ALTA CALIFORNIA
GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

FOULGER-PRATT
136 Calle de Los Molinos
San Clemente, CA 92672

February 24, 2020
Proposal No. 1-0312

Attention: Mr. Jim Ivory

Subject: **GEOTECHNICAL INVESTIGATION**
5261 Arlington Avenue
City of Riverside, California

References: See Appendix A

Dear Mr. Ivory:

Alta California Geotechnical, Inc. (Alta) is pleased to present this geotechnical investigation for the proposed residential and retail development located at 5261 Arlington Avenue, in the City of Riverside, California. This report is based on a recent subsurface investigation conducted by Alta, laboratory testing, and review of the referenced reports and the Site Plan (enclosed Plate 1).

Alta's review of the data and site plan indicates that the proposed development is feasible, from a geotechnical perspective, provided that the recommendations presented in this report are incorporated into the grading and improvement plans and implemented during site development.

Also included in this report are:

- Discussion of the site geotechnical conditions;
- Recommendations for remedial and site grading, including unsuitable soil removals;
- Geotechnical site construction recommendations;
- Foundation design parameters.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

FERNANDO RUIZ
Civil Engineering Associate

JAMES B. COYNE
Engineering Geology Associate

Reviewed By:

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-20
Registered Geotechnical Engineer
Vice President

REGISTERED PROFESSIONAL ENGINEER
SCOTT A. GRAY
No. 2857
Exp. 12-31-20
GEOTECHNICAL
STATE OF CALIFORNIA

THOMAS J. MCCARTHY/CEG 2080
Reg. Exp.: 9-30-20
Certified Engineering Geologist
Vice President

CERTIFIED ENGINEERING GEOLOGIST
THOMAS J. McCARTHY
No. CEG 2080
Exp. 9-30-20
STATE OF CALIFORNIA

Distribution: (1) Addressee

SAG:-1-0312, February 24th, 2020 (Geo Investigation, 5261 Arlington Avenue, Riverside)

1.0 INTRODUCTION

The following report presents Alta's findings, conclusions, and geotechnical recommendations for the proposed residential and retail development located at 5261 Arlington Avenue, in the City of Riverside, California.

1.1 Purpose

The purpose of this report is to examine the existing onsite geotechnical conditions and assess the impacts that the geotechnical conditions may have on the proposed development. The property is depicted on the enclosed Site Plan (Plate 1). This report is suitable for use in developing grading plans and engineer's cost estimates.

1.2 Scope of Work

Alta's *Scope of Work* for this geotechnical investigation included the following:

- Reviewing the referenced reports and air photos (Appendix A);
- Site geologic mapping;
- Excavating, logging, and sampling twelve (12) hollow-stem auger borings to a maximum depth of 51.5-feet below the existing surface (Appendix B);
- Conducting laboratory testing on samples obtained during our investigation (Appendix C);
- Performing an infiltration study to provide an assessment of the infiltration characteristics of the onsite soil and their impact on storm water disposal;
- Evaluating engineering geologic and geotechnical engineering data, including laboratory data, to develop recommendations for site remedial grading including specialized grading techniques for unsuitable soil removals along the property boundary, import soil, foundations and utilities;
- Preparing this report and accompanying exhibits.

1.3 Report Limitations

The conclusions and recommendations presented in this report are based on the field and laboratory information generated during this investigation, and a review of the referenced reports. The information contained in this report is intended to be used for development of grading plans and preliminary construction cost estimates.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The irregular-shaped site is located on the northeast corner of Arlington Avenue and Streeter Avenue in Riverside at an elevation of approximately 775 feet above sea level. There is a former Sears structure and associated parking lot onsite. The site is bounded to the south by Arlington Avenue, to the west by Streeter Avenue, and to the east and north by residential developments.

Review of vintage air photos (Historic Aerials, 2020) indicates that the current development was constructed after 1948 but before 1966. In 1948, a few small structures were present near the western boundary with the site mainly used for agriculture. By 1966, the current development was completed, and the site has remained largely unchanged.

2.2 Proposed Development

Based on our review of the Site Plan, the existing structures and parking lot will be demolished, and 18 multi-story residential structures, 2 retail structures, one pool/pool house and associated improvements will be developed. Alta anticipates that remedial grading will be required to develop the site to support the proposed structures with shallow foundations and reinforced concrete slabs-on-grade. Significant height slopes are not anticipated for the project.

