Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

# GEOTECHNICAL EVALUATION
# PEPPER DRIVE SCHOOL
# SANTEE, CALIFORNIA

**PREPARED FOR:**
Santee School District
9625 Cuyamaca Street
Santee, California 92071


**PREPARED BY:**
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July 20, 2007
Project No. 106112001

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Ms. Christina Becker
Santee School District
9625 Cuyamaca Street
Santee, California 92071

Subject: Geotechnical Evaluation Report
Pepper Drive School
Santee, California

Dear Ms. Becker:

In accordance with your authorization, we have performed a geotechnical evaluation for the proposed improvements at Pepper Drive School, located at 1935 Marlinda Way, in Santee, California. This report presents our geotechnical findings, conclusions, and recommendations regarding the proposed project. Our report was prepared in accordance with our proposal which was originally dated May 7, 2007 and revised June 12, 2007.

We appreciate the opportunity to be of service on this project. Please contact our project engineer, Mr. Kenneth Mansir, with questions about this report.

Sincerely,
**NINYO & MOORE**

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## 1. INTRODUCTION

In accordance with your request and our proposal originally dated May 7, 2007 and revised June 12, 2007, we have performed a geotechnical evaluation for the proposed improvements to Pepper Drive School, located at 1935 Marlinda Way, in Santee, California (Figure 1). The proposed improvements include new buildings, additions to existing buildings, and a new fire access lane. The purposes of this study were to evaluate the geotechnical conditions at the site and provide geotechnical design and construction recommendations for the proposed improvements.

## 2. SCOPE OF SERVICES

The scope of services for this study included the following:

- Reviewing readily available background information including geologic maps and literature, stereoscopic aerial photographs, topographic maps, and a conceptual site plan of the proposed project.
- Performing a geologic reconnaissance of the site to observe the existing conditions and to mark out boring locations.
- Coordinating with school personnel and Underground Service Alert (USA) to clear the boring locations for existing underground utilities.
- Drilling, sampling, and logging ten exploratory borings to depths ranging from approximately 11 to 26 feet below the existing ground surface. Bulk and relatively undisturbed drive samples of soil were collected at selected intervals from the borings and transported to our in-house geotechnical laboratory for testing.
- Geotechnical laboratory testing to evaluate soil conditions and obtain parameters for use in design of the project.
- Compiling and analyzing data obtained from our field and laboratory evaluations.
- Preparing this report presenting our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed project.

## 3. PROJECT DESCRIPTION

It is our understanding that the proposed improvements to Pepper Drive School include construction of a new approximately 21,000 square-foot, two story (12,000 and 9,000 square-foot per floor, respectively), classroom building, a new approximately 5,700 square-foot library, a new fire access lane, and possible additions of approximately 500 square feet each to be located at existing buildings. We anticipate that the new buildings will consist of wood or steel framing with slab on grade floors. Foundations will likely consist of shallow, spread and continuous footings. Building loads are expected to be typical of this type of relatively light construction.

## 4. SITE DESCRIPTION

Pepper Drive School is located in Santee, California (see Figure 1). The school site is situated on a generally flat-lying, rectangular-shaped parcel. The site is "terraced," and playfields in the northern portions of the site are approximately 20 feet higher than the southern portion of the site. Site boundaries include open space to the north, Churchill Drive and residences to the east, El Cajon Valley Christian School to the south, and Marlinda Way to the west. Outcrops of granitic rock were observed on the north slopes in the open space area north of the site. The site is at latitude 32.827° North and longitude 116.952° West. The current site elevations range from approximately 490 to 510 feet above mean sea level (MSL).

## 5. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration was conducted on June 29 and July 2, 2007, and consisted of the excavation of 10 exploratory borings. A truck-mounted drill rig equipped with 8-inch diameter continuous flight hollow stem augers was utilized to excavate the borings. The borings were excavated to depths ranging from approximately 11 to 26 feet. The purpose of the borings was to observe and sample the underlying earth materials. Relatively undisturbed and bulk samples were obtained from the borings at selected intervals. The approximate locations of the borings are shown on Figure 2, and the boring logs are presented in Appendix A.

Geotechnical laboratory testing of samples obtained during our subsurface exploration included an evaluation of in-situ moisture content and dry density, grain-size analysis, shear strength, Proctor density, soil corrosivity (electrical resistivity, pH, chloride content, and sulfate content), and R-value. The tests were performed at our in-house geotechnical laboratory. The results of the in-situ moisture content and dry density tests are shown at the corresponding sample depths on the boring logs in Appendix A. The results of the other laboratory tests performed are presented in Appendix B.

## 6. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and local geology at the subject site are provided in the following sections.

### 6.1. Regional Geologic Setting

The project area is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults (Figure 3) are considered active faults. The Elsinore, San Jacinto and San Andreas faults are active fault systems located northeast of the project area and the Agua Blanca–Coronado Bank, San Clemente, Newport-Inglewood and Rose Canyon faults are active faults located west of the project area. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

### 6.2. Site Geology

Geologic units encountered during our subsurface evaluation included fill materials, Quaternary-age alluvial deposits (older alluvium), and Cretaceous-age Tonalite, hereafter "granitic rock." Generalized descriptions of the earth units are provided in the subsequent sections and shown on Figure 4. In addition, a cross-sectional view of the earth units encountered is shown on Figure 5.

#### 6.2.1. Fill Material

Fill material was encountered in our borings B-9 and B-10 to depths up to approximately 7 feet. As encountered, the material generally consisted of reddish brown, damp, loose to medium dense, silty sand.

#### 6.2.2. Older Alluvium

Older alluvium was encountered in each of our borings from the surface or underlying the fill materials to depths up to approximately 26 feet. As encountered, the material generally consisted of brown, dark brown, or reddish brown, damp to moist, loose to very dense, sandy silt and silty or clayey sand with scattered gravel.

#### 6.2.3. Granitic Rock

Decomposed or weathered granitic rock was encountered in our borings B-1, B-6, B-7, B-8 and B-9 underlying the older alluvium to the total depth explored. Decomposed granitic rock generally consisted of brown to light reddish brown, very dense, sandy silt or silty sand. Granitic rock was observed to be generally light brown, weathered rock.

### 6.3. Rippability

Based on our subsurface exploration of the site, the on-site soils are expected to be rippable with normal heavy-duty earthmoving equipment in good condition.

### 6.4. Groundwater

During our field evaluation, groundwater was not encountered in our exploratory borings. Seepage was encountered in our boring B-5 at a depth of approximately 9.5 feet. Groundwater levels can fluctuate due to seasonal variations, irrigation, groundwater withdrawal or injection, and other factors. In general, groundwater is not expected to be a constraint to the construction of the project.

### 6.5. Flood Hazards

Based on review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), posted on the County of San Diego, San Diego Geographic Information Source (SanGIS) website (County of San Diego, 2004), the site is not within a flood zone. Based on review of topographic maps, the site is located approximately 1.5 miles south of the San Diego River bed that serves as a drainage for the El Capitan and San Vicente Reservoirs and Lake Jennings. The site is located at an elevation approximately 120 to 140 feet above the river bed. Based on this review and our site reconnaissance, the potential for significant flooding of the site is not a design consideration.

### 6.6. Faulting and Seismicity

The subject site is considered to be in a seismically active area. Our review of readily available published geological maps and literature indicates that there are no known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively), underlying the proposed site.

The closest known active fault is the Rose Canyon Fault, which is capable of generating an earthquake magnitude of 7.2 (United States Geological Survey/California Geological Survey, 2003). The Rose Canyon Fault is located approximately 14 miles west of the site (Treiman, 1993).

In general, hazards associated with seismic activity include; strong ground motion; ground surface rupture; liquefaction; and tsunamis. These hazards are discussed in the following sections.

#### 6.6.1. Strong Ground Motion

Based on our review of background information, the following Table 1 summarizes the historical seismicity of the project area. Listed are events of magnitude 5.0 or greater. In addition, aftershocks are not listed if they are of lower magnitude.

**Table 1 – Historical Earthquakes that Affected the Site**

| Date | Moment Magnitude (M) | Epicentral Distance (km) | Epicentral Distance (mi) |
|---|---|---|---|
| November 22, 1800 | 6.5 | 37 | 23 |
| May 27, 1862 | 5.9 | 27 | 17 |
| February 9, 1890 | 6.3 | 87 | 54 |
| February 24, 1892 | 6.7 | 62 | 39 |
| May 28, 1892 | 6.3 | 81 | 50 |
| October 23, 1894 | 5.7 | 14 | 9 |
| September 30, 1916 | 5.0 | 85 | 53 |
| January 1, 1920 | 5.0 | 47 | 29 |
| November 25, 1934 | 5.0 | 86 | 53 |
| March 25, 1937 | 6.0 | 91 | 57 |
| June 4, 1940 | 5.1 | 52 | 32 |
| October 21, 1942 | 6.5 | 92 | 57 |
| October 21, 1942 | 5.0 | 90 | 56 |
| August 15, 1945 | 5.7 | 87 | 54 |
| November 4, 1949 | 5.7 | 79 | 49 |
| March 19, 1954 | 6.2 | 87 | 54 |
| September 23, 1963 | 5.0 | 97 | 60 |
| April 9, 1968 | 6.4 | 86 | 53 |
| April 28, 1969 | 5.8 | 80 | 50 |
| January 12, 1975 | 5.1 | 95 | 56 |
| February 25, 1980 | 5.6 | 85 | 53 |
| July 13, 1986 | 5.8 | 87 | 54 |
| October 31, 2001 | 5.2 | 85 | 53 |
| June 12, 2005 | 5.2 | 85 | 53 |

Based on a Probabilistic Earthquake Hazard Analysis computer program by Blake (FRISKSP, 2000), the calculated ground acceleration for the Upper-Bound Earthquake (UBE) at the site, defined as having a 10 percent probability of exceedance in 100 years, with a statistical return period of approximately 949 years, is 0.24g (24 percent of the acceleration of gravity). The calculated ground acceleration for the Design-Basis Earthquake (DBE), defined as having a 10 percent probability of exceedance in 50 years, with a statistical return period of approximately 475 years is 0.19g. The requirements of the governing jurisdictions and applicable building codes should be considered in the design of structures. The most significant seismic event likely to affect the project site would be an earthquake within the Rose Canyon fault zone which can generate a 7.2 magnitude earthquake (California Geological Survey, 2003).

The requirements of the governing jurisdictions and the 2001 California Building Code should be considered in the project design. Distances to active faults within 62 miles of the site are presented in Table 2.

**Table 2 – Active Fault Distances**

| Fault | Distance (km) | Distance (mi) | Moment Magnitude |
|---|---|---|---|
| Rose Canyon | 23 | 14 | 7.2 |
| Coronado Bank | 44 | 27 | 7.6 |
| Elsinore Fault – Julian | 45 | 28 | 7.1 |
| Earthquake Valley | 52 | 32 | 6.5 |
| Elsinore – Coyote Mountain | 58 | 36 | 6.8 |
| Newport-Inglewood (Offshore) | 59 | 37 | 7.1 |
| Elsinore – Temecula | 62 | 39 | 6.8 |
| San Jacinto – Coyote Creek | 79 | 49 | 6.8 |
| San Jacinto – Anza | 82 | 51 | 7.2 |
| San Jacinto – Borrego | 82 | 51 | 6.6 |
| Elsinore – Glen Ivy | 99 | 62 | 6.3 |
| Superstition Mountain – San Jacinto | 99 | 62 | 6.6 |

As discussed, the closest known active fault is the Rose Canyon Fault located approximately 14 miles west of the school site, and has been assigned a maximum earthquake magnitude of 7.2 The site is not located within a State of California Alquist-Priolo Earthquake Fault Zone.

### 6.6.2. CBC Seismic Design Parameters

According to the 2001 edition of the California Building Code (CBC), the proposed site is within Seismic Zone 4, and is not within a UBC Near-Source Zone. Table 3 includes the seismic design parameters for the site as defined in, and for use with, the 2001 edition of the CBC (CBSC, 2001).

**Table 3 – Seismic Design Parameters**

| Parameter | Value | 2001 UBC Reference |
|---|---|---|
| Seismic Zone Factor, Z | 0.40 | Table 16A – I |
| Soil Profile Type | $S_C$ | Table 16A – J |
| Seismic Coefficient $C_a$ | 0.40 | Table 16A – Q |
| Seismic Coefficient $C_v$ | 0.56 | Table 16A – R |
| Near-Source Factor, $N_a$ | 1.0 | Table 16A – S |
| Near-Source Factor, $N_v$ | 1.0 | Table 16A – T |
| Seismic Source Type | B | Table 16A – U |

#### 6.6.3. Surface Rupture

Ground surface rupture due to active faulting is not considered likely in the project area due to the absence of any known active faults underlying the site. Lurching or cracking of the ground surface as a result of nearby or distant seismic events is also considered unlikely.

#### 6.6.4. Liquefaction

Based on the generally dense nature of the subsurface materials, it is our opinion that the potential for liquefaction at the site is not a design consideration.

#### 6.6.5. Tsunamis

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location of the site, the potential for damage due to tsunami is considered nil.

### 6.7. Landsliding

Based on our review of referenced geologic maps, literature, topographic maps, and stereoscopic aerial photographs, no landslides or indications of deep-seated landsliding were noted underlying the project site. As such, the potential for significant large-scale slope instability at the site is not a design consideration.

## 7. CONCLUSIONS

Based on our review of the referenced background data, geologic field reconnaissance, subsurface evaluation, and laboratory testing, it is our opinion that the proposed improvements to Pepper Drive School are feasible from a geotechnical standpoint, provided that the recommendations of this report are incorporated into the design and construction of the project. Geotechnical considerations include the following:

- The on-site material is generally excavatable with conventional heavy-duty earth moving equipment. However, granitic rock may be encountered in deeper excavations at this site. Extra ripping effort and perhaps rock breaking to efficiently remove the materials should be anticipated.
- Fill materials and the upper foot of alluvial materials encountered in our exploratory borings are considered unsuitable for structural support. Recommendations are presented herein for remedial grading of this material.
- We recommend that where a cut/fill transition line or a transition between older alluvium and compacted fill extends beneath a proposed building location, the cut portion of the pad should be overexcavated by one-third or more of the deepest fill depth or 3 feet beneath the lowest foundation of the structure, whichever is greater, and replaced with compacted fill. Recommendations are presented herein for grading of the cut/fill transition.
- The project site is not located in a Near-Source Zone, but it is located in Seismic Zone 4 according to the California Building Code (CBSC, 2001). Accordingly, the potential for seismic accelerations will need to be considered in the design of proposed structural improvements.

## 8. RECOMMENDATIONS

The following sections present our geotechnical recommendations for the design and construction of the proposed building. We recommend that the site earthwork and construction be performed in accordance with the following recommendations and the recommendations presented in the Typical Earthwork Guidelines included in Appendix C. In case of conflict, the following recommendations shall supersede those outlined in Appendix C.

### 8.1. Site Preparation

The project site should be cleared and grubbed prior to grading. Clearing and grubbing should consist of the substantial removal of vegetation and other deleterious materials from the areas to be graded. Clearing and grubbing should extend to the outside of the proposed excavation and fill areas. The debris generated during clearing and grubbing should be removed from areas to be graded and be disposed of off site at a legal dumpsite.

### 8.2. Remedial Grading

Based on the observed condition of the existing soils, we recommend that the existing fill soils and the upper foot of alluvial soils be removed in the building pad areas of the proposed new structures. For the purpose of this report, the building pad area is defined as that area underlying any settlement-sensitive structure and extending a horizontal distance of 5 feet beyond the limits of the structure and extending downward at a 1:1 (horizontal:vertical) inclination. The depth and extent of the removal should be observed in the field by Ninyo & Moore. The fill and the upper foot of alluvial deposits should be replaced/recompacted with suitable fill materials to the design elevations in accordance with the earthwork recommendations in this report. Deeper removals may be needed if unsuitable materials are exposed during grading.

The resultant removal surface should be scarified to a depth of approximately 8 inches, moisture conditioned and recompacted to 90 percent or more of relative compaction as evaluated by American Society of Testing and Materials (ASTM) test method D 1557-02.

### 8.3. Cut/Fill Transitions

In order to reduce the potential for differential settlement, we recommend that where a cut/fill transition line or a transition between older alluvium and compacted fill extends beneath a proposed building location, the cut portion of the pad should be overexcavated by one-third or more of the deepest fill depth or 3 feet beneath the lowest foundation of the structure, whichever is greater, and replaced with compacted fill. The overexcavation should be extended outward from the building footprint to a distance of 3 feet plus the depth of overexcavation. The grading and building plans should be reviewed by Ninyo & Moore to evaluate the potential transition locations.

