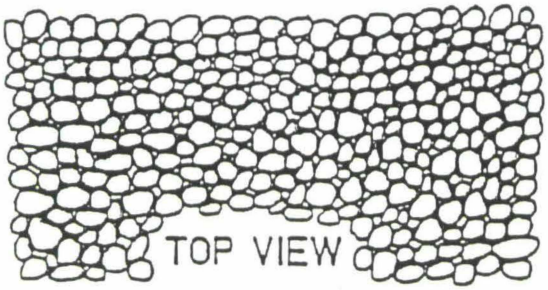


PLATE RD—2