3.0 SITE INVESTIGATION

3.1 Investigation and Laboratory Testing

Alta conducted a subsurface investigation on January 28 and 29, 2020, consisting of the excavation, logging and select sampling of twelve (12) hollow-stem auger borings. The locations of the borings are shown on enclosed Plate 1 and the boring logs are presented in Appendix B.

Laboratory testing was performed on bulk and ring samples obtained during the field investigation. A brief description of the laboratory test procedures and the test results are presented in Appendix C.

3.2 Infiltration Testing

It is Alta's understanding that the project may utilize infiltration systems for storm water disposal. Details of the system are not known at this time.

Infiltration testing was undertaken using three (3) borings, P-1 and P-2 which were five (5) feet in depth and P-3 which was ten (10) feet in depth. The testing was performed on January 30, 2020 in general accordance with the County of Riverside WQMP standards. The three test wells were presoaked, and water level readings were recorded every 30 minutes. During the test, the borings were filled with water and measured every 30 minutes until the readings stabilized.

The data was then adjusted to provide an infiltration rate utilizing the Porchet Method. The resulting infiltration rates for P-1, P-2 and P-3 are presented in Table 3-1. The results do not include a factor of safety. Recommendations for infiltration BMP design are presented in Section 6.2.

Table 3-1-Summary of Infiltration Testing (No Factor of Safety)			
Test Designation	P-1	P-2	P-3
Approximate Depth of Test	5 ft	5 ft	10 ft
Time Interval	30 minutes	30 minutes	30 minutes
Radius of Test Hole	4 inches	4 inches	4 inches
Tested Infiltration Rate	0.0 (in/hr)	0.1 (in/hr)	0.1 (in/hr)

4.0 GEOLOGIC CONDITIONS

4.1 Geologic and Geomorphic Setting

Regionally, the site is located in the Peninsular Ranges geomorphic province, which characterizes the southwest portion of southern California. The Peninsular Ranges province is composed of plutonic and metamorphic rock, lesser amounts of Tertiary volcanic and sedimentary rock, and Quaternary drainage in-fills and sedimentary veneers.

4.2 Stratigraphy

Based on our literature review and subsurface investigation, the site is underlain by undocumented artificial fill, and young and old alluvial fan deposits. These geologic units are briefly described below.

4.2.1 Artificial Fill - Undocumented (map symbol afu)

The undocumented artificial fill observed at the site consists mainly of brown silt, clayey silt, and sandy silt in a dry to slightly moist, moderately firm to very stiff condition. The unit was logged to a depth of 2 to 6.5 feet below the ground surface and is underlain by young and old alluvial fan deposits.

4.2.2 Young Alluvial Fan Deposits (map symbol Qyf)

The young alluvial deposits observed at the site consist mainly of light brown, brown, and tannish brown silty clay, clayey silt, sandy silt, and

sand, in a dry to slightly moist, firm to very stiff/dense condition. The unit was logged to a depth of 20 feet below the ground surface and is underlain by old alluvial fan deposits.

4.2.3 Old Alluvial Fan Deposits (map symbol Qof)

The old alluvial deposits observed at the site consist mainly of gray, tan, light brown, and brown clayey sand, silty sandy, sand, and gravelly sand, in a dry to wet, medium dense to very dense condition. The unit was logged to a depth of 51.5 feet below the ground surface.

4.3 Geologic Structure

4.3.1 Tectonic Framework

Jennings and Bryant (2010, 1985) defined eight structural provinces within California that have been classified by predominant regional fault trends and similar fold structure. These provinces are in turn divided into blocks and sub-blocks that are defined by "major Quaternary faults." These blocks and sub-blocks exhibit similar structural features. Within this framework, the subject site is located within Structural Province I, which is controlled by the dominant northwest trend of the San Andreas Fault and is divided into two blocks, the Coast Range Block and the Peninsular Range Block. The Peninsular Range Block, on which this site is located, is characterized by a series of parallel, northwest trending faults that exhibit right lateral dip-slip movement. These faults are terminated by the Transverse Range block to the north and extend southward into the Baja Peninsula. These northwest trending faults divide the Peninsular Range block into eight sub-blocks. The site is located on the Riverside sub-block, one of the eight sub-blocks, and it is bounded on the west by the Elsinore fault zone and on the east by the San Jacinto fault zone.