### 8.4. Excavation Characteristics

Our evaluation of the excavation characteristics of the on-site materials is based on the results of the exploratory excavations and our experience with similar materials. The test borings encountered fill materials, alluvial deposits, and granitic rock. In our opinion, excavation of the on-site soils should generally be achievable with heavy-duty equipment in good operating condition. The granitic rock will generally require extra ripping effort by conventional heavy-duty equipment. Encountering hard boulders or corestones will likely require rock breaking or blasting to efficiently achieve desired grades. Excavations in the granitic rock will likely generate oversize material that will require special handling to place as fill. Oversize material will not be suitable for use as trench backfill.

### 8.5. Materials for Fill

Generally granular on-site soils with an organic content of less than approximately 3 percent by volume (or 1 percent by weight) are suitable for use as fill. Fill material should not generally contain rocks or lumps greater than 6 inches, and particles not more than approximately 40 percent larger than ¾-inch. Utility trench backfill should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site. Imported fill material, if needed for the project, should generally be granular soils with low or very low expansion potential. Import material should also have generally low corrosion potential. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

The soils encountered in the borings should be generally suitable for reuse as backfill in the utility trench zone, provided they are free of organic material, contaminated material, clay lumps, debris, and rocks greater than 3 inches in diameter. Rocks greater than ¾-inch in diameter should not exceed 40 percent of the backfill volume.

### 8.6. Import Soil

Imported fill material, if needed for the project, should generally be granular soils with a very low to low expansion potential (i.e., an EI of 50 or less as evaluated by California Building Code [CBC, 2001] test method 18-2). Import material should also be non-corrosive in accordance with Caltrans (2003) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

### 8.7. Compacted Fill

Prior to placement of compacted fill the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve moisture contents generally above the optimum moisture content. Backfill should be moisture conditioned to a moisture content within approximately 2 percent of the optimum moisture content, placed, and compacted to 90 or more percent of the specified relative compaction, as evaluated by ASTM D 1557-02. Wet soils, if encountered, should be allowed to dry to moisture contents within approximately 2 percent of optimum prior to their placement as backfill. Backfill lift thickness will be dependent upon the type of compaction equipment utilized. Backfill should generally be placed in uniform lifts not exceeding 8 inches in loose thickness. Base and the upper 12 inches of pavement subgrade should be compacted to 95 percent or more relative compaction. Special care should be exercised to avoid damaging utilities during compaction of the backfill.

### 8.8. Temporary Excavations, Braced Excavations and Shoring

We recommend that trenches and excavations be designed and constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations. These regulations provide trench sloping and shoring design parameters for trenches up to 20 feet deep based on a description of the soil types encountered. Trenches over 20 feet deep should be designed by the Contractor's engineer based on site-specific geotechnical analyses. For planning purposes, we recommend that the following OSHA soil classifications be used:

| | |
|---|---|
| *Fill and Alluvium* | *Type C* |

Upon making the excavations, the soil classifications and excavation performance should be confirmed in the field by the geotechnical consultant in accordance with the OSHA regulations. Temporary excavations should be constructed in accordance with OSHA recommendations. For trench or other excavations, OSHA requirements regarding personnel safety should be met using appropriate shoring (including trench boxes), or by laying back the slopes no steeper than 1.5:1 (horizontal:vertical) in fill and alluvium. Temporary excavations that encounter seepage may require shoring or may be stabilized by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. On-site safety of personnel is the responsibility of the contractor.

## 8.9. Foundations

The following foundation design parameters are provided based on our preliminary analysis. The foundation design parameters are not intended to control differential movement of soils. Minor cracking (considered tolerable) of foundations may occur. The proposed buildings will likely be constructed on spread and continuous foundations bearing on compacted fill material. The following sections present our preliminary foundation recommendations.

### 8.9.1. Shallow Foundations

Shallow foundations, either spread or continuous placed in compacted fill or competent older alluvium may be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf). These allowable bearing capacities may be increased by one-third when considering loads of short duration such as wind or seismic forces. Foundations should be founded 18 inches or more below lowest adjacent grade. Continuous footings should have a width of 15 inches or more and isolated footings should be 24 inches or more in width.

Foundations should be reinforced in accordance with the recommendations of the project structural engineer. From a geotechnical standpoint, we recommend that continuous footings be reinforced with four No. 4 reinforcing bars, two placed near the top of the footing and two near the bottom.

#### 8.9.2. Shallow Foundation Lateral Earth Pressures

Allowable lateral bearing pressures equal to an equivalent fluid weight of 300 pounds per cubic foot (pcf) may be used provided the footings are placed neat against the undisturbed compacted fill or alluvial materials. The lateral bearing pressure may be increased with depth to a maximum of 3,000 psf. Footings may also be designed using a coefficient of friction between soil and concrete of 0.35. To estimate the total frictional resistance, the coefficient should be multiplied by the dead load.

The foundations should be designed for their specific loads and usage. We recommend that a structural engineer experienced with such construction be consulted.

#### 8.9.3. Static Settlement

We estimate that the proposed structures, designed and constructed as recommended herein, will undergo total settlements of less than approximately 1 inch. Differential settlements are typically about one-half of the total settlement.

### 8.10. Floor Slabs

The slabs should be designed for their specific loads and usage. We recommend that a structural engineer experienced with such construction be consulted. The slab thickness should be as recommended by the structural engineer. To help limit shrinkage cracking, we recommend that slabs-on-grade be 5 or more inches in thickness and be reinforced with No. 3 reinforcing bars placed at the midpoint of the slab and spaced at 18 inches on-center both ways. The reinforcing bars should be placed on chairs. Floor slabs should be constructed and reinforced in accordance with the recommendations of the structural engineer.

Floor slabs should be underlain by a moisture barrier consisting of a 2-inch layer of clean sand underlain by a polyethylene moisture barrier, 10-mil or thicker, which is, in turn, underlain by a 4-inch layer of clean coarse sand/pea gravel. Soils underlying the slabs should be moisture conditioned and compacted in accordance with the recommendations contained in this report. Joints should be constructed at intervals designed by the structural engineer to help reduce random cracking of the slab.

### 8.11. Concrete Flatwork

To reduce the potential manifestation of distress to exterior concrete flatwork due to minor soil movement and concrete shrinkage, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as designed by the structural engineer. Exterior slabs should be underlain by 4 inches of clean sand. Subgrades should be prepared in accordance with the earthwork recommendations presented herein. Positive drainage should be established and maintained adjacent to flatwork.

### 8.12. Soil Corrosivity

Laboratory testing was performed on samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test Method 643 and the sulfate and chloride tests were performed in accordance with California Test Methods 416 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing indicated that the electrical resistivity of the samples tested were approximately 375 and 17,420 ohm-cm, respectively. The soil pH of the samples were 6.7 and 7.2, which are considered neutral. The chloride content of the tested samples were approximately 825 and 115 parts per million (ppm), respectively. The sulfate content of the tested samples were approximately 0.25 and 0.01 percent. Based on the laboratory test results and Caltrans criteria, the site warrants a corrosive site classification, which is defined as soil with more than 500 ppm chlorides, more than 0.20 percent sulfates, or pH less than 5.5. A corrosion engineer should be consulted and provide recommendations for construction of improvements.

### 8.13. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Based on the CBC criteria (CBSC, 2001), the potential for sulfate attack is negligible for water-soluble sulfate contents in soil ranging from 0.00 to 0.10 percent by weight, and moderate for water-soluble sulfate contents ranging from 0.10 to 0.20 percent by weight. The potential for sulfate attack is severe for water-soluble sulfate contents ranging from 0.20 to 2.00 percent by weight and very severe for water-soluble sulfate contents over 2.00 percent by weight. Laboratory testing indicated the sulfate content of the samples tested were approximately 0.25 and 0.01 percent. Although only one of our laboratory tests indicated severe sulfate content, due to the potential of mixing and variable conditions, we recommend that concrete in contact with soil possess a water cement ratio of not more than 0.45 and a minimum strength of 4,500 pounds per square inch (psi). Further, we recommend the use of Type V cement concrete at the site.

### 8.14. Pavement Design

Based on the results of our subsurface evaluation and laboratory testing, we have used an R-value of 74 for the preliminary basis for design of flexible pavements at the project site. Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils that are exposed at the finished subgrade elevations across the site at the completion of the mass grading operations.

We understand that traffic will consist primarily of automobiles, light trucks, school buses, and occasional heavy trucks. For design we have assumed Traffic Indices (TI) of 5.0, 6.0, and 7.0 for site pavements. We recommend that the geotechnical consultant re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction. The preliminary recommended pavement sections are as follows:

**Table 4 – Recommended Preliminary Pavement Sections**

| Traffic Index | R-Value | Asphalt Concrete (in) | Class 2 Aggregate Base (in) |
|---|---|---|---|
| 5.0 | 74 | 3.0 | 4.0 |
| 6.0 | 74 | 3.0 | 4.0 |
| 7.0 | 74 | 4.0 | 4.0 |

As indicated, these values assume traffic indices of 5.0, 6.0, and 7.0 for site pavements. In addition, we recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 or more percent relative density as evaluated by the current version of ASTM D 1557. If traffic loads are different from those assumed, the pavement design should be re-evaluated.

### 8.15. Concrete Pavement Design

We recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 percent of the laboratory Proctor dry density as evaluated by ASTM D 1557. In addition, the Class 2 aggregate base should also be compacted to a relative compaction of 95 percent.

We suggest that consideration be given to using Portland cement concrete pavements in areas where dumpsters will be stored and where refuse trucks will stop and load. Experience indicates that refuse truck traffic can significantly shorten the useful life of AC sections. We recommend that in these areas, 6 inches of 600 psi flexural strength Portland cement concrete reinforced with No. 3 bars, 18-inches on center, be placed over 6 inches or more of Class 2 aggregate base compacted to a relative compaction of 95 percent.

### 8.16. Site Drainage

Surface drainage should be provided to divert water away from structures and off of pavement surfaces. Surface water should not be permitted to drain toward the structures or to pond adjacent to foundations or on pavement areas. Positive drainage is defined as a slope of 2 percent or more for a distance of 5 feet or more away from the structures.

### 8.17. Pre-Construction Conference

We recommend that a pre-construction conference be held. The owner or the owner's representative, the agency representatives, the civil engineer, Ninyo & Moore, and the contractor should be in attendance to discuss the plans and the project.

### 8.18. Plan Review and Construction Observation

The conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, the geotechnical consultant should be notified and additional recommendations will be provided upon request. The project geotechnical consultant should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform appropriate observation and testing services during construction operations.

The recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

## 9. LIMITATIONS

The field evaluation and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

## 10. SELECTED REFERENCES

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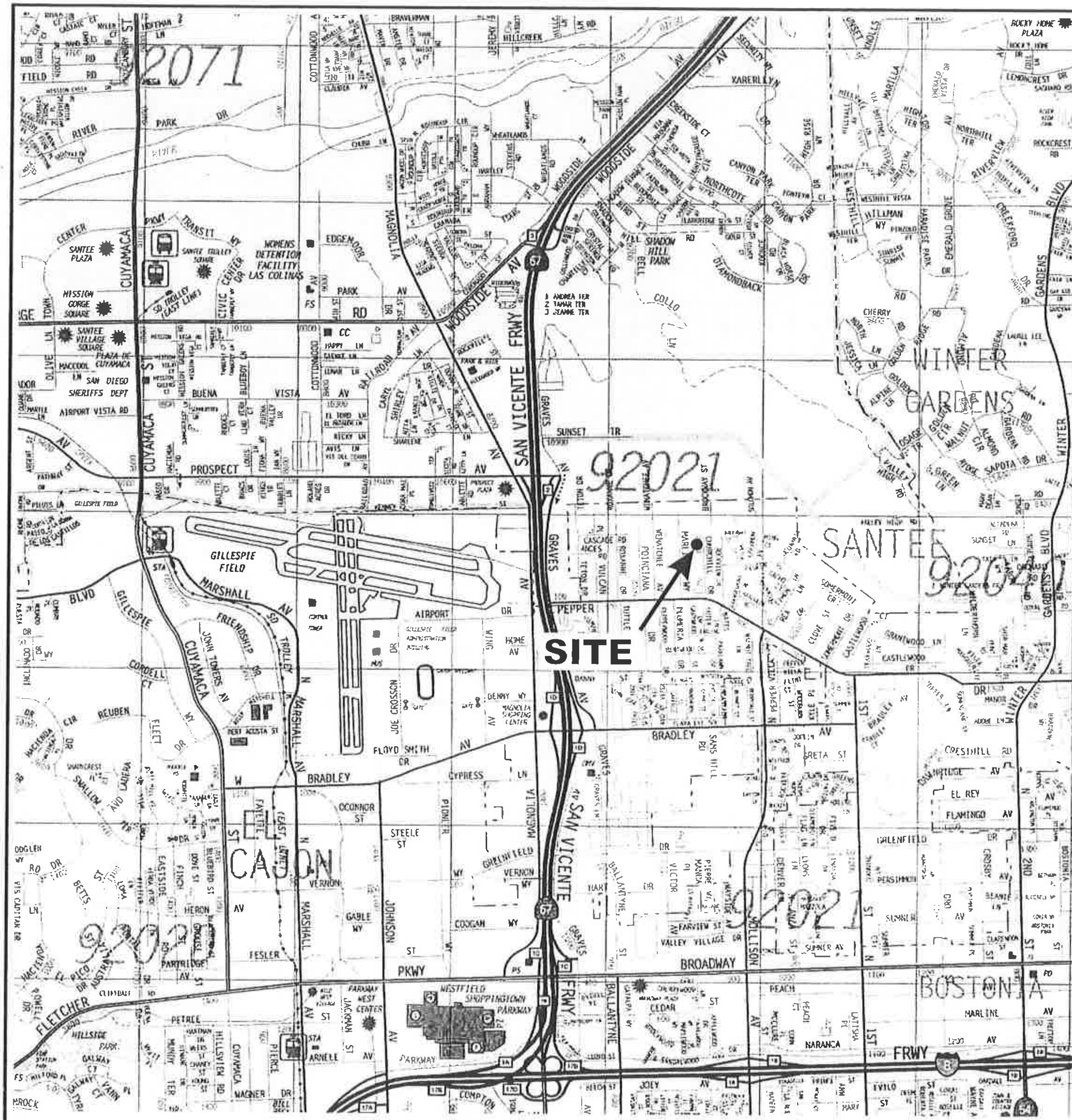
| AERIAL PHOTOGRAPHS | | | | |
|---|---|---|---|---|
| **Source** | **Date** | **Flight** | **Numbers** | **Scale** |
| USDA | 4-14-53 | AXN-9M | 69 & 70 | 1:20,000 |




REFERENCE: 2005 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY.

0 2400 4800

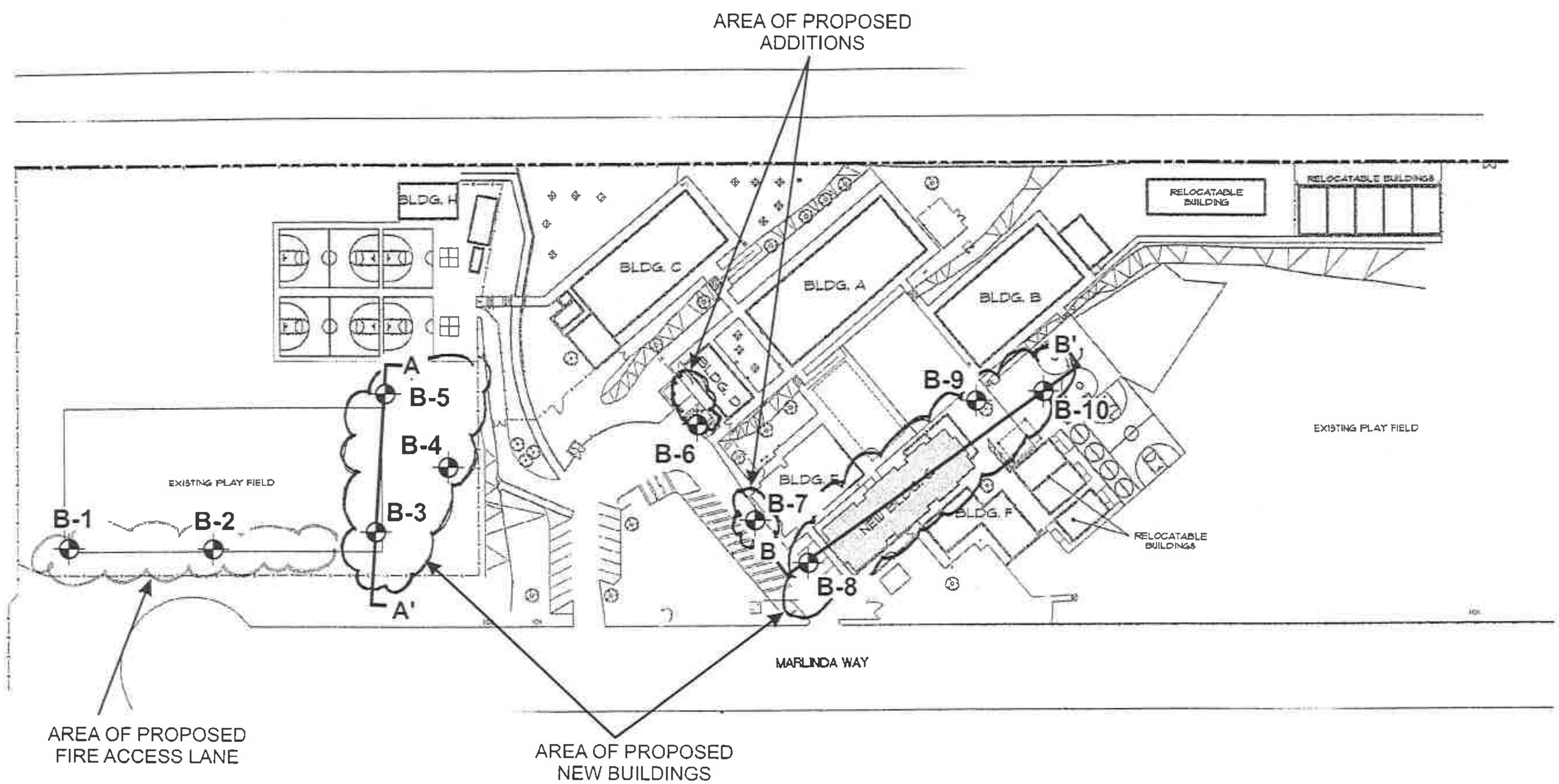
APPROXIMATE SCALE IN FEET

N

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

| Ninyo & Moore | | SITE LOCATION MAP | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | 1 |
| 106112001 | 7/07 | | |

001 slr




**LEGEND**

- B-10 — APPROXIMATE LOCATION OF EXPLORATORY BORING
- B — B' — GEOLOGIC CROSS SECTION

NOT TO SCALE

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: PEPPER DRIVE SCHOOL, SPROTTE + WATSON.

Ninyo & Moore

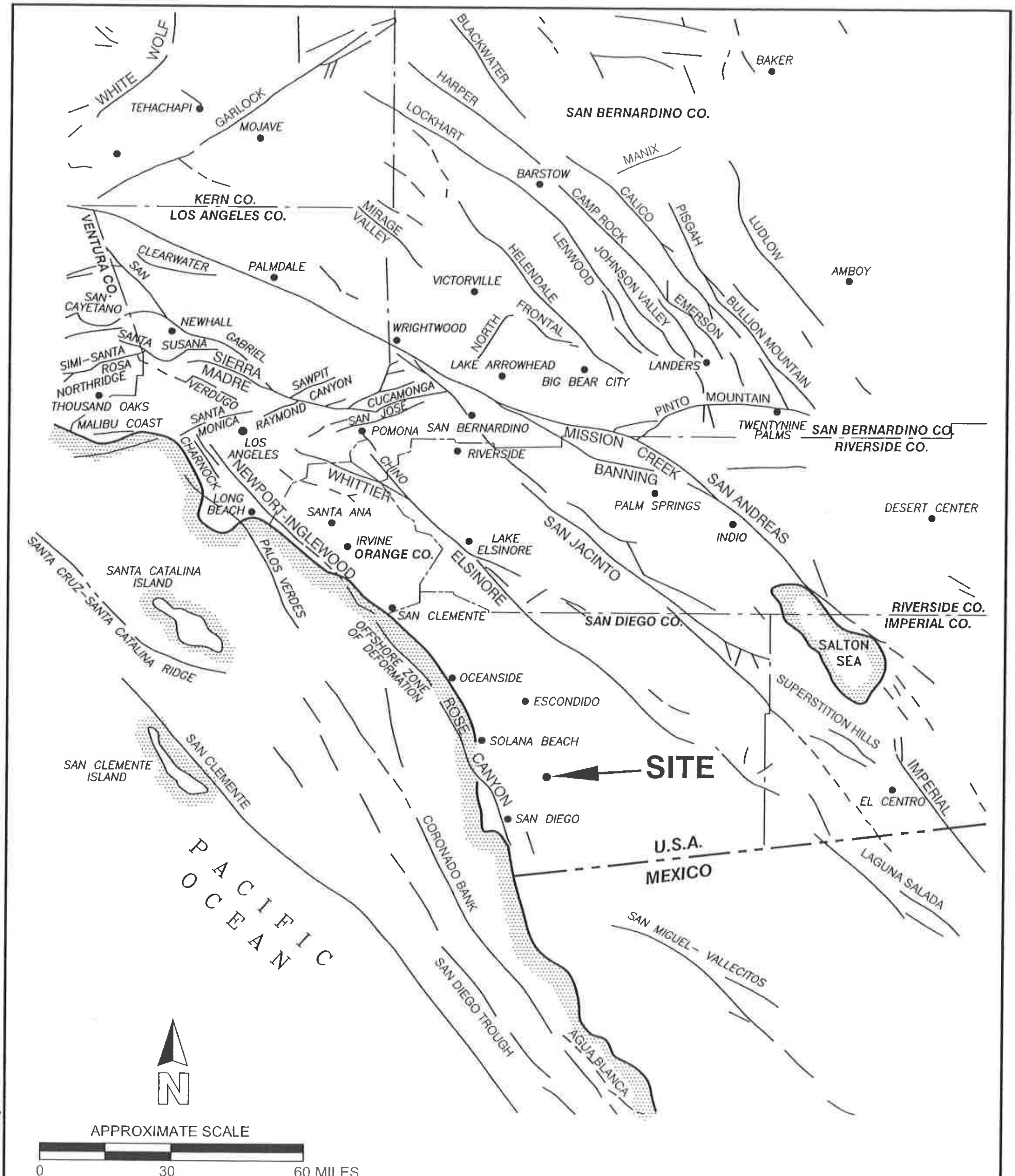
# BORING LOCATION MAP

| PROJECT NO. | DATE |
| --- | --- |
| 106112001 | 7/07 |

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

FIGURE 2

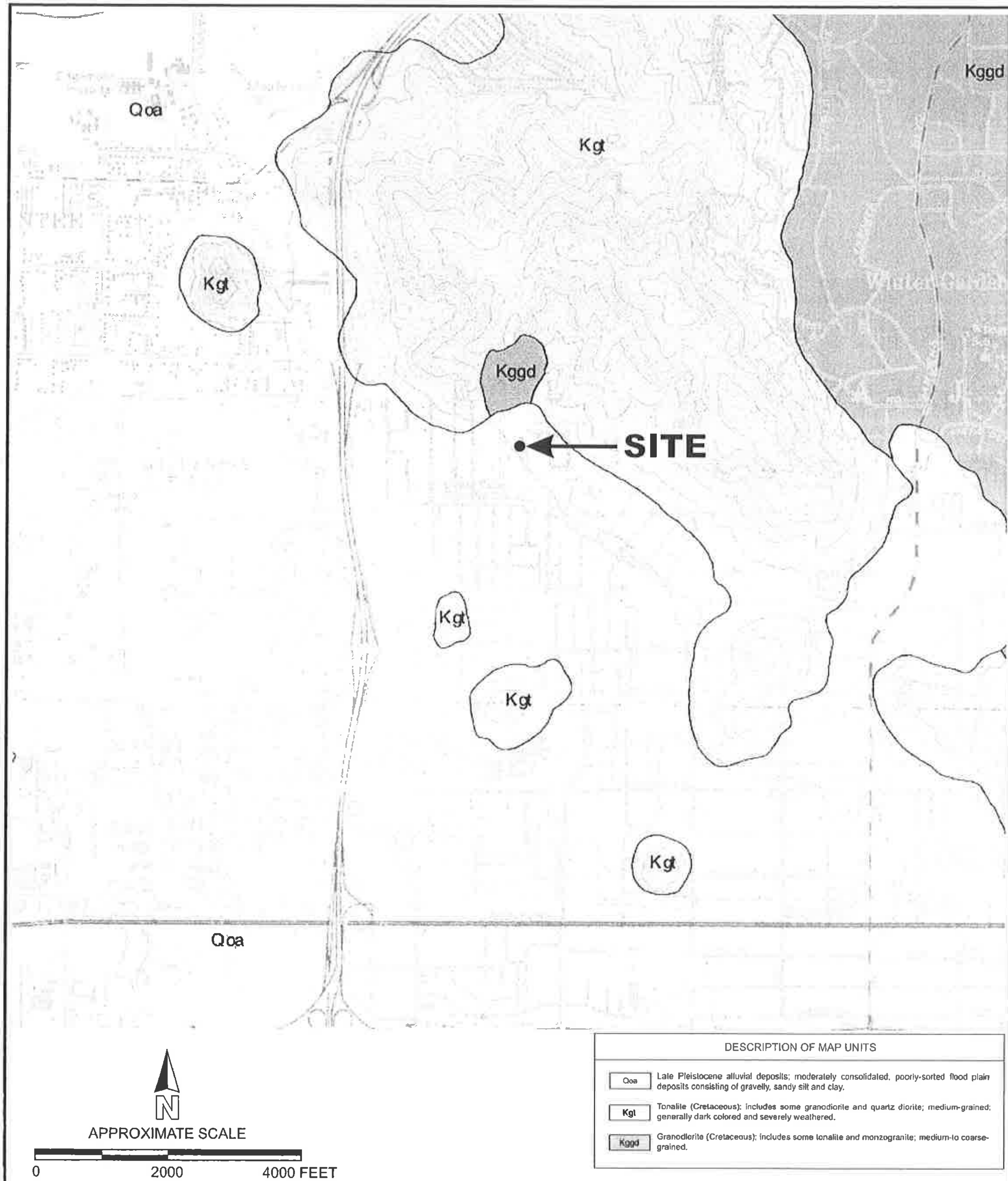
106112001 blm fig 2




NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

| Ninyo & Moore | | FAULT LOCATION MAP | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | 3 |
| 106112001 | 7/07 | | |

106112001 fault fig 3




**DESCRIPTION OF MAP UNITS**

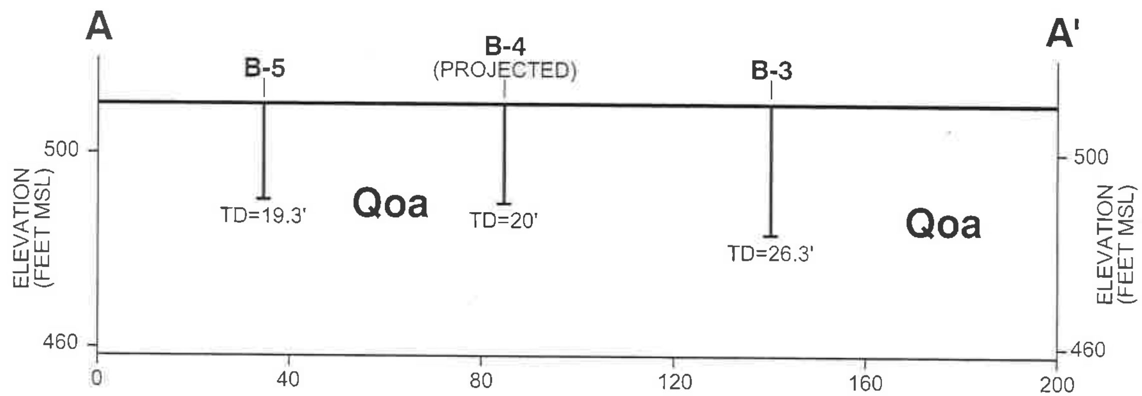
| | |
|---|---|
| Qoa | Late Pleistocene alluvial deposits; moderately consolidated, poorly-sorted flood plain deposits consisting of gravelly, sandy silt and clay. |
| Kgt | Tonalite (Cretaceous); includes some granodiorite and quartz diorite; medium-grained; generally dark colored and severely weathered. |
| Kggd | Granodiorite (Cretaceous); includes some tonalite and monzogranite; medium-to coarse-grained. |

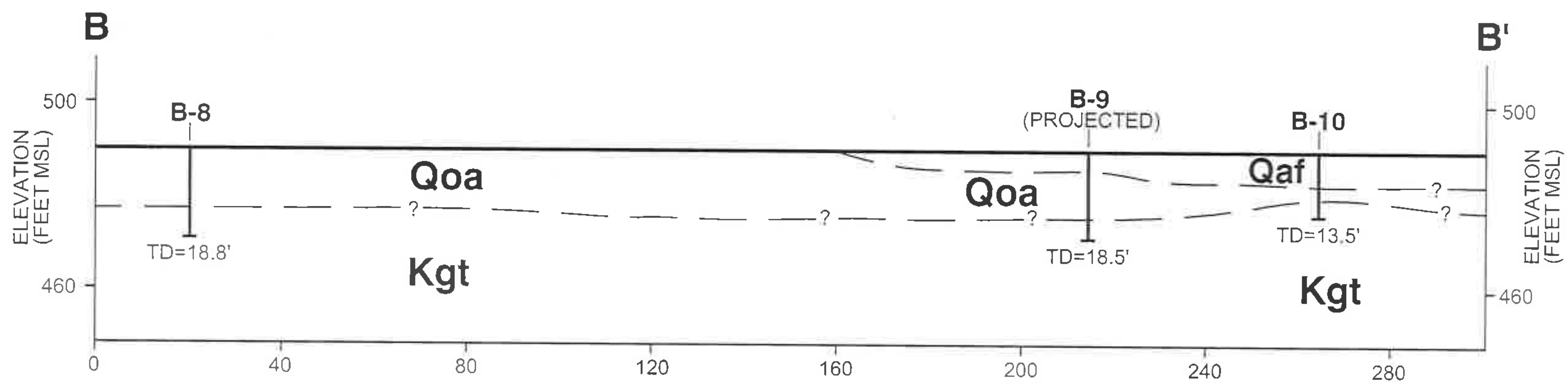
NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: U.S.G.S., GEOLOGIC MAP OF THE EL CAJON 7.5' QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA, DATED 2002.

| Ninyo & Moore | | GEOLOGIC MAP | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | 4 |
| 106112001 | 7/07 | | |

001 ge




**LEGEND**

| | |
|---|---|
| B-10 | APPROXIMATE LOCATION OF EXPLORATORY BORING |
| TD=18.5' | TD=APPROXIMATE TOTAL DEPTH IN FEET |
| Qaf | FILL |
| Qoa | OLDER ALLUVIUM |
| Kgt | TONALITE |
| ? | APPROXIMATE LOCATION OF GEOLOGIC CONTACT QUERIED WERE QUESTIONABLE |

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

APPROXIMATE SCALE

0 40 80 FEET

Ninyo & Moore

| PROJECT NO. | DATE |
|---|---|
| 106112001 | 7/07 |

## GEOLOGIC CROSS SECTIONS

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

FIGURE

5

106112001 xsec a-a' fig 5

# APPENDIX A

# BORING LOGS

**Field Procedure for the Collection of Disturbed Samples**
Disturbed soil samples were obtained in the field using the following methods.

**Bulk Samples**
Bulk samples of representative earth materials were obtained from the drill cuttings of the exploratory excavations. The samples were bagged and transported to the laboratory for testing.

**The Standard Penetration Test (SPT) Sampler**
Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-99. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

**Field Procedure for the Collection of Relatively Undisturbed Samples**
Relatively undisturbed soil samples were obtained in the field using the following method.