4.3.2 Regionally Mapped Active Faults

Several large, active fault systems, including the Whittier-Elsinore, the San Jacinto, and the San Andreas occur in the region surrounding the site. These fault systems have been studied extensively and in a large part control the geologic structure of southern California.

4.3.3 Geologic Structure

Based upon our site investigation and literature review, the sediments are of Quaternary, and are not folded, or faulted.

4.4 Groundwater

Groundwater was encountered during our investigation in Borings B-2, B-4, B-7, and B-8 at a depth between 41 to 43 feet below the ground surface, corresponding to an elevation between 732 to 735 feet above sea level. Several nearby groundwater wells exist within a 2-mile radius of the site. Recent groundwater data recorded from state well numbers 02S05W32B001S, 03S05W03F001S, 03S05W08E002S, 03S05W06Q003S, and 03S05W09E001S in October of 2019 indicates that groundwater ranges from 730 to 756 feet above sea level in the area (CDWR, 2020), roughly corresponding to the elevations observed onsite.

4.5 Earthquake Hazards

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting a site are dependent on the distance to the causative fault and the intensity and magnitude of the seismic event. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction and/or ground lurching.

4.5.1 Local and Regional Faulting

The site is located on the northern portion of the Riverside sub-block, approximately 10.9 miles west of the San Jacinto Fault zone, 11.9 miles east of the Whittier-Elsinore Fault zone, and 17.5 miles west of the San Andreas Fault Zone.

4.5.2 Surface Rupture

Active faults are not known to exist within the project and a review of Special Publication 42 indicates the site is not within a California State designated earthquake fault zone. Accordingly, the potential for fault surface rupture on the subject site is very low.

4.5.3 Seismicity

Ground shaking hazards caused by earthquakes along other active regional faults do exist. The 2019 California Building Code requires use-modified spectral accelerations and velocities for most structural designs. Seismic design parameters using soil profile types identified in the 2019 California Building Code are presented in Section 7.3.

4.5.4 Liquefaction

Seismic agitation of relatively loose saturated sands, silty sands, and some silts can result in a buildup of pore pressure. If the pore pressure exceeds the overburden stresses, a temporary quick condition known as liquefaction can occur. Liquefaction effects can manifest in several ways including: 1) loss of bearing; 2) lateral spread; 3) dynamic settlement; and 4) flow failure. Lateral spreading has typically been the most damaging mode of failure.

In general, the more recent that a sediment has been deposited, the more likely it will be susceptible to liquefaction. Other factors that must

be considered are: groundwater, confining stresses, relative density, and the intensity and duration of seismically-induced ground shaking.

Groundwater was encountered during our subsurface investigation at a depth approximately 41 to 43 feet below the ground surface. The regional groundwater data indicates that high groundwater levels average 40 below the ground surface (CDWR, 2020). The site is located in a low (old alluvial fan deposits) to high (young alluvial fan deposits) potential liquefaction zones and potential subsidence zones designated by Riverside County per the Riverside County Mapping Portal (RCMP, 2020).

Alta performed a liquefaction analysis utilizing data from the hollow-stem auger borings and laboratory test results. A description of Alta's analysis and calculations are presented in Appendix D of this report. A groundwater level of 40 feet below existing ground surface was assumed in the calculations. The results of our findings are discussed below under the headings of the specific types of liquefaction which can be manifested during seismic shaking. Our liquefaction calculations are presented in Appendix D.

- **Loss of Bearing:**
  Liquefaction can potentially cause foundation bearing failure due to ground softening and near-failure in bearing. Based on the depth to groundwater, the potential for loss of bearing is considered nil.
- **Lateral Spreading:**
  The lateral displacement of surficial blocks of sediment can occur as a result of liquefaction in a subsurface layer. The most pervasive forms of lateral spreading typically involve sites located near a "free-face" (large slopes, channels, etc.), however, it has

been noted that lateral spreading can occur on sites with gently sloping (1% or more) ground, such as the subject site.