**The Modified Split-Barrel Drive Sampler**
The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer, in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | BORING LOG EXPLANATION SHEET |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | Bulk sample. |
| | | | | | | | | Modified split-barrel drive sampler. |
| | | | | | | | | No recovery with modified split-barrel drive sampler. |
| | | | | | | | | Sample retained by others. |
| | | | | | | | | Standard Penetration Test (SPT). |
| 5 | | | | | | | | No recovery with a SPT. |
| | | | XX/XX | | | | | Shelby tube sample. Distance pushed in inches/length of sample recovered in inches. |
| | | | | | | | | No recovery with Shelby tube sampler. |
| | | | | | | | | Continuous Push Sample. |
| | | | | | | | | Seepage. |
| 10 | | | | | | | | Groundwater encountered during drilling. |
| | | | | | | | | Groundwater measured after drilling. |
| | | | | | | | SM | ALLUVIUM:<br>Solid line denotes unit change. |
| | | | | | | | | Dashed line denotes material change. |
| 15 | | | | | | | | Attitudes: Strike/Dip<br>b: Bedding<br>c: Contact<br>j: Joint<br>f: Fracture<br>F: Fault<br>cs: Clay Seam<br>s: Shear<br>bss: Basal Slide Surface<br>sf: Shear Fracture<br>sz: Shear Zone<br>sbs: Sheared Bedding Surface |
| 20 | | | | | | | | The total depth line is a solid line that is drawn at the bottom of the boring. |

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**BORING LOG**

EXPLANATION OF BORING LOG SYMBOLS

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| | Rev. 01/03 | |

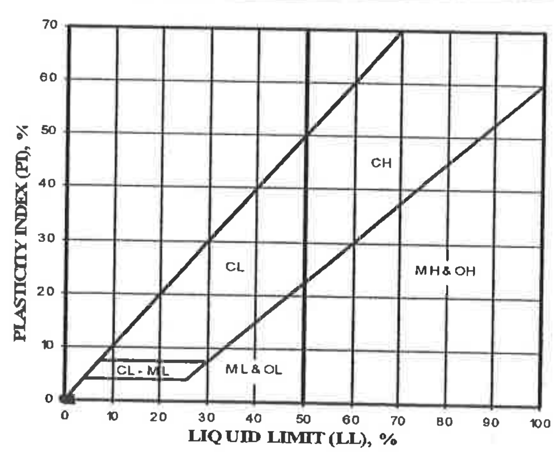
# U.S.C.S. METHOD OF SOIL CLASSIFICATION

| MAJOR DIVISIONS | | SYMBOL | TYPICAL NAMES |
|---|---|---|---|
| COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size) | GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size) | GW | Well graded gravels or gravel-sand mixtures, little or no fines |
| | | GP | Poorly graded gravels or gravel-sand mixtures, little or no fines |
| | | GM | Silty gravels, gravel-sand-silt mixtures |
| | | GC | Clayey gravels, gravel-sand-clay mixtures |
| | SANDS (More than 1/2 of coarse fraction <No. 4 sieve size) | SW | Well graded sands or gravelly sands, little or no fines |
| | | SP | Poorly graded sands or gravelly sands, little or no fines |
| | | SM | Silty sands, sand-silt mixtures |
| | | SC | Clayey sands, sand-clay mixtures |
| FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size) | SILTS & CLAYS Liquid Limit <50 | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with |
| | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean |
| | | OL | Organic silts and organic silty clays of low plasticity |
| | SILTS & CLAYS Liquid Limit >50 | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | CH | Inorganic clays of high plasticity, fat clays |
| | | OH | Organic clays of medium to high plasticity, organic silty clays, organic silts |
| HIGHLY ORGANIC SOILS | | Pt | Peat and other highly organic soils |

## GRAIN SIZE CHART

| CLASSIFICATION | RANGE OF GRAIN SIZE | |
|---|---|---|
| | U.S. Standard Sieve Size | Grain Size in Millimeters |
| BOULDERS | Above 12" | Above 305 |
| COBBLES | 12" to 3" | 305 to 76.2 |
| GRAVEL<br>Coarse<br>Fine | 3" to No. 4<br>3" to 3/4"<br>3/4" to No. 4 | 76.2 to 4.76<br>76.2 to 19.1<br>19.1 to 4.76 |
| SAND<br>Coarse<br>Medium<br>Fine | No. 4 to No. 200<br>No. 4 to No. 10<br>No. 10 to No. 40<br>No. 40 to No. 200 | 4.76 to 0.075<br>4.76 to 2.00<br>2.00 to 0.420<br>0.420 to 0.075 |
| SILT & CLAY | Below No. 200 | Below 0.075 |

## PLASTICITY CHART

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U.S.C.S. METHOD OF SOIL CLASSIFICATION

| DATE DRILLED | 6/29/07 | BORING NO. | B-1 |
|---|---|---|---|
| GROUND ELEVATION | 510'± (MSL) | SHEET | 1 OF 1 |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) | DROP | 30" |
| SAMPLED BY | MAH | LOGGED BY MAH | REVIEWED BY RI |

| DEPTH (feet) | SAMPLES Bulk / Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | SM | OLDER ALLUVIUM: Reddish brown, moist, loose, silty fine to medium SAND. |
| | | 10 | 4.7 | 105.5 | | | |
| 5 | | 5 | | | | | |
| 10 | | 50/5" | | | | | Dense. Tough drilling. Brown. |
| | | | | | | SM | DECOMPOSED GRANITIC ROCK: Brown, damp, very dense, silty fine to coarse SAND. |
| | | 50/5" | | | | | |
| 15 | | 50/5" | | | | | |
| | | 30/5" | | | | | |
| 20 | | | | | | | Total Depth = 18.5 feet. Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with hydrated bentonite shortly after drilling on 6/29/07. |

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-1 |

| DATE DRILLED | 6/29/07 | BORING NO. | B-2 |
|---|---|---|---|
| GROUND ELEVATION | 510'± (MSL) | SHEET | 1 OF 1 |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) | DROP | 30" |
| SAMPLED BY | MAH | LOGGED BY | MAH |
| REVIEWED BY | RI | | |

| DEPTH (feet) | SAMPLES (Bulk / Driven) | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | Bulk | | | | | SM | OLDER ALLUVIUM: Brown, damp, medium dense, silty fine to medium SAND. |
| | Driven | 22 | | | | | Dense |
| 5 | | | | | | | Very dense. |
| | Driven | 50/5" | 66 | 83.3 | | | |
| | | | | | | | Dark brown. |
| | | | | | | | Dark brown to reddish brown. |
| 10 | Driven | 10 | | | | | Medium dense. |
| | | | | | | | Total Depth = 11.5 feet. Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with hydrated bentonite shortly after drilling on 6/29/07. |
| 15 | | | | | | | |
| 20 | | | | | | | |

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-3 |

| | | | | |
|---|---|---|---|---|
| DATE DRILLED | 6/29/07 | BORING NO. | B-3 | |
| GROUND ELEVATION | 510'± (MSL) | SHEET | 1 | OF 2 |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | | |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) | DROP | 30" | |
| SAMPLED BY | BTM | LOGGED BY | BTM | REVIEWED BY RI |

| DEPTH (feet) | SAMPLES: Bulk / Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | SM | OLDER ALLUVIUM: Reddish brown, damp, very dense, silty SAND. |
| | | 40 | 5.7 | | | | |
| 5 | | | | | | | Dark brown; slightly clayey, silty sand. |
| | | 75 | 4.5 | 13.1 | | | |
| 10 | | | | | | | |
| | | 60 | 6.4 | | | | |
| 15 | | | | | | | |
| | | 16 | 4.1 | 111.4 | | | Medium dense. |
| | | 11 | | | | | |
| 20 | | | | | | | |

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-4 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DATE DRILLED 6/29/07 BORING NO. B-3 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GROUND ELEVATION 510'± (MSL) SHEET 2 OF 2 |
| | | | | | | | | METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) |
| | | | | | | | | DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30" |
| | | | | | | | | SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI |
| | | | | | | | | **DESCRIPTION/INTERPRETATION** |
| 20 | | | | | | | SM | OLDER ALLUVIUM: (Continued)<br>Reddish brown, damp, medium dense, slightly clayey, silty SAND. |
| | | | | | | | SC | Reddish brown, damp, very dense, clayey SAND. |
| 25 | | | 80/9" | | | | | |
| | | | | | | | | Total Depth = 26.3 feet.<br>Groundwater was not encountered during drilling.<br>Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.<br>Backfilled with approximately 8.6 cubic feet of bentonite shortly after drilling on 6/29/07. |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-5 |

| DATE DRILLED | 6/29/07 | BORING NO. | B-4 |
|---|---|---|---|
| GROUND ELEVATION | 510'± (MSL) | SHEET 1 OF 2 | |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)) | | |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) | DROP | 30" |
| SAMPLED BY | BTM | LOGGED BY BTM | REVIEWED BY RI |

| DEPTH (feet) | SAMPLES Bulk / Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | Bulk | | | | | SM | OLDER ALLUVIUM: Brown, damp, very dense, silty SAND. |
| | Driven | 45 | 5.5 | | | | |
| 5 | Driven | 85 | | | | | Dark brown; slightly clayey, silty sand. |
| 10 | Driven | 30 | 6.9 | | | | Dense. |
| 15 | Driven | 40 | | | | | Reddish brown; medium dense. |
| | Driven | 11 | | | | | |
| 20 | | | | | | | |

Ninyo & Moore

**BORING LOG**
PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-6 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DATE DRILLED 6/29/07 BORING NO. B-4<br>GROUND ELEVATION 510'± (MSL) SHEET 2 OF 2<br>METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS))<br>DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"<br>SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI<br>DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | Total Depth = 20 feet.<br>Groundwater was not encountered during drilling.<br>Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.<br>Backfilled with approximately 6.8 cubic feet of bentonite grout shortly after drilling on 6/29/07. |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-7 |

| | | |
|---|---|---|
| DATE DRILLED 6/29/07 | BORING NO. B-5 | |
| GROUND ELEVATION 510'± (MSL) | SHEET 1 OF 2 | |
| METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | |
| DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) | DROP 30" | |
| SAMPLED BY BTM | LOGGED BY BTM | REVIEWED BY RI |

| DEPTH (feet) | SAMPLES (Bulk / Driven) | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | Bulk (0–5) | | | | | SC | OLDER ALLUVIUM: Brown, damp, very dense, clayey SAND. |
| | Driven | 35 | 6.7 | | | | |
| 5 | Driven | 27 | 6.8 | 123.9 | | | Medium dense. |
| 10 | Driven | 6 | | | | | Reddish brown, loose. |
| 15 | Driven | 50/4" | | | | | Very dense. |
| | Driven | 75/9" | | | | | |
| 20 | | | | | | | Total Depth = 19.3 feet.<br>Seepage encountered at approximately 9.5 feet. |

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-8 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DATE DRILLED 6/29/07 BORING NO. B-5<br>GROUND ELEVATION 510'± (MSL) SHEET 2 OF 2<br>METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)<br>DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"<br>SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI<br>**DESCRIPTION/INTERPRETATION** |
|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | Groundwater was not encountered during drilling.<br>Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.<br>Backfilled with approximately 6.8 cubic feet of bentonite shortly after drilling on 6/29/07. |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-9 |

| | |
|---|---|
| DATE DRILLED | 6/29/07 |
| BORING NO. | B-6 |
| GROUND ELEVATION | 490'± (MSL) |
| SHEET | 1 OF 1 |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) |
| DROP | 30" |
| SAMPLED BY | BTM |
| LOGGED BY | BTM |
| REVIEWED BY | RI |

| DEPTH (feet) | SAMPLES (Bulk / Driven) | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | ASPHALT CONCRETE: Approximately 3" thick. |
| | | | | | | SC | OLDER ALLUVIUM: Reddish brown, damp, loose to medium dense, clayey SAND. |
| | Bulk / Driven | 7 | 8.8 | | | | |
| 5 | Driven | 40 | | | | | |
| | | | | | | | GRANITIC ROCK: Light brown, weathered GRANITIC ROCK; highly fractured. |
| 10 | Driven | 50/2" | | | | | |
| | | | | | | | Auger refusal. |
| | | | | | | | Total Depth = 11 feet (Refusal). Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 3.3 cubic feet of bentonite grout shortly after drilling on 6/29/07. |
| 15 | | | | | | | |
| 20 | | | | | | | |

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-10 |

| | | | |
|---|---|---|---|
| DATE DRILLED | 6/29/07 | BORING NO. | B-7 |
| GROUND ELEVATION | 490'± (MSL) | SHEET | 1 OF 2 |
| METHOD OF DRILLING | 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | |
| DRIVE WEIGHT | 140 LBS. (AUTO-TRIP HAMMER) | DROP | 30" |
| SAMPLED BY | BTM | LOGGED BY | BTM |
| REVIEWED BY | RI | | |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | ASPHALT CONCRETE: Approximately 4" thick. |
| | | | | | | | SC | OLDER ALLUVIUM: Reddish brown, damp, medium dense, clayey SAND. |
| | | | 10 | | | | | |
| 5 | | | 15 | | | | | |
| 10 | | | 14 | | | | | Scattered gravel. |
| | | | | | | | | GRANITIC ROCK: Light brown, weathered GRANITIC ROCK; highly fractured. |
| 15 | | | 100/9" | | | | | |
| | | | 50/3" | | | | | |
| | | | | | | | | Total Depth = 18.8 feet. Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due |
| 20 | | | | | | | | |

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-11 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 6.2 cubic feet of bentonite shortly after drilling on 6/29/07. |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

DATE DRILLED 6/29/07 BORING NO. B-7

GROUND ELEVATION 490'± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-12 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| DATE DRILLED 6/29/07 BORING NO. B-8 | | | | | | | | |
| GROUND ELEVATION 490'± (MSL) SHEET 1 OF 2 | | | | | | | | |
| METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS) | | | | | | | | |
| DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30" | | | | | | | | |
| SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI | | | | | | | | |
| 0 | | | | | | | SC | ASPHALT CONCRETE: Approximately 3" thick. |
| | | | | | | | | OLDER ALLUVIUM: Reddish brown, damp, medium dense to dense, clayey SAND. |
| | | | 20 | 8.3 | | | | |
| 5 | | | 15 | 5.5 | 108.9 | | | Medium dense. |
| 10 | | | 45 | | | | | Very dense. |
| | | | | | | | | GRANITIC ROCK: Light brown, weathered GRANITIC ROCK; highly fractured. |
| 15 | | | 50/4" | | | | | |
| | | | 50/3" | | | | | |
| | | | | | | | | Total Depth = 18.8 feet. Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due |
| 20 | | | | | | | | |

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**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-13 |

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 6.2 cubic feet of bentonite shortly after drilling on 6/29/07. |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

DATE DRILLED 6/29/07 BORING NO. B-8

GROUND ELEVATION 490'± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RI

Ninyo & Moore

**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-14 |

DATE DRILLED 7/02/07 BORING NO. B-9

GROUND ELEVATION 490'± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY MAH LOGGED BY MAH REVIEWED BY RI

| DEPTH (feet) | SAMPLES Bulk | SAMPLES Driven | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | SM | FILL: Reddish brown, damp, loose, silty fine SAND. |
| | | | 12 | 7.3 | 110.4 | | | |
| | | | | | | | SM | OLDER ALLUVIUM: Reddish brown, moist, medium dense, silty fine SAND. |
| 5 | | | 21 | | | | | |
| 10 | | | 38 | | | | SM | Reddish brown, moist, medium dense, silty SAND; trace clay. |
| | | | | | | | | Harder drilling. |
| | | | | | | | | DECOMPOSED GRANITIC ROCK: Light reddish brown, moist, very dense, sandy SILT; remnant grain structure. |
| 15 | | | 50/4" | | | | | |
| | | | 50/5" | | | | | |
| 20 | | | | | | | | Total Depth = 18.5 feet. Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled shortly after drilling on 7/02/07. |

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**BORING LOG**

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-15 |

DATE DRILLED 7/02/07 BORING NO. B-10

GROUND ELEVATION 490'± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY MAH LOGGED BY MAH REVIEWED BY RI

| DEPTH (feet) | SAMPLES (Bulk / Driven) | BLOWS/FOOT | MOISTURE (%) | DRY DENSITY (PCF) | SYMBOL | CLASSIFICATION U.S.C.S. | DESCRIPTION/INTERPRETATION |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | ASPHALT CONCRETE: Approximately 2½" thick. |
| | | | | | | SM | FILL: Reddish brown, damp, loose, silty SAND. |
| | Driven | 12 | 7.5 | 115.3 | | | |
| 5 | Driven | 20 | 7.1 | 112.3 | | | Medium dense. |
| | | | | | | ML | OLDER ALLUVIUM: Reddish brown, moist, medium dense, clayey sandy SILT. |
| 10 | Driven | 50/4" | | | | | GRANITIC ROCK: Light reddish brown, moist, very dense, sandy SILT; with few scattered gravel. |
| | Driven | 50/5" | | | | | |
| | | | | | | | Very tough drilling. |
| | Driven | 50/5" | | | | | Auger refusal. |
| | | | | | | | Total Depth = 13.5 feet (Refusal). Groundwater was not encountered during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with hydrated bentonite shortly after drilling on 7/02/07. |
| 15 | | | | | | | |
| 20 | | | | | | | |

Ninyo & Moore

## BORING LOG

PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

| PROJECT NO. | DATE | FIGURE |
|---|---|---|
| 106112001 | 7/07 | A-17 |

## APPENDIX B

## LABORATORY TESTING

**Classification**

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488-93. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

**In-Place Moisture and Density Tests**

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937-94. The test results are presented on the logs of the exploratory borings in Appendix A.

**Gradation Analysis**

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422-63. The grain-size distribution curves are shown on Figures B-1 and B-2. The test results were utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System.

**Expansion Index Tests**

The expansion index of a selected material was evaluated in general accordance with U.B.C. Standard No. 18-2. The specimen was molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of these tests are presented on Figure B-4.

**Direct Shear Tests**

One direct shear test was performed on a remolded sample in general accordance with ASTM D 3080-98 to evaluate the shear strength characteristics of the selected material. The sample was inundated during shearing to represent adverse field conditions. The results are shown on Figure B-3.

**Proctor Density Test**

The maximum dry density and optimum moisture content of a selected representative soil sample were evaluated using the Modified Proctor method in general accordance with ASTM D 1557-02. The results of this test are summarized on Figure B-5.

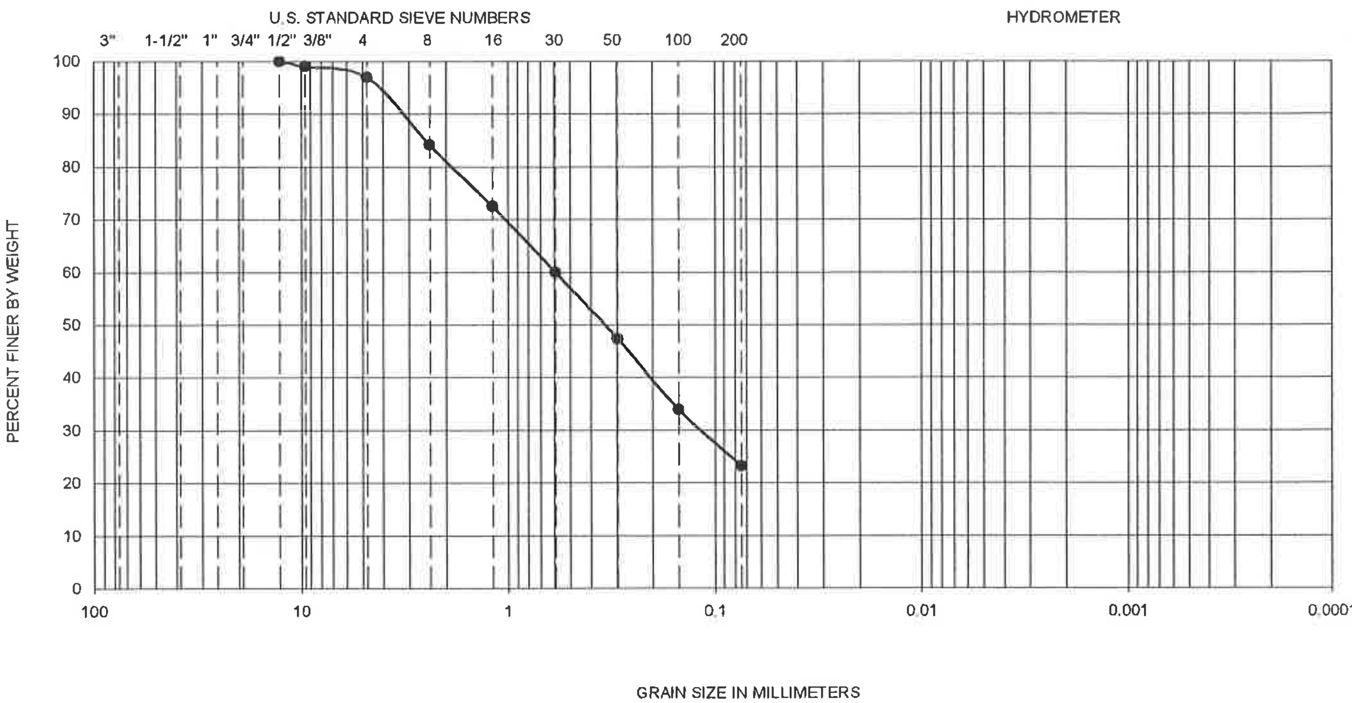
**Soil Corrosivity Tests**

Soil pH, and electrical resistivity tests were performed on a representative sample in general accordance with California Test (CT) 643. The chloride content of the selected sample was evaluated in general accordance with CT 422. The sulfate content of the selected sample was evaluated in general accordance with CT 417. The test results are presented on Figure B-6.

**R-Value**

The resistance value, or R-value, for basement soils was evaluated in general accordance with ASTM D 2844-01. A sample was prepared and tested for exudation pressure and R-value. The graphically evaluated R-value at an exudation pressure of 300 pounds per square inch is reported. The test results are shown on Figure B-7.

| GRAVEL | | SAND | | | FINES | |
|---|---|---|---|---|---|---|
| Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |

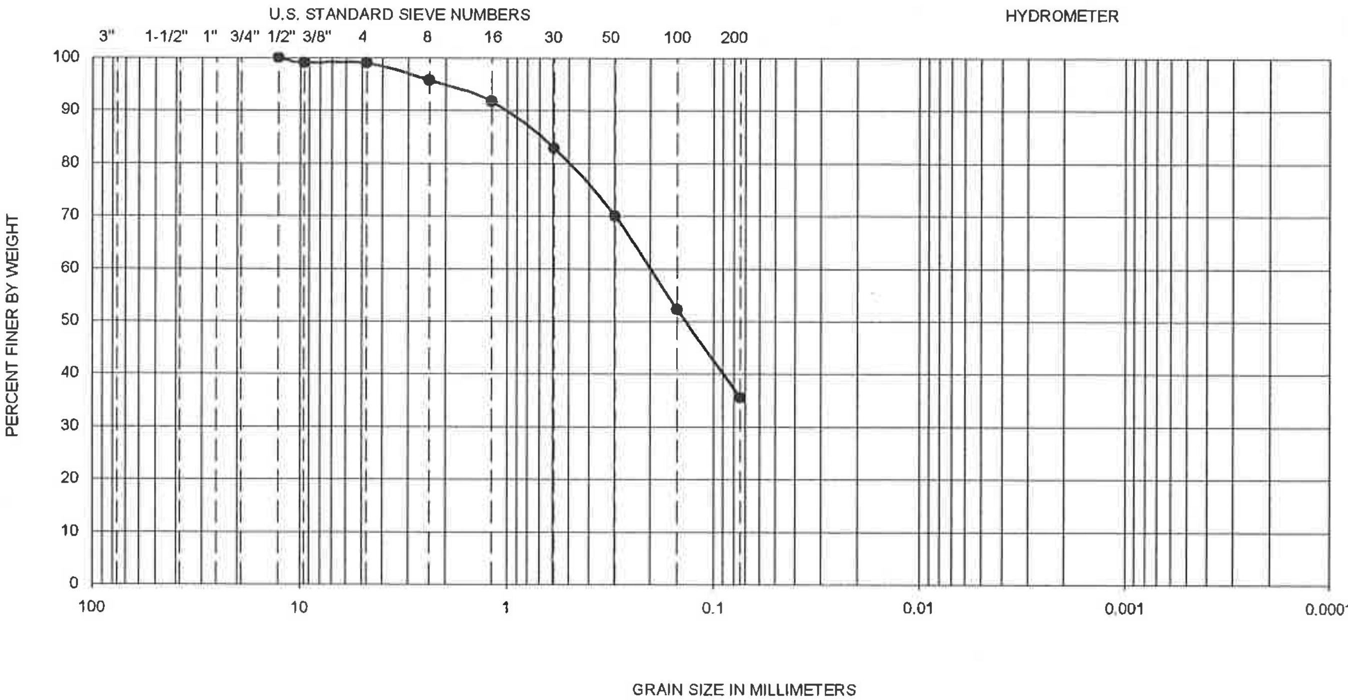



| Symbol | Hole No. | Depth (ft) | Liquid Limit | Plastic Limit | Plasticity Index | $D_{10}$ | $D_{30}$ | $D_{60}$ | $C_u$ | $C_c$ | Passing No. 200 (%) | U.S.C.S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ● | B-1 | 0.0-5.0 | -- | -- | -- | -- | -- | -- | -- | -- | 23 | SM |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

| *Ninyo & Moore* | | GRADATION TEST RESULTS | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | B-1 |
| 106112001 | 7/07 | | |

| GRAVEL | | SAND | | | FINES | |
|---|---|---|---|---|---|---|
| Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |

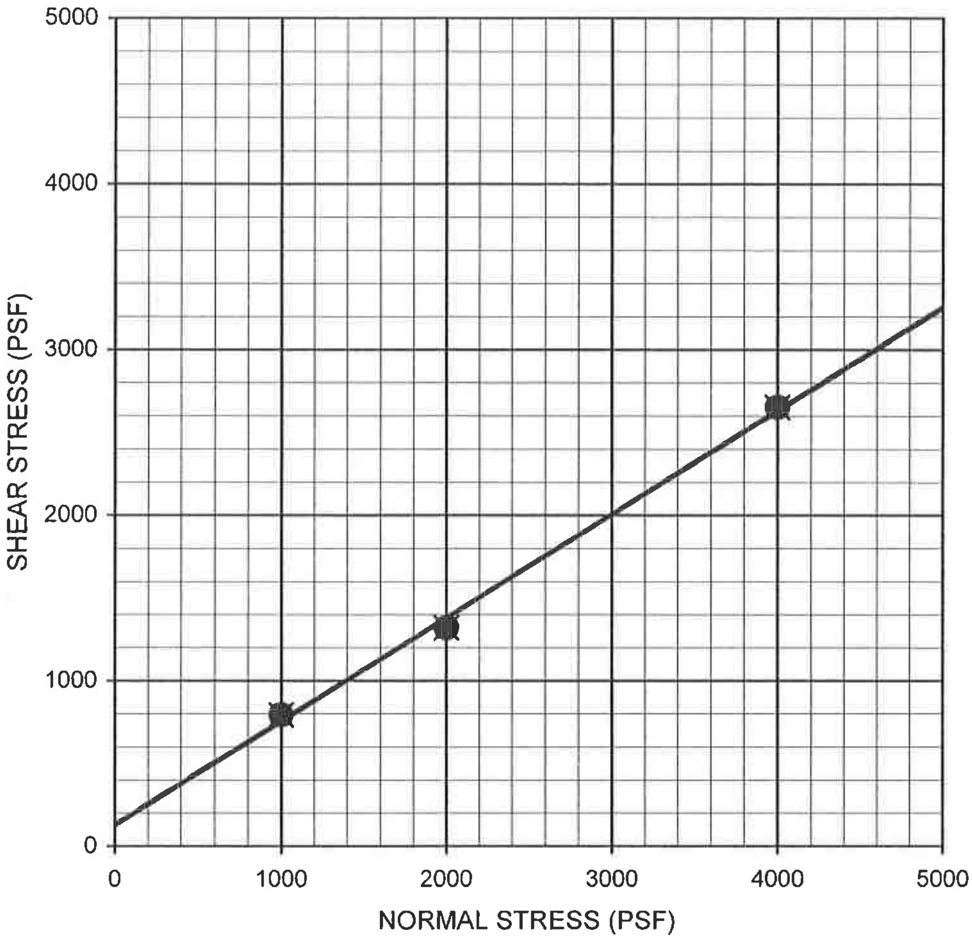



| Symbol | Hole No. | Depth (ft) | Liquid Limit | Plastic Limit | Plasticity Index | $D_{10}$ | $D_{30}$ | $D_{60}$ | $C_u$ | $C_c$ | Passing No. 200 (%) | U.S.C.S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ● | B-10 | 2.0-3.5 | -- | -- | -- | -- | -- | -- | -- | -- | 36 | SM |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

| Ninyo & Moore | | GRADATION TEST RESULTS | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL SANTEE, CALIFORNIA | B-2 |
| 106112001 | 7/07 | | |

106112001 SIEVE B-10 @ 2.0-3.5.xls




| Description | Symbol | Sample Location | Depth (ft) | Shear Strength | Cohesion, c (psf) | Friction Angle, ϕ (degrees) | Soil Type |
|---|---|---|---|---|---|---|---|
| Remolded @ 90% Relative Compaction | —●— | B-9 | 0.0-5.0 | Peak | 130 | 32 | SM |
| | - - X - - | B-9 | 0.0-5.0 | Ultimate | 130 | 32 | SM |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080-04

Ninyo & Moore

# DIRECT SHEAR TEST RESULTS

| PROJECT NO. | DATE |
|---|---|
| 106112001 | 7/07 |

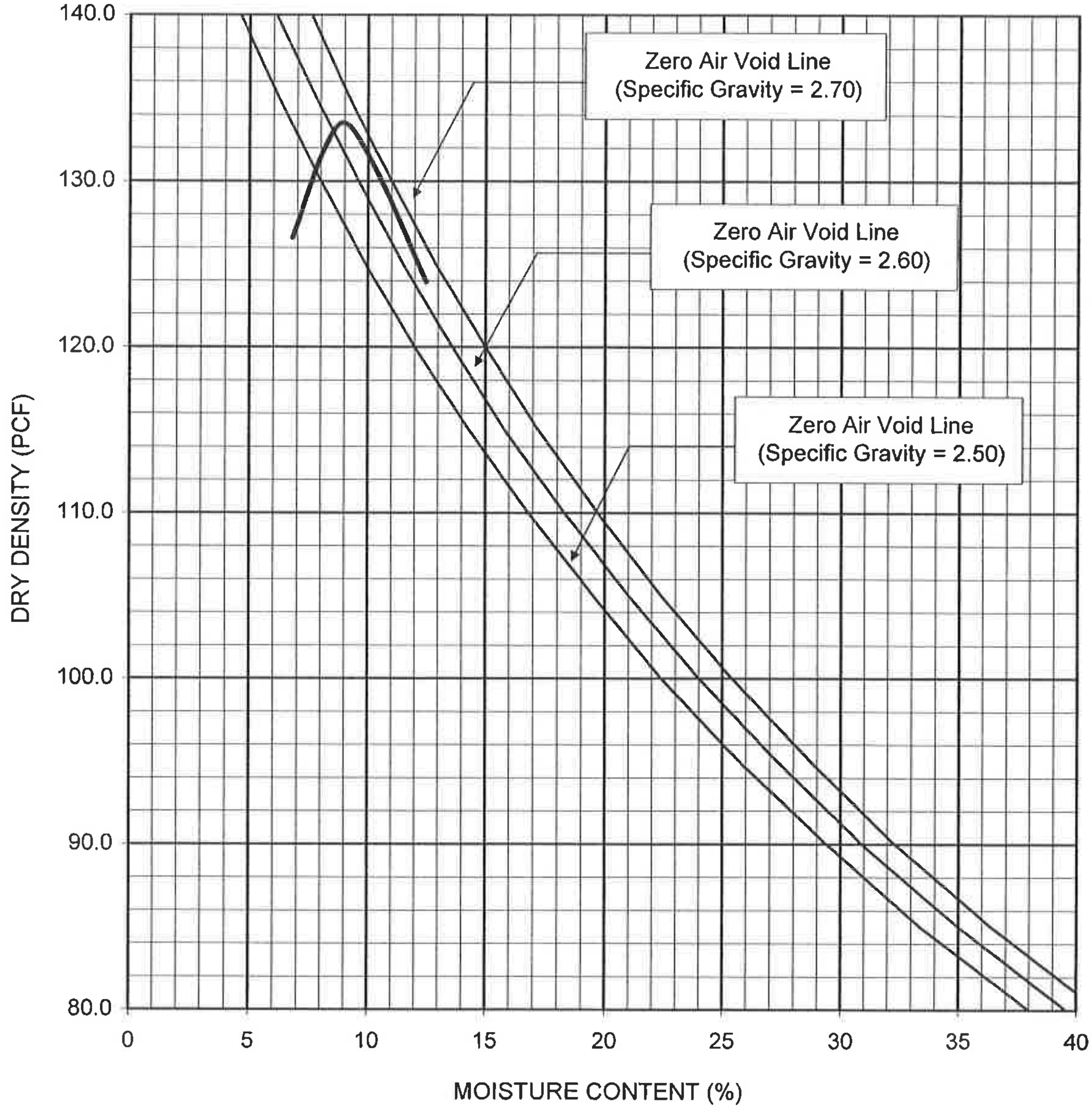
PEPPER DRIVE SCHOOL
SANTEE, CALIFORNIA

FIGURE
**B-3**

| SAMPLE LOCATION | SAMPLE DEPTH (FT) | INITIAL MOISTURE (%) | COMPACTED DRY DENSITY (PCF) | FINAL MOISTURE (%) | VOLUMETRIC SWELL (IN) | EXPANSION INDEX | POTENTIAL EXPANSION |
|---|---|---|---|---|---|---|---|
| B-3 | 0.0-5.0 | 8.0 | 118.0 | 13.1 | 0.000 | 0 | Very Low |
| B-4 | 0.0-5.0 | 8.0 | 118.3 | 14.6 | 0.000 | 0 | Very Low |