Determination of the potential for lateral spread is based on the presence of continuous potentially liquefiable soil layers underneath the structures, the presence of lateral confinement, and various analyses such as empirical modeling. Bartlett, Hansen and Youd (2002) states that surface manifestation of lateral spread is typically limited to sites with liquefiable soils within 10 meters (32 feet) of grade, and that sites underlain by soils with $(N1)_{60}$ values 15 and greater do not experience significant displacements from earthquakes with magnitudes less than 8.

Based on the depth to groundwater and the density of the deposits onsite, the potential for lateral spread is considered nil.

- **Settlement:**

  Settlement due to seismic shaking can occur as a result of both liquefaction of saturated sediments or rearrangement of dry sand particles. Our liquefaction analysis was performed utilizing SPT from the hollow-stem auger borings and laboratory test results to analyze the potential amount of settlement. A description of Alta's analysis and calculations are presented in Appendix D of this report. In summary, the analysis showed that the amount of dynamic settlement due to liquefaction is low. Design dynamic settlement parameters are presented in Table 7-1.

- **Flow Failure:**

  Due to the relatively flat nature of the site, and the relatively horizontal deposition of the underlying deposits, the potential for flow failure onsite is considered nil.

4.5.5 Dry Sand Settlement

Dry sand settlement is the process of non-uniform settlement of the ground surface during a seismic event. Based on our subsurface investigation and our removal/recompaction recommendations, the potential for dry sand settlement is anticipated to be low and within foundation design tolerances. Design dynamic settlement parameters are presented in Table 7-1.

5.0 ENGINEERING PROPERTIES AND ANALYSIS

5.1 Materials Properties

Presented herein is a general discussion of the engineering properties of the onsite materials that will be encountered during construction of the proposed project. Descriptions of the soil (Unified Soil Classification System) are presented on the boring logs in Appendix B.

5.1.1 Excavation Characteristics

Based on the data provided from the subsurface investigations, it is our opinion that the majority of the onsite materials possess favorable excavation characteristics such that conventional earth moving equipment can be utilized.

5.1.2 Compressibility

The artificial fill and upper portions of the young alluvial fan deposits and old alluvial fan deposits onsite are considered compressible and unsuitable to support the proposed improvements. Recommended removal depths are presented in Section 6.1.2.

5.1.3 Hydro-Consolidation

Hydro-consolidation is the effect of introducing water into soil that is prone to collapse. Upon loading and initial wetting, the soil structure and apparent strength are altered resulting in almost immediate settlement. That settlement can have adverse impacts on engineered structures, particularly in areas where it is manifested differentially. Differential settlements are typically associated with differential wetting, irregularities in the subsurface soil conditions, or irregular loading patterns.

Based on our laboratory testing (Appendix C), the potential for hydro-collapse onsite is minimal and should be within foundation tolerances upon the completion of the recommended unsuitable soil removals.

5.1.4 Expansion Potential

Expansion index testing was performed on samples taken during our subsurface investigation. Based on the results, it is anticipated that the majority of materials onsite are "low" to "medium" in expansion potential (21≤EI≤90, Appendix C) when tested per ASTM D: 4829.

5.1.5 Earthwork Adjustments

The values presented in Table 5-1 are deemed appropriate for estimating purposes and may be used in an effort to balance earthwork quantities. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in-progress and actual conditions are better defined.

TABLE 5-1
Earthwork Adjustment Factors

Geologic Unit	Adjustment Factor Range	Average
Artificial Fill-undocumented	Shrink 10% to 14%	12%
Young and old alluvial fan deposits	Shrink 6% to 10%	8%

5.1.6 Chemical Analyses

Chemical testing was performed on samples of material underlying the proposed site. Soluble sulfate test results indicate that the soluble sulfate concentrations of the soils tested are classified as negligible (Category S0) per ACI 318-14.

Negligible chloride levels were detected in the onsite soils. Resistivity testing conducted as part of this investigation, indicates that the soils are corrosive to buried metals (per Romanoff, 1989). Additional discussions

on corrosion are presented in Section 7.9. Corrosion tests results are presented in Appendix C.

5.2 Engineering Analysis

Presented below is a general discussion of the engineering analysis methods that were utilized to develop the conclusions and recommendations presented in this report.