PERFORMED IN GENERAL ACCORDANCE WITH ☑ UBC STANDARD 18-2 ☐ ASTM D 4829-03

| Ninyo & Moore | | EXPANSION INDEX TEST RESULTS | FIGURE B-4 |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | |
| 106112001 | 7/07 | | |




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| B-9 | 0.0-5.0 | Reddish Brown Silty SAND (SM) | 133.5 | 9.0 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718-87) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☑ ASTM D 1557-02 ☐ ASTM D 698-00a METHOD ☑ A ☐ B ☐ C

| Ninyo & Moore | | PROCTOR DENSITY TEST RESULTS | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | B-5 |
| 106112001 | 7/07 | | |

106112001 PROCTOR B-9 @ 0.0-5.0.xls

| SAMPLE LOCATION | SAMPLE DEPTH (FT) | pH [1] | RESISTIVITY [1] (Ohm-cm) | SULFATE CONTENT [2] | | CHLORIDE CONTENT [3] (ppm) |
|---|---|---|---|---|---|---|
| | | | | (ppm) | (%) | |
| B-3 | 0.0-5.0 | 6.7 | 375 | 2520 | 0.252 | 825 |
| B-10 | 5.0-6.5 | 7.2 | 17,420 | 80 | 0.008 | 115 |

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643

[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417

[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

| Ninyo & Moore | | CORROSIVITY TEST RESULTS | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | B-6 |
| 106112001 | 7/07 | | |

| SAMPLE LOCATION | SAMPLE DEPTH (FT) | SOIL TYPE | R-VALUE |
|---|---|---|---|
| B-1 | 0.0-5.0 | SM | 74 |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844-01/CT 301

| Ninyo & Moore | | R-VALUE TEST RESULTS | FIGURE |
|---|---|---|---|
| PROJECT NO. | DATE | PEPPER DRIVE SCHOOL<br>SANTEE, CALIFORNIA | B-7 |
| 106112001 | 7/07 | | |

# APPENDIX C

# TYPICAL EARTHWORK GUIDELINES

## TABLE OF CONTENTS

# TYPICAL EARTHWORK GUIDELINES

## 1. GENERAL

These guidelines and the standard details attached hereto are presented as general procedures for earthwork construction for sites having slopes less than 10 feet high. They are to be utilized in conjunction with the project grading plans. These guidelines are considered a part of the geotechnical report, but are superseded by recommendations in the geotechnical report in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supersede these specifications and/or the recommendations of the geotechnical report. It is the responsibility of the contractor to read and understand these guidelines as well as the geotechnical report and project grading plans.

1.1. The contractor shall not vary from these guidelines without prior recommendations by the geotechnical consultant and the approval of the client or the client's authorized representative. Recommendations by the geotechnical consultant and/or client shall not be considered to preclude requirements for approval by the jurisdictional agency prior to the execution of any changes.

1.2. The contractor shall perform the grading operations in accordance with these specifications, and shall be responsible for the quality of the finished product notwithstanding the fact that grading work will be observed and tested by the geotechnical consultant.

1.3. It is the responsibility of the grading contractor to notify the geotechnical consultant and the jurisdictional agencies, as needed, prior to the start of work at the site and at any time that grading resumes after interruption. Each step of the grading operations shall be observed and documented by the geotechnical consultant and, where needed, reviewed by the appropriate jurisdictional agency prior to proceeding with subsequent work.

1.4. If, during the grading operations, geotechnical conditions are encountered which were not anticipated or described in the geotechnical report, the geotechnical consultant shall be notified immediately and additional recommendations, if applicable, may be provided.

1.5. An as-graded report shall be prepared by the geotechnical consultant and signed by a registered engineer and registered engineering geologist. The report documents the geotechnical consultants' observations, and field and laboratory test results, and provides conclusions regarding whether or not earthwork construction was performed in accordance with the geotechnical recommendations and the grading plans. Recommendations for foundation design, pavement design, subgrade treatment, etc., may also be included in the as-graded report.

1.6. For the purpose of evaluating quantities of materials excavated during grading and/or locating the limits of excavations, a licensed land surveyor or civil engineer shall be retained.

1.7. Definitions of terms utilized in the remainder of these specifications have been provided in Section 11.

## 2. OBLIGATIONS OF PARTIES

The parties involved in the projects earthwork activities shall be responsible as outlined in the following sections.

2.1. The client is ultimately responsible for each of the aspects of the project. The client or the client's authorized representative has a responsibility to review the findings and recommendations of the geotechnical consultant. The client shall authorize the contractor and/or other consultants to perform work and/or provide services. During grading the client or the client's authorized representative shall remain on site or remain reasonably accessible to the concerned parties to make the decisions that may be needed to maintain the flow of the project.

2.2. The contractor is responsible for the safety of the project and satisfactory completion of grading and other associated operations, including, but not limited to, earthwork in accordance with the project plans, specifications, and jurisdictional agency requirements. During grading, the contractor or the contractor's authorized representative shall remain on site. The contractor shall further remain accessible during non-working hours, including at night and during days off.

2.3. The geotechnical consultant shall provide observation and testing services and shall make evaluations to advise the client on geotechnical matters. The geotechnical consultant shall report findings and recommendations to the client or the client's authorized representative.

2.4. Prior to proceeding with any grading operations, the geotechnical consultant shall be notified two working days in advance to schedule the needed observation and testing services.

2.4.1. Prior to any significant expansion or reduction in the grading operation, the geotechnical consultant shall be provided with two working days notice to make appropriate adjustments in scheduling of on-site personnel.

2.4.2. Between phases of grading operations, the geotechnical consultant shall be provided with two working days notice in advance of commencement of additional grading operations.

## 3. SITE PREPARATION

Site preparation shall be performed in accordance with the recommendations presented in the following sections.

3.1. The client, prior to any site preparation or grading, shall arrange and attend a pre-grading meeting between the grading contractor, the design engineer, the geotechnical consultant, and representatives of appropriate governing authorities, as well as any other involved parties. The parties shall be given two working days notice.

3.2. Clearing and grubbing shall consist of the substantial removal of vegetation, brush, grass, wood, stumps, trees, tree roots greater than ½-inch in diameter, and other deleterious materials from the areas to be graded. Clearing and grubbing shall extend to the outside of the proposed excavation and fill areas.

3.3. Demolition in the areas to be graded shall include removal of building structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, etc.), and other manmade surface and subsurface improvements, and the backfilling of mining shafts, tunnels and surface depressions. Demolition of utilities shall include capping or rerouting of pipelines at the project perimeter, and abandonment of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

3.4. The debris generated during clearing, grubbing and/or demolition operations shall be removed from areas to be graded and disposed of off site at a legal dump site. Clearing, grubbing, and demolition operations shall be performed under the observation of the geotechnical consultant.

3.5. The ground surface beneath proposed fill areas shall be stripped of loose or unsuitable soil. These soils may be used as compacted fill provided they are generally free of organic or other deleterious materials and evaluated for use by the geotechnical consultant. The resulting surface shall be evaluated by the geotechnical consultant prior to proceeding. The cleared, natural ground surface shall be scarified to a depth of approximately 8 inches, moisture conditioned, and compacted in accordance with the specifications presented in Section 5 of these guidelines.

## 4. REMOVALS AND EXCAVATIONS

Removals and excavations shall be performed as recommended in the following sections.

4.1. Removals

4.1.1. Materials which are considered unsuitable shall be excavated under the observation of the geotechnical consultant in accordance with the recommendations contained herein. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic, compressible natural soils, fractured, weathered, soft bedrock, and undocumented or otherwise deleterious fill materials.

4.1.2. Materials deemed by the geotechnical consultant to be unsatisfactory due to moisture conditions shall be excavated in accordance with the recommendations of the geotechnical consultant, watered or dried as needed, and mixed to a generally uniform moisture content in accordance with the specifications presented in Section 5 of this document.

4.2. Excavations

4.2.1. Temporary excavations no deeper than 5 feet in firm fill or natural materials may be made with vertical side slopes. To satisfy California Occupational Safety and Health Administration (CAL OSHA) requirements, any excavation deeper than 5 feet shall be shored or laid back at a 1:1 inclination or flatter, depending on material type, if construction workers are to enter the excavation.

## 5. COMPACTED FILL

Fill shall be constructed as specified below or by other methods recommended by the geotechnical consultant. Unless otherwise specified, fill soils shall be compacted to 90 percent relative compaction, as evaluated in accordance with ASTM Test Method D 1557.

5.1. Prior to placement of compacted fill, the contractor shall request an evaluation of the exposed ground surface by the geotechnical consultant. Unless otherwise recommended, the exposed ground surface shall then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve a generally uniform moisture content at or near the optimum moisture content. The scarified materials shall then be compacted to 90 percent relative compaction. The evaluation of compaction by the geotechnical consultant shall not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

5.2. Excavated on-site materials which are in general compliance with the recommendations of the geotechnical consultant may be utilized as compacted fill provided they are generally free of organic or other deleterious materials and do not contain rock fragments greater than 6 inches in dimension. During grading, the contractor may encounter soil types other than those analyzed during the preliminary geotechnical study. The geotechnical consultant shall be consulted to evaluate the suitability of any such soils for use as compacted fill.

5.3. Where imported materials are to be used on site, the geotechnical consultant shall be notified three working days in advance of importation in order that it may sample and test the materials from the proposed borrow sites. No imported materials shall be delivered for use on site without prior sampling, testing, and evaluation by the geotechnical consultant.

5.4. Soils imported for on-site use shall preferably have very low to low expansion potential (based on UBC Standard 18-2 test procedures). Lots on which expansive soils may be exposed at grade shall be undercut 3 feet or more and capped with very low to low expansion potential fill. Details of the undercutting are provided in the Transition and Undercut Lot Details, Figure B of these guidelines. In the event expansive soils are present near the ground surface, special design and construction considerations shall be utilized in general accordance with the recommendations of the geotechnical consultant.

5.5. Fill materials shall be moisture conditioned to near optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils shall be generally uniform in the soil mass.

5.6. Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill shall be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

5.7. Compacted fill shall be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift shall be watered or dried as needed to achieve near optimum moisture condition, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other appropriate compacting rollers, to the specified relative compaction. Successive lifts shall be treated in a like manner until the desired finished grades are achieved.

5.8. Fill shall be tested in the field by the geotechnical consultant for evaluation of general compliance with the recommended relative compaction and moisture conditions. Field density testing shall conform to ASTM D 1556-00 (Sand Cone method), D 2937-00 (Drive-Cylinder method), and/or D 2922-96 and D 3017-96 (Nuclear Gauge method). Generally, one test shall be provided for approximately every 2 vertical feet of fill placed, or for approximately every 1000 cubic yards of fill placed. In addition, on slope faces one or more tests shall be taken for approximately every 10,000 square feet of slope face and/or approximately every 10 vertical feet of slope height. Actual test intervals may vary as field conditions dictate. Fill found to be out of conformance with the grading recommendations shall be removed, moisture conditioned, and compacted or otherwise handled to accomplish general compliance with the grading recommendations.

5.9. The contractor shall assist the geotechnical consultant by excavating suitable test pits for removal evaluation and/or for testing of compacted fill.

5.10. At the request of the geotechnical consultant, the contractor shall "shut down" or restrict grading equipment from operating in the area being tested to provide adequate testing time and safety for the field technician.

5.11. The geotechnical consultant shall maintain a map with the approximate locations of field density tests. Unless the client provides for surveying of the test locations, the locations shown by the geotechnical consultant will be estimated. The geotechnical consultant shall not be held responsible for the accuracy of the horizontal or vertical locations or elevations.

5.12. Grading operations shall be performed under the observation of the geotechnical consultant. Testing and evaluation by the geotechnical consultant does not preclude the need for approval by or other requirements of the jurisdictional agencies.

5.13. Fill materials shall not be placed, spread or compacted during unfavorable weather conditions. When work is interrupted by heavy rains, the filling operation shall not be resumed until tests indicate that moisture content and density of the fill meet the project specifications. Regrading of the near-surface soil may be needed to achieve the specified moisture content and density.

5.14. Upon completion of grading and termination of observation by the geotechnical consultant, no further filling or excavating, including that planned for footings, foundations, retaining walls or other features, shall be performed without the involvement of the geotechnical consultant.

5.15. Fill placed in areas not previously viewed and evaluated by the geotechnical consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removal of the unobserved and undocumented fill will be decided based upon review of the field conditions by the geotechnical consultant.

5.16. Off-site fill shall be treated in the same manner as recommended in these specifications for on-site fills. Off-site fill subdrains temporarily terminated (up gradient) shall be surveyed for future locating and connection.

## 6. OVERSIZED MATERIAL

Oversized material shall be placed in accordance with the following recommendations.

6.1. During the course of grading operations, rocks or similar irreducible materials greater than 6 inches in dimension (oversized material) may be generated. These materials shall not be placed within the compacted fill unless placed in general accordance with the recommendations of the geotechnical consultant.

6.2. Where oversized rock (greater than 6 inches in dimension) or similar irreducible material is generated during grading, it is recommended, where practical, to waste such material off site, or on site in areas designated as "nonstructural rock disposal areas." Rock designated for disposal areas shall be placed with sufficient sandy soil to generally fill voids. The disposal area shall be capped with a 5-foot thickness of fill which is generally free of oversized material.

6.3. Rocks 6 inches in dimension and smaller may be utilized within the compacted fill, provided they are placed in such a manner that nesting of rock is not permitted. Fill shall be placed and compacted over and around the rock. The amount of rock greater than 3/4-inch in dimension shall generally not exceed 40 percent of the total dry weight of the fill mass, unless the fill is specially designed and constructed as a "rock fill."

6.4. Rocks or similar irreducible materials greater than 6 inches but less than 4 feet in dimension generated during grading may be placed in windrows and capped with finer materials in accordance with the recommendations of the geotechnical consultant, the approval of the governing agencies, and the Oversized Rock Placement Detail, Figure D, of these guidelines. Selected native or imported granular soil (Sand Equivalent of 30 or higher) shall be placed and flooded over and around the windrowed rock such that voids are filled. Windrows of oversized materials shall be staggered so that successive windrows of oversized materials are not in the same vertical plane. Rocks greater than 4 feet in dimension shall be broken down to 4 feet or smaller before placement, or they shall be disposed of off site.

## 7. SLOPES

The following sections provide recommendations for cut and fill slopes.

### 7.1. Cut Slopes

7.1.1. The geotechnical consultant shall observe cut slopes during excavation. The geotechnical consultant shall be notified by the contractor prior to beginning slope excavations.

7.1.2. If, during the course of grading, adverse or potentially adverse geotechnical conditions are encountered in the slope which were not anticipated in the preliminary evaluation report, the geotechnical consultant shall evaluate the conditions and provide appropriate recommendations.

### 7.2. Fill Slopes

7.2.1. When placing fill on slopes steeper than 5:1 (horizontal:vertical), topsoil, slope wash, colluvium, and other materials deemed unsuitable shall be removed. Near-horizontal keys and near-vertical benches shall be excavated into sound bedrock or firm fill material, in accordance with the recommendation of the geotechnical consultant. Keying and benching shall be accomplished. Compacted fill shall not be placed in an area subsequent to keying and benching until the area has been observed by the geotechnical consultant. Where the natural gradient of a slope is less than 5:1, benching is generally not recommended. However, fill shall not be placed on compressible or otherwise unsuitable materials left on the slope face.

7.2.2. Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a temporary slope, benching shall be conducted in the manner described in Section 7.2.1. A 3-foot or higher near-vertical bench shall be excavated into the documented fill prior to placement of additional fill.

7.2.3. Unless otherwise recommended by the geotechnical consultant and accepted by the Building Official, permanent fill slopes shall not be steeper than 2:1 (horizontal:vertical). The height of a fill slope shall be evaluated by the geotechnical consultant.

7.2.4. Unless specifically recommended otherwise, compacted fill slopes shall be overbuilt and cut back to grade, exposing firm compacted fill. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes shall be overexcavated and reconstructed in accordance with the recommendations of the geotechnical consultant. The degree of overbuilding may be increased until the desired compacted slope face condition is achieved. Care shall be taken by the contractor to provide mechanical compaction as close to the outer edge of the overbuilt slope surface as practical.

7.2.5. If access restrictions, property line location, or other constraints limit overbuilding and cutting back of the slope face, an alternative method for compaction of the slope face may be attempted by conventional construction procedures including backrolling at intervals of 4 feet or less in vertical slope height, or as dictated by the capability of the available equipment, whichever is less. Fill slopes shall be backrolled utilizing a conventional sheeps foot-type roller. Care shall be taken to maintain the specified moisture conditions and/or reestablish the same, as needed, prior to backrolling.

7.2.6. The placement, moisture conditioning and compaction of fill slope materials shall be done in accordance with the recommendations presented in Section 5 of these guidelines.

7.2.7. The contractor shall be ultimately responsible for placing and compacting the soil out to the slope face to obtain a relative compaction of 90 percent as evaluated by ASTM D 1557 and a moisture content in accordance with Section 5. The geotechnical consultant shall perform field moisture and density tests at intervals of one test for approximately every 10,000 square feet of slope.

7.2.8. Backdrains shall be provided in fill as recommended by the geotechnical consultant.

7.3. Top-of-Slope Drainage

7.3.1. For pad areas above slopes, positive drainage shall be established away from the top of slope. This may be accomplished utilizing a berm and pad gradient of 2 percent or steeper at the top-of-slope areas. Site runoff shall not be permitted to flow over the tops of slopes.

7.3.2. Gunite-lined brow ditches shall be placed at the top of cut slopes to redirect surface runoff away from the slope face where drainage devices are not otherwise provided.

7.4. Slope Maintenance

7.4.1. In order to enhance surficial slope stability, slope planting shall be accomplished at the completion of grading. Slope plants shall consist of deep-rooting, variable root depth, drought-tolerant vegetation. Native vegetation is generally desirable. Plants native to semiarid and arid areas may also be appropriate. Large-leafed ice plant should not be used on slopes. A landscape architect shall be consulted regarding the actual types of plants and planting configuration to be used.

7.4.2. Irrigation pipes shall be anchored to slope faces and not placed in trenches excavated into slope faces. Slope irrigation shall be maintained at a level just sufficient to support plant growth. Property owners shall be made aware that over watering of slopes is detrimental to slope stability. Slopes shall be monitored regularly and broken sprinkler heads and/or pipes shall be repaired immediately.

7.4.3. Periodic observation of landscaped slope areas shall be planned and appropriate measures taken to enhance growth of landscape plants.

7.4.4. Graded swales at the top of slopes and terrace drains shall be installed and the property owners notified that the drains shall be periodically checked so that they may be kept clear. Damage to drainage improvements shall be repaired immediately. To reduce siltation, terrace drains shall be constructed at a gradient of 3 percent or steeper, in accordance with the recommendations of the project civil engineer.

7.4.5. If slope failures occur, the geotechnical consultant shall be contacted immediately for field review of site conditions and development of recommendations for evaluation and repair.

## 8. TRENCH BACKFILL

The following sections provide recommendations for backfilling of trenches.

8.1. Trench backfill shall consist of granular soils (bedding) extending from the trench bottom to 1 foot or more above the pipe. On-site or imported fill which has been evaluated by the geotechnical consultant may be used above the granular backfill. The cover soils directly in contact with the pipe shall be classified as having a very low expansion potential, in accordance with UBC Standard 18-2, and shall contain no rocks or chunks of hard soil larger than 3/4-inch in diameter.

8.2. Trench backfill shall, unless otherwise recommended, be compacted by mechanical means to 90 percent relative compaction as evaluated by ASTM D 1557. Backfill soils shall be placed in loose lifts 8-inches thick or thinner, moisture conditioned, and compacted in accordance with the recommendations of Section 5. of these guidelines. The backfill shall be tested by the geotechnical consultant at vertical intervals of approximately 2 feet of backfill placed and at spacings along the trench of approximately 100 feet in the same lift.

8.3. Jetting of trench backfill materials is generally not a recommended method of densification, unless the on-site soils are sufficiently free-draining and provisions have been made for adequate dissipation of the water utilized in the jetting process.

8.4. If it is decided that jetting may be utilized, granular material with a sand equivalent greater than 30 shall be used for backfilling in the areas to be jetted. Jetting shall generally be considered for trenches 2 feet or narrower in width and 4 feet or shallower in depth. Following jetting operations, trench backfill shall be mechanically compacted to the specified compaction to finish grade.

8.5. Trench backfill which underlies the zone of influence of foundations shall be mechanically compacted to 90 percent or greater relative compaction, as evaluated by ASTM D 1557-02. The zone of influence of the foundations is generally defined as the roughly triangular area within the limits of a 1:1 (horizontal:vertical) projection from the inner and outer edges of the foundation, projected down and out from both edges.

8.6. Trench backfill within slab areas shall be compacted by mechanical means to a relative compaction of 90 percent, as evaluated by ASTM D 1557. For minor interior trenches, density testing may be omitted or spot testing may be performed, as deemed appropriate by the geotechnical consultant.

8.7. When compacting soil in close proximity to utilities, care shall be taken by the grading contractor so that mechanical methods used to compact the soils do not damage the utilities. If the utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, then the grading contractor may elect to use light mechanical compaction equipment or, with the approval of the geotechnical consultant, cover the conduit with clean granular material. These granular materials shall be jetted in place to the top of the conduit in accordance with the recommendations of Section 8.4 prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review by the geotechnical consultant and the utility contractor, at the time of construction.

8.8. Clean granular backfill and/or bedding materials are not recommended for use in slope areas unless provisions are made for a drainage system to mitigate the potential for buildup of seepage forces or piping of backfill materials.

8.9. The contractor shall exercise the specified safety precautions, in accordance with OSHA Trench Safety Regulations, while conducting trenching operations. Such precautions include shoring or laying back trench excavations at 1:1 or flatter, depending on material type, for trenches in excess of 5 feet in depth. The geotechnical consultant is not responsible for the safety of trench operations or stability of the trenches.

## 9. DRAINAGE

The following sections provide recommendations pertaining to site drainage.

9.1. Roof, pad, and slope drainage shall be such that it is away from slopes and structures to suitable discharge areas by nonerodible devices (e.g., gutters, downspouts, concrete swales, etc.).

9.2. Positive drainage adjacent to structures shall be established and maintained. Positive drainage may be accomplished by providing drainage away from the foundations of the structure at a gradient of 2 percent or steeper for a distance of 5 feet or more outside the building perimeter, further maintained by a graded swale leading to an appropriate outlet, in accordance with the recommendations of the project civil engineer and/or landscape architect.

9.3. Surface drainage on the site shall be provided so that water is not permitted to pond. A gradient of 2 percent or steeper shall be maintained over the pad area and drainage patterns shall be established to remove water from the site to an appropriate outlet.

9.4. Care shall be taken by the contractor during grading to preserve any berms, drainage terraces, interceptor swales or other drainage devices of a permanent nature on or adjacent to the property. Drainage patterns established at the time of finish grading shall be maintained for the life of the project. Property owners shall be made very clearly aware that altering drainage patterns may be detrimental to slope stability and foundation performance.

## 10. SITE PROTECTION

The site shall be protected as outlined in the following sections.

10.1. Protection of the site during the period of grading shall be the responsibility of the contractor unless other provisions are made in writing and agreed upon among the concerned parties. Completion of a portion of the project shall not be considered to preclude that portion or adjacent areas from the need for site protection, until such time as the project is finished as agreed upon by the geotechnical consultant, the client, and the regulatory agency.

10.2. The contractor is responsible for the stability of temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations are made in consideration of stability of the finished project and, therefore, shall not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant shall also not be considered to preclude more restrictive requirements by the applicable regulatory agencies.

10.3. Precautions shall be taken during the performance of site clearing, excavation, and grading to protect the site from flooding, ponding, or inundation by surface runoff. Temporary provisions shall be made during the rainy season so that surface runoff is away from and off the working site. Where low areas cannot be avoided, pumps shall be provided to remove water as needed during periods of rainfall.

10.4. During periods of rainfall, plastic sheeting shall be used as needed to reduce the potential for unprotected slopes to become saturated. Where needed, the contractor shall install check dams, desilting basins, riprap, sandbags or other appropriate devices or methods to reduce erosion and provide recommended conditions during inclement weather.

10.5. During periods of rainfall, the geotechnical consultant shall be kept informed by the contractor of the nature of remedial or precautionary work being performed on site (e.g., pumping, placement of sandbags or plastic sheeting, other labor, dozing, etc.).

10.6. Following periods of rainfall, the contractor shall contact the geotechnical consultant and arrange a walk-over of the site in order to visually assess rain-related damage. The geotechnical consultant may also recommend excavation and testing in order to aid in the evaluation. At the request of the geotechnical consultant, the contractor shall make excavations in order to aid in evaluation of the extent of rain-related damage.

10.7. Rain- or irrigation-related damage shall be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress, and other adverse conditions noted by the geotechnical consultant. Soil adversely affected shall be classified as "Unsuitable Material" and shall be subject to overexcavation and replacement with compacted fill or to other remedial grading as recommended by the geotechnical consultant.

10.8. Relatively level areas where saturated soils and/or erosion gullies exist to depths greater than 1 foot shall be overexcavated to competent materials as evaluated by the geotechnical consultant. Where adverse conditions extend to less than 1 foot in depth, saturated and/or eroded materials may be processed in-place. Overexcavated or in-place processed materials shall be moisture conditioned and compacted in accordance with the recommendations provided in Section 5. If the desired results are not achieved, the affected materials shall be overexcavated, moisture conditioned, and compacted until the specifications are met.

10.9. Slope areas where saturated soil and/or erosion gullies exist to depths greater than 1 foot shall be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where adversely affected materials exist to depths of 1 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place and compaction in accordance with the appropriate specifications may be attempted. If the desired results are not achieved, the affected materials shall be overexcavated, moisture conditioned, and compacted until the specifications are met. As conditions dictate, other slope repair procedures may also be recommended by the geotechnical consultant.

10.10. During construction, the contractor shall grade the site to provide positive drainage away from structures and to keep water from ponding adjacent to structures. Water shall not be allowed to damage adjacent properties. Positive drainage shall be maintained by the contractor until permanent drainage and erosion reducing devices are installed in accordance with project plans.

## 11. DEFINITIONS OF TERMS

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| ALLUVIUM: | Unconsolidated detrital deposits deposited by flowing water; includes sediments deposited in river beds, canyons, flood plains, lakes, fans at the foot of slopes, and in estuaries. |
| AS-GRADED (AS-BUILT): | The site conditions upon completion of grading. |
| BACKCUT: | A temporary construction slope at the rear of earth-retaining structures such as buttresses, shear keys, stabilization fills, or retaining walls. |
| BACKDRAIN: | Generally a pipe-and-gravel or similar drainage system placed behind earth-retaining structures such as buttresses, stabilization fills, and retaining walls. |
| BEDROCK: | Relatively undisturbed in-place rock, either at the surface or beneath surficial deposits of soil. |
| BENCH: | A relatively level step and near-vertical riser excavated into sloping ground on which fill is to be placed. |
| BORROW (IMPORT): | Any fill material hauled to the project site from off-site areas. |
| BUTTRESS FILL: | A fill mass, the configuration of which is designed by engineering calculations, to retain slopes containing adverse geologic features. A buttress is generally specified by a key width and depth and by a backcut angle. A buttress normally contains a back drainage system. |
| CIVIL ENGINEER: | The Registered Civil Engineer or consulting firm responsible for preparation of the grading plans and surveying, and evaluating as-graded topographic conditions. |
| CLIENT: | The developer or a project-responsible authorized representative. The client has the responsibility of reviewing the findings and recommendations made by the geotechnical consultant and authorizing the contractor and/or other consultants to perform work and/or provide services. |
| COLLUVIUM: | Generally loose deposits, usually found on the face or near the base of slopes and brought there chiefly by gravity through slow continuous downhill creep (see also Slope Wash). |
| COMPACTION: | The densification of a fill by mechanical means. |

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| CONTRACTOR: | A person or company under contract or otherwise retained by the client to perform demolition, grading, and other site improvements. |
| DEBRIS: | The products of clearing, grubbing, and/or demolition, or contaminated soil material unsuitable for reuse as compacted fill, and/or any other material so designated by the geotechnical consultant. |
| ENGINEERED FILL: | A fill which the geotechnical consultant or the consultant's representative has observed and/or tested during placement, enabling the consultant to conclude that the fill has been placed in substantial compliance with the recommendations of the geotechnical consultant and the governing agency requirements. |
| ENGINEERING GEOLOGIST: | A geologist registered by the state licensing agency who applies geologic knowledge and principles to the exploration and evaluation of naturally occurring rock and soil, as related to the design of civil works. |
| EROSION: | The wearing away of the ground surface as a result of the movement of wind, water, and/or ice. |
| EXCAVATION: | The mechanical removal of earth materials. |
| EXISTING GRADE: | The ground surface configuration prior to grading; original grade. |
| FILL: | Any deposit of soil, rock, soil-rock blends, or other similar materials placed by man. |
| FINISH GRADE: | The as-graded ground surface elevation that conforms to the grading plan. |
| GEOFABRIC: | An engineering textile utilized in geotechnical applications such as subgrade stabilization and filtering. |
| GEOTECHNICAL CONSULTANT: | The geotechnical engineering and engineering geology consulting firm retained to provide technical services for the project. For the purpose of these specifications, observations by the geotechnical consultant include observations by the geotechnical engineer, engineering geologist and other persons employed by and responsible to the geotechnical consultant. |

GEOTECHNICAL ENGINEER: A licensed civil engineer and geotechnical engineer, registered by the state licensing agency, who applies scientific methods, engineering principles, and professional experience to the acquisition, interpretation, and use of knowledge of materials of the earth's crust to the resolution of engineering problems. Geotechnical engineering encompasses many of the engineering aspects of soil mechanics, rock mechanics, geology, geophysics, hydrology, and related sciences.

GRADING: Any operation consisting of excavation, filling, or combinations thereof and associated operations.

LANDSLIDE DEPOSITS: Material, often porous and of low density, produced from instability of natural or manmade slopes.

OPTIMUM MOISTURE: The moisture content that is considered optimum relative to correction operations obtained from ASTM test method D 1557.

RELATIVE COMPACTION: The degree of compaction (expressed as a percentage) of a material as compared to the dry density obtained from ASTM test method D 1557.

ROUGH GRADE: The ground surface configuration at which time the surface elevations approximately conform to the project plan.

SHEAR KEY: Similar to a subsurface buttress; however, it is generally constructed by excavating a slot within a natural slope in order to stabilize the upper portion of the slope without encroaching into the lower portion of the slope.

SITE: The particular parcel of land where grading is being performed.

SLOPE: An inclined ground surface, the steepness of which is generally specified as a ratio of horizontal units to vertical units.

SLOPE WASH: Soil and/or rock material that has been transported down a slope by gravity assisted by the action of water not confined to channels (see also Colluvium).

SLOUGH: Loose, uncompacted fill material generated during grading operations.