5.2.1 Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was determined by applying a factor of safety of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases. If it is desired to use Coulomb forces, a separate analysis specific to the application can be conducted.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on Alta's findings during our subsurface investigation, the laboratory test results, our staff's previous experience in the area, it is Alta's opinion that the development of the site is feasible from a geotechnical perspective. Presented below are recommendations that should be incorporated into site development and construction plans.

6.1 General Earthwork Recommendations

All grading shall be accomplished under the observation and testing of the project geotechnical consultant in accordance with the recommendations contained herein and the City of Riverside criteria.

6.1.1 Site Preparation

Vegetation, construction debris, and other deleterious materials are unsuitable as structural fill material and should be disposed of off-site

prior to commencing grading/construction. Any septic tanks, seepage pits or wells should be abandoned as per the County of Riverside Department of Health Services.

Existing concrete should be removed prior to the placement of engineered fill. The demolished concrete may be incorporated into compacted, engineered fills after it is crushed to a maximum size of six (6) inches. Prior to placement as engineered fill any protruding steel rebar should be cut from the concrete pieces and disposed of offsite.

Existing asphaltic concrete should be removed prior to the placement of engineered fill. From a geotechnical perspective, this material may be incorporated into compacted, engineered fills after it is crushed to a maximum size of six (6) inches. The crushed asphalt should not be placed under residential structures, but rather, it can be placed in approved non-residential areas, such as streets, parking areas or open space.

These recommendations should be verified by the environmental consultant.

6.1.2 Unsuitable Soil Removals

The undocumented artificial fill and the uppermost portions of the young and old alluvial fan deposits onsite are compressible and as such, are not suitable to support the proposed structures. Accordingly, it is recommended to completely remove the undocumented artificial fills and the highly weathered portions of the underlying young and old alluvial deposits across the site and as close to the property boundaries as possible.

It is anticipated that the upper five (5) to seven (7) feet of existing soils will require removal and recompaction, extending a minimum of five (5)

feet horizontally outside the proposed building envelopes. Removal bottoms should be observed by the Project Geotechnical Consultant to make a final determination that suitable (non-weathered, limited porosity) soils have been exposed. Removal bottoms should be tested to determine that the exposed soils have a minimum relative compaction of 85% of the laboratory maximum density (per ASTM test method D-1557). Both observations and tests must be accomplished to determine that suitable bottoms have been exposed. This recommended removal combined with the foundation recommendations presented in Section 7.1 should provide suitable support for the proposed structures.

For fill areas in streets, in general, a minimum removal and recompaction of two (2) feet is recommended, however all undocumented artificial fill shall be removed and recompacted, which may require deeper removals (see boring logs in Appendix B). For cuts deeper than the two (2) feet in street areas, removals are not required provided all the undocumented artificial fill is removed. Cuts less than the thickness of the undocumented fill should extend down to the fan deposits.

The Project Geotechnical Consultant should observe the removal bottom prior to placing fill. If unsuitable soils such as undocumented artificial fill are exposed upon the completion of the removals recommended above, additional removals may be required. Material removed as part of the unsuitable soil removals can be used as artificial fill, provided it is free of deleterious materials.

6.1.3 Over-excavation of Building Pads

Footings for structures should be underlain by a minimum of two (2) feet of compacted fill. As such, for building pads where unsuitable soil

removals do not provide the minimum depth of compacted fill, or where design grades and/or remedial grading activities create cut/fill transitions, the cut and shallow fill portions of the building pads should be over-excavated during grading and replaced with compacted fill.

6.1.4 Compaction Standards

All fill and processed natural ground shall be compacted to a minimum relative compaction of 90 percent, as determined by ASTM Test Method: D-1557. Fill material should be moisture conditioned to optimum moisture or above, and as generally discussed in Alta's Earthwork Specification Section presented in Appendix F. Compaction shall be achieved with the use of sheepsfoot rollers or similar kneading type equipment. Mixing and moisture conditioning will be required in order to achieve the recommended moisture conditions.

6.1.5 Groundwater/Seepage

It is anticipated that groundwater will not be encountered during construction. It is possible that perched water conditions could be encountered depending on the time of year construction occurs.