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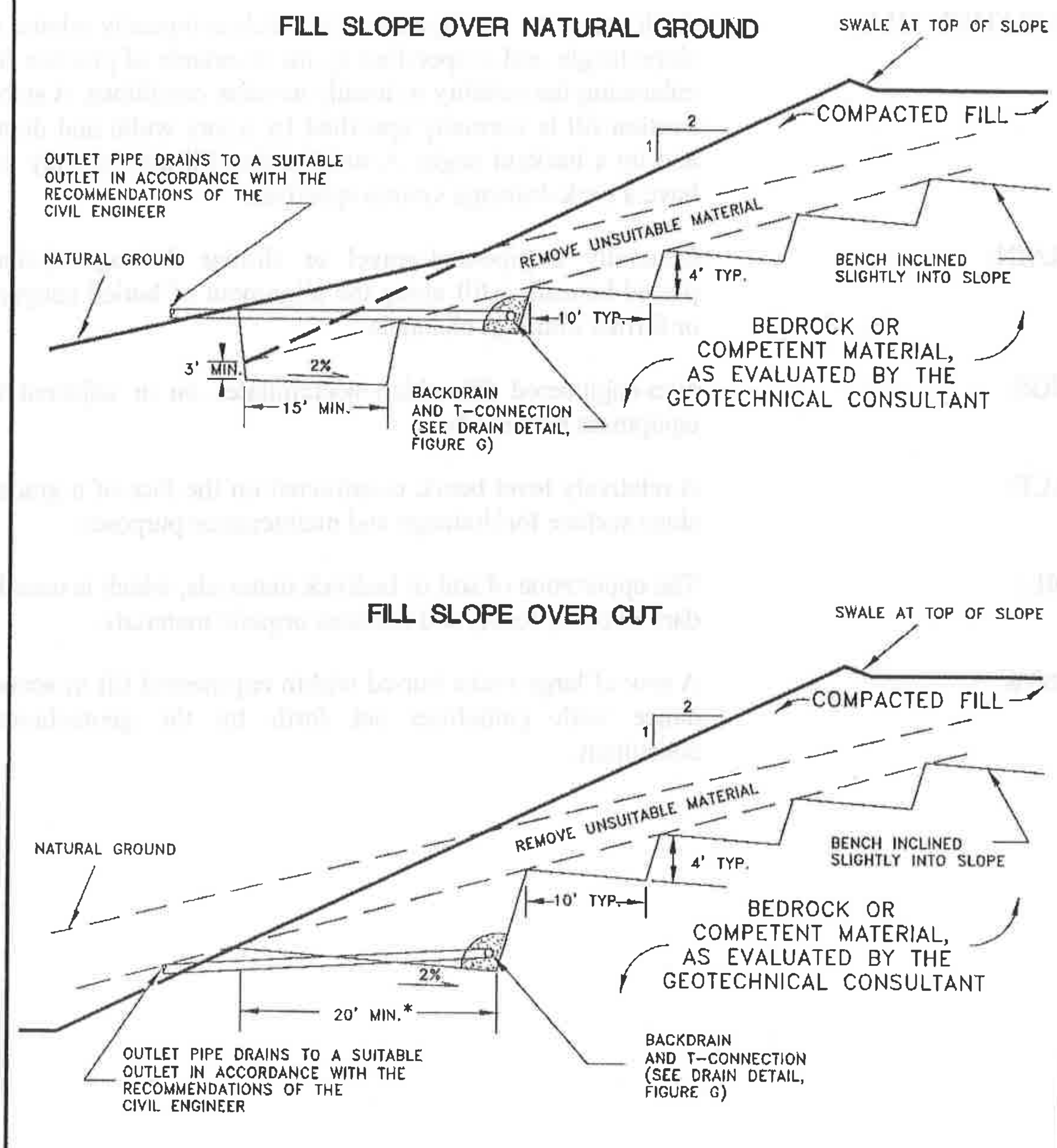
| SOIL: | Naturally occurring deposits of sand, silt, clay, etc., or combinations thereof. |
| STABILIZATION FILL: | A fill mass, the configuration of which is typically related to slope height and is specified by the standards of practice for enhancing the stability of locally adverse conditions. A stabilization fill is normally specified by a key width and depth and by a backcut angle. A stabilization fill may or may not have a back drainage system specified. |
| SUBDRAIN: | Generally a pipe-and-gravel or similar drainage system placed beneath a fill along the alignment of buried canyons or former drainage channels. |
| TAILINGS: | Non-engineered fill which accumulates on or adjacent to equipment haul roads. |
| TERRACE: | A relatively level bench constructed on the face of a graded slope surface for drainage and maintenance purposes. |
| TOPSOIL: | The upper zone of soil or bedrock materials, which is usually dark in color, loose, and contains organic materials. |
| WINDROW: | A row of large rocks buried within engineered fill in accordance with guidelines set forth by the geotechnical consultant. |




*MINIMUM KEY WIDTH DIMENSION. ACTUAL WIDTH SHOULD BE PROVIDED BY GEOTECHNICAL CONSULTANT BASED ON EVALUATION OF SITE-SPECIFIC GEOTECHNICAL CONDITIONS.

NOTES: CUT SLOPE SHALL BE CONSTRUCTED PRIOR TO PLACEMENT OF FILL.
SLOPE DRAINAGE SHOULD BE PROVIDED IN ACCORDANCE WITH RECOMMENDATIONS PRESENTED ON FIGURE E

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NOT TO SCALE

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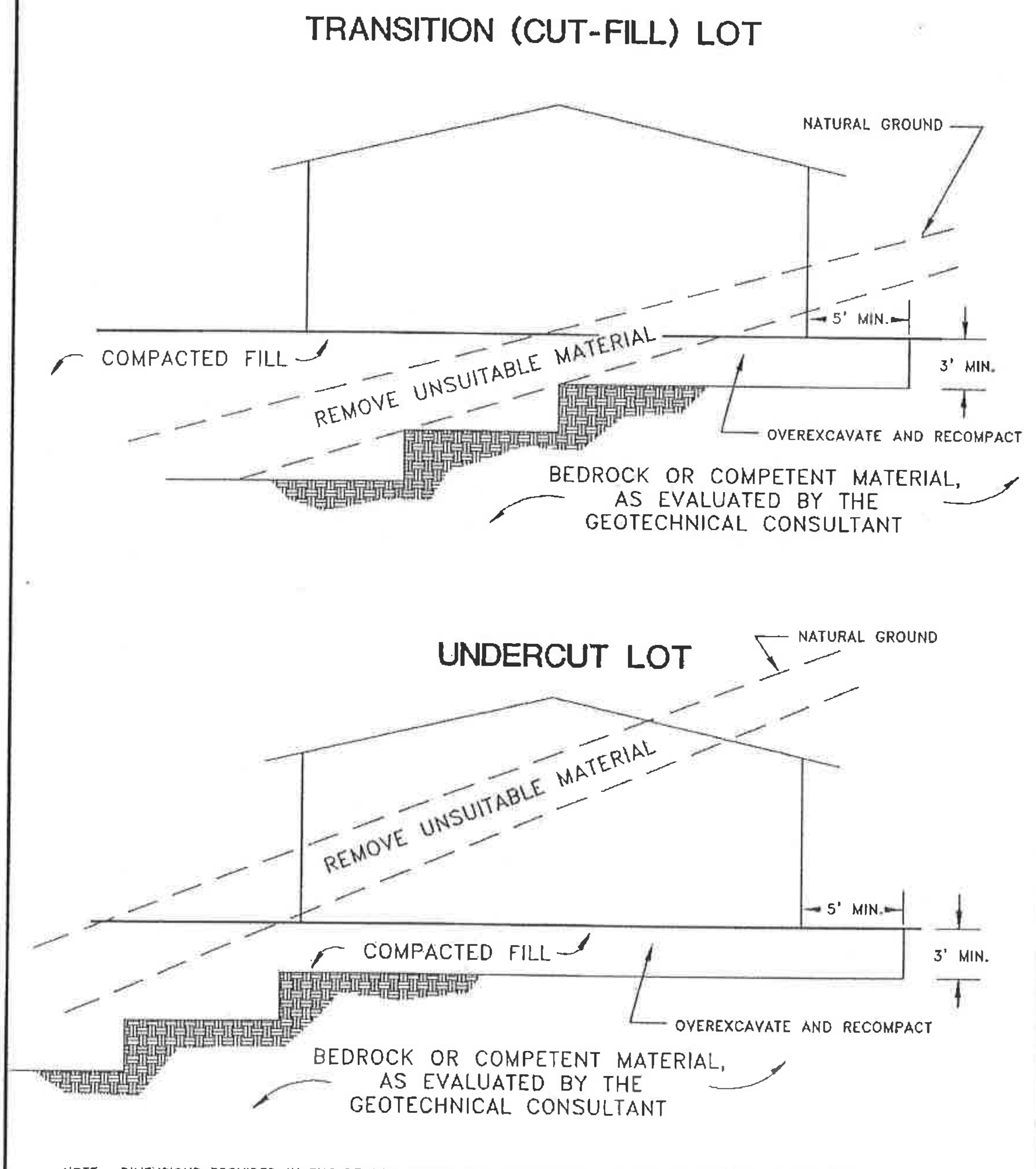
FILL SLOPE OVER NATURAL GROUND OR CUT

FIGURE A




NOTE: DIMENSIONS PROVIDED IN THE DETAILS ABOVE ARE APPROXIMATE AND MAY BE MODIFIED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT AS CONDITIONS DICTATE.

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NOT TO SCALE

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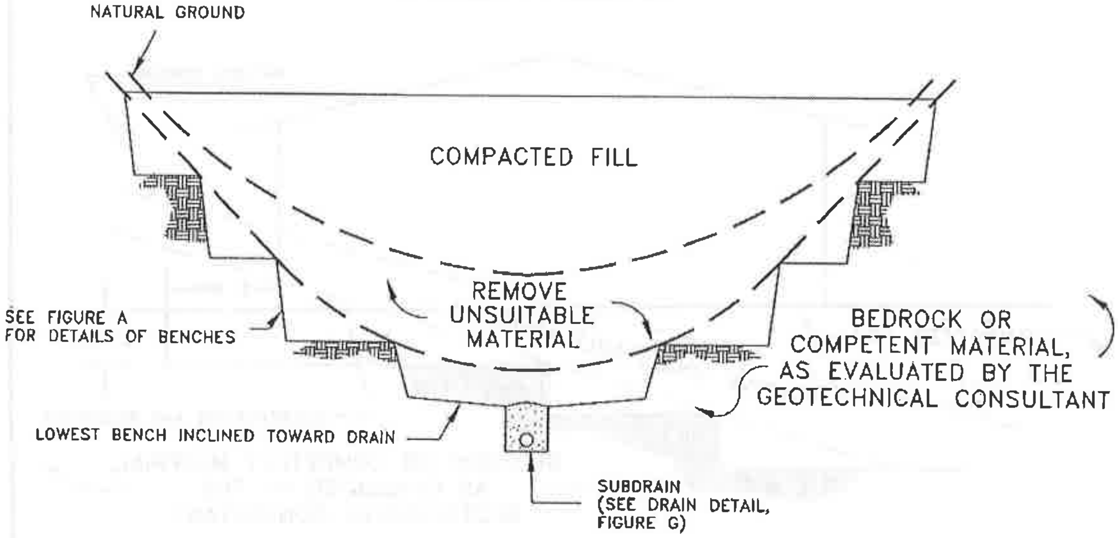
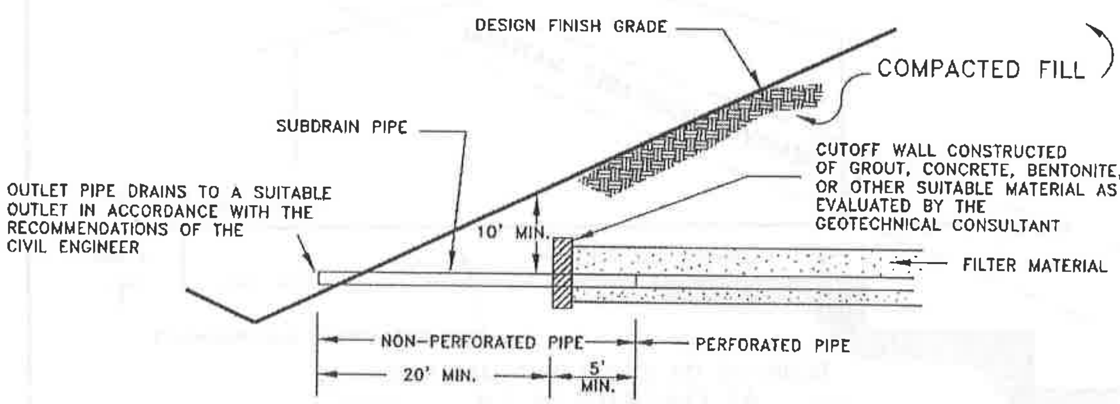
TRANSITION AND UNDERCUT LOT DETAILS FIGURE B

## CANYON SUBDRAIN




## DETAIL OF CANYON SUBDRAIN TERMINATION

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NOT TO SCALE

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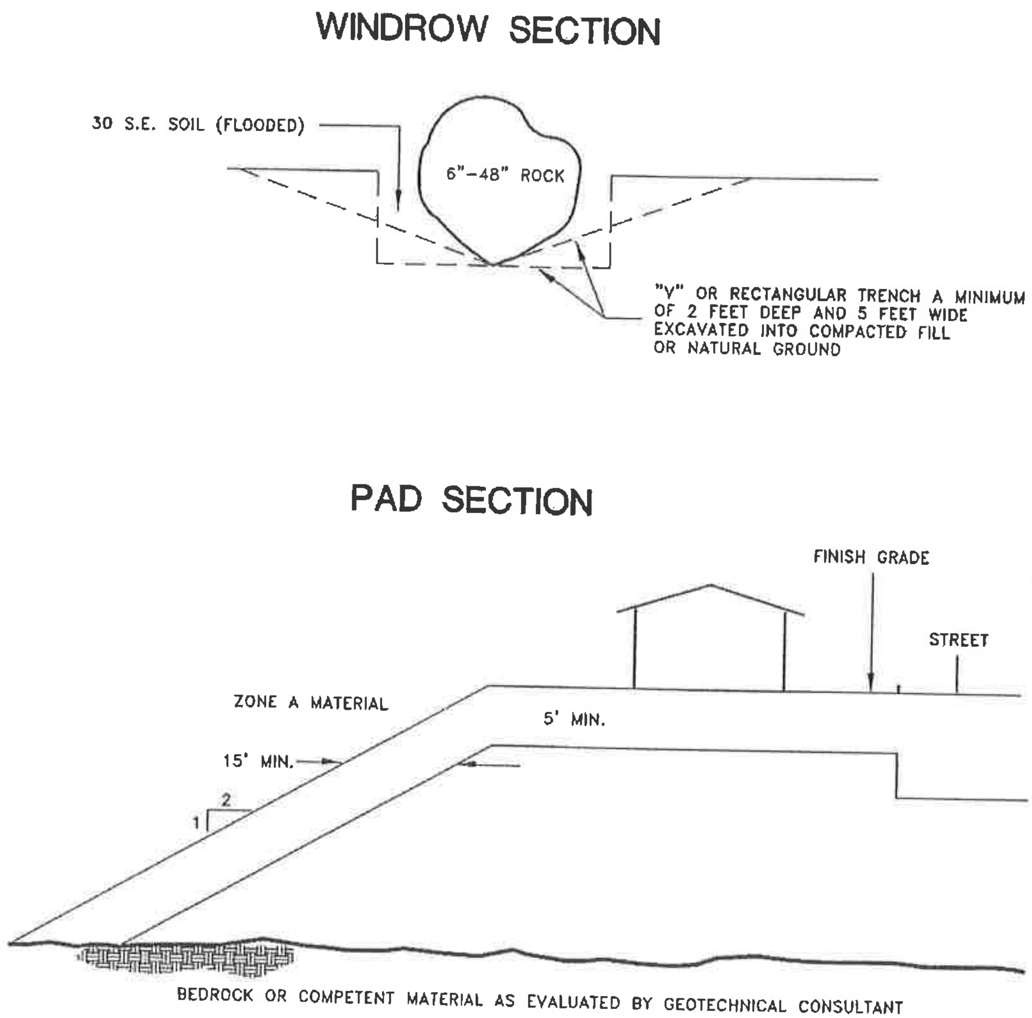
CANYON SUBDRAIN DETAIL

FIGURE C




ZONE A: COMPACTED FILL WITH ROCK FRAGMENTS NO GREATER THAN 6 INCHES IN DIAMETER.

ZONE B: COMPACTED FILL WITH ROCK FRAGMENTS BETWEEN 6 AND 48 INCHES IN DIAMETER MAY BE PLACED IN STAGGERED WINDROWS UP TO 100' LONG IN THIS ZONE AND SURROUNDED BY GRANULAR SOIL (30 SAND EQUIVALENT) DENSIFIED BY FLOODING. ROCK FRAGMENTS LESS THAN 6 INCHES IN DIAMETER MAY BE PLACED IN COMPACTED FILL SOIL.

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OVERSIZED ROCK PLACEMENT DETAIL

FIGURE D