6.1.6 Documentation of Removals

All removal/over-excavation bottoms should be observed and approved by the project Geotechnical Consultant prior to fill placement. Consideration should be given to surveying the removal bottoms and undercuts after approval by the geotechnical consultant and prior to the placement of fill. Staking should be provided in order to verify undercut locations and depths.

6.1.7 Treatment of Removal Bottoms

At the completion of removals/over-excavation, the exposed removal bottom should be ripped to a minimum depth of eight (8) inches,

moisture-conditioned to above optimum moisture content and compacted in-place to the project standards.

6.1.8 Fill Placement

After removals, scarification, and compaction of in-place materials are completed, additional fill may be placed. Fill should be placed in eight-inch bulk maximum lifts, moisture conditioned to optimum moisture content or above, compacted and tested as grading/construction progresses until final grades are attained.

6.1.9 Mixing

Mixing of materials may be necessary to prevent layering of different soil types and/or different moisture contents. The mixing should be accomplished prior to and as part of compaction of each fill lift.

6.1.10 Import Soils

Import soils, if necessary, should consist of clean, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris, or other objectionable materials. The project Geotechnical Consultant should be notified not less than 72 hours in advance of the locations of any soils proposed for import. Import sources should be sampled, tested, and approved by the project Geotechnical Consultant at the source prior to the importation of the soils to the site. The project Civil Engineer should include these requirements on plans and specifications for the project.

6.1.11 Utility Trenches

6.1.11.1 Excavation

Utility trenches should be supported, either by laying back excavations or shoring, in accordance with applicable OSHA standards. In general, existing site soils are classified as Soil

Types "B" per OSHA standards. Upon completion of the recommended removals and recompaction, the artificial fill will be classified as Soil Type "B". The Project Geotechnical Consulting should be consulted if geologic conditions vary from what is presented in this report.

6.1.11.2 Backfill

Trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D-1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

6.1.12 Backcut Stability

Temporary backcuts, if required during unsuitable soil removals, should be made no steeper than 1:1 without review and approval of the geotechnical consultant. Flatter backcuts may be necessary where geologic conditions dictate and where minimum width dimensions are to be maintained.

Care should be taken during remedial grading operations in order to minimize risk of failure. Should failure occur, complete removal of the disturbed material will be required.

In consideration of the inherent instability created by temporary construction backcuts for removals, it is imperative that grading schedules are coordinated to minimize the unsupported exposure time of these excavations. Once started, these excavations and subsequent fill operations should be maintained to completion without intervening delays imposed by avoidable circumstances. In cases where five-day workweeks comprise a normal schedule, grading should be planned to avoid exposing at-grade or near-grade excavations through a non-work weekend. Where improvements may be affected by temporary instability, either on or offsite, further restrictions such as slot cutting, extending workdays, implementing weekend schedules, and/or other requirements considered critical to serving specific circumstances may be imposed.

6.2 Storm Water Infiltration Systems

Municipalities have been increasing the requirement for onsite storm water infiltration, rather than allowing water to enter storm drain systems. From a geotechnical perspective, allowing storm water to infiltrate the onsite soil in concentrated areas increases the potential for settlement, liquefaction, and water-related damage to structures/improvements, such as wet slabs or pumping subgrade, and should be avoided where possible. If infiltration systems are required on this site, care should be taken in designing systems that control the storm water as much as possible.

Preliminary infiltration testing was conducted at the site as part of this investigation, and the methodology is discussed in 3.2. The resulting infiltration rates for P-1, P-2 and P-3 were calculated to be 0.0-inches per hour, 0.1-inches per hour and 0.1-inches per hour, respectively. The results do not include a factor

of safety. Groundwater was encountered during our investigation ranging between 41 to 43 feet below the ground surface.

The Project Geotechnical Consultant should review the final WQMP design prior to construction.

6.3 Boundary Conditions

The site is bounded to the south by Arlington Avenue, to the west by Streeter Avenue, and to the east and north by residential developments. Construction of retaining/screen walls along these boundaries may require additional geotechnical recommendations concerning unsuitable soil removals and foundation design parameters. Boundary conditions for the project should be reviewed by the Project Geotechnical Consultant as the design progresses.

7.0 DESIGN CONSIDERATIONS

7.1 Structural Design

It is anticipated that multi-story wood-framed residential and retail structures with slab on-grade and shallow foundations will be constructed. Upon the completion of rough grading, finish grade samples should be collected and tested in order to provide specific recommendations as they relate to the individual building pad. These test results and corresponding design recommendations should be presented in a final rough grading report. Final slab and foundation design recommendations should be made based upon specific structure sitings, loading conditions, and as-graded soil conditions.

It is anticipated that the majority of onsite soils will possess "low" to "medium" expansion potential when tested in general accordance with ASTM Test Method D: 4829. For budgeting purposes, the following foundation design requirements for a range of potential expansion characteristics are presented.

7.1.1 Foundations

Foundations may be preliminary designed based on the values presented in Table 7-1 below.

Table 7-1 Foundation Design Parameters*	
Allowable Bearing	2000 lbs/ft^2(assuming a minimum width and embedment of 12-inches).
Lateral Bearing	250 lbs/ft^2 at a depth of 12 inches plus 250 lbs/ft^2 for each additional 12 inches of embedment to a maximum of 2000 lbs/ft^2
Sliding Coefficient	0.30
Differential Settlement	Dynamic: Differential = 1 inches in 40 feet Static: Differential = 0.5 inches in 40 feet

*These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

7.1.2 Conventional Slab/Foundation Systems

Based on the onsite soils conditions and information supplied by the 2019 CBC, conventional slab/foundation systems may be designed in accordance with Tables 7-1 and 7-2.

TABLE 7-2 CONVENTIONAL FOUNDATION DESIGN PARAMETERS		
Expansion Potential	***Low***	***Medium***
Soil Category	I	II
Design Plasticity Index	12	20 (Expansive per 2019 CBC)
Minimum Footing Embedment	12 inches*	18 inches*
*The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code.		
Minimum Footing Width	12-inches-The structural engineer should determine the minimum footing width based on loading and the latest California Building Code.	
Minimum Footing Reinforcement	No. 4 rebar, two (2) on top, two (2) on bottom	
Minimum Slab Thickness	4 inches (actual)	
Minimum Slab Reinforcement	No. 3 rebar spaced 18 inches on center, each way	No. 3 rebar spaced 15 inches on center, each way
Under-Slab Requirement	See Section 7.2	
Slab Subgrade Moisture	Minimum of 110 percent of optimum moisture to a depth of 12 inches prior to placing concrete.	Minimum of 120 percent of optimum moisture to a depth of 12 inches prior to placing concrete.
Footing Embedment Adjacent to Swales and Slopes	If exterior footings adjacent to drainage swales are to exist within five (5) feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that at least five- (5) feet is provided horizontally from edge of the footing to the face of the slope.	

7.1.3 Post-Tensioned Slabs/Foundation Design Recommendations

Post-tensioned slabs for the project may be preliminarily designed utilizing the parameters presented in Tables 7-1 and 7-3. The parameters presented herein are based on methodology provided in the Design of Post-Tensioned Slabs-On-Ground, Third Edition, by the Post-Tensioning Institute, in accordance with the 2019 CBC.

TABLE 7-3
POST-TENSION SLAB DESIGN PARAMETERS

Category	Expansion Potential	Minimum Embedment	Edge Lift		Center Lift	
			Em (ft)	Ym (inch)	Em (ft)	Ym (inch)
I	Low	12 inches*	5.4	0.61	9.0	0.26
II	Medium	18 inches*	5.5	1.10	9.0	0.46
Slab Subgrade Moisture						
Category I	Minimum 110% of optimum moisture to a depth of 12 inches prior to pouring concrete					
Category II	Minimum 120% of optimum moisture to a depth of 12 inches prior to pouring concrete					
Embedment*						
The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code. If mat slabs are utilized, alternate embedment depths can be provided.						
Moisture Barrier						
A moisture barrier should be provided in accordance with the recommendations presented in Section 7.2						
The parameters presented herein are based on procedures presented in the Design of Post-Tensioned Slabs-On-Ground, Third Edition. No corrections for vertical barriers at the edge of the slab, or for adjacent vegetation have been assumed. The design parameters are based on a Constant Suction Value of 3.9 pF.						

7.2 Moisture Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive and should be capable of effectively preventing the migration of water and reducing the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as Visqueen, placed between two to four inches of clean sand, has been used for this purpose. The use of this system or other systems can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.3 Seismic Design

In accordance with the requirements in Section 11.4.8 of ASCE 7-16 for sites with Site Class D and S1 values greater than 0.2, Alta has performed a site-specific ground motion analysis for the subject project. The analysis was performed in accordance with Chapter 21 of ASCE 7-16, the 2019 CBC, and the 2014 USGS Ground Acceleration Maps. The USGS Unified Hazard Tool (https://earthquake.usgs.gov/hazards/interactive/index.php) and the USGS National Seismic Hazard Map source model was utilized to perform the analysis.

The site class was determined based on the subsurface investigation and published geologic maps in the area in general conformance with Chapter 20 of ASCE 7-16. Based on density of the underlying soil, a Site Class of D was selected (shear wave velocity of 259 m/s).

Probabilistic (MCER) ground motions were determined in accordance with Method 1 of Section 21.2.1 of ACE 7-16. At each spectral response period for which the acceleration was computed, ordinates of the probabilistic ground motion response spectrum were determined as the project of the risk coefficient, CR, and the spectral response acceleration from a 5% damped acceleration response spectrum that has a 2% probability of exceedance within a 50-year period. The site specific MCER was taken as the lesser of the probabilistic and deterministic ground motions.

The design response spectrum was determined per Section 21.3 of ASCE 7-16. Design acceleration parameters were determined per Section 21.4 of ASCE 7-16 and the results are presented in Table A. These parameters should be verified by the structural engineer. Additional parameters should be determined by the structural engineer based on the Occupancy Category of the proposed structures.

TABLE 7-4 Seismic Ground Motion Values 2019 CBC and ASCE 7-16	
Parameter	*Value*
Site Class	D
Site Latitude	33.9476
Site Longitude	-117.4170
Spectral Response Acceleration Parameter, S_S	1.5
Spectral Response Acceleration Parameter, S_1	0.574
Site Coefficient, F_a	1
Site Coefficient, F_v (Per Table 11.4-2 of ASCE 7-16. Site Specific Parameters Govern)	1.7
Site Specific Parameters Per Chapter 21 of ASCE 7-16	
MCE Spectral Response Acceleration Parameter, S_{MS}	1.65
MCE Spectral Response Acceleration Parameter, S_{M1}	1.28
Design Spectral Response Acceleration Parameter, S_{DS}	1.1
Design Spectral Response Acceleration Parameter, S_{D1}	0.85
Peak Ground Acceleration, PGA_M	0.75

7.4 Pool Design Recommendations

It is anticipated that the proposed pool can be designed for medium expansive conditions. Steel reinforcement may be required within the pool shell and should be verified by the pool designer. The pressure from existing soils that will act of the pool walls that can be utilized in pool design is 45 psf/ft for the active condition.

Where pools are to be constructed in proximity to other structures or subjected to transient loads, the effects of those stresses should be considered in the pool

and/or spa design. The pool/spa should be provided with a pressure release valve system below the bottom.

Pool/spa decking shall have a minimum thickness of four (4) inches (actual). Consideration should be given to underlying the decking with at least six (6) inches of three-quarter- (3/4) inch crushed rock (or other non-expansive materials). Backfill for all conduits and any retaining walls shall be compacted to at least 90 percent of maximum density as determined by ASTM: D 1557.

Subgrade soils below the concrete decking shall be moisture-conditioned to a minimum of 120 percent of optimum moisture to a depth of twelve (12) inches prior to placing concrete. The subgrade soils should be shaped to provide a minimum gradient of one (1) percent away from the pool shell and toward a subsurface drainage system. The subsurface drainage system should be designed to collect subsurface water and discharge it into the area drain system.

The outside edges of the decking should be thickened to provide a perimeter beam that is eight- (8) inches wide and twelve- (12) inches deep. Slabs should be reinforced with a minimum of No. 3 bars at twenty-four (24) inches on center, each way, or an equivalent section of welded wire mesh. Final determination of reinforcement requirements is under the purview of the pool designer. The decking should be separated from the pool/spa coping. Expansion joints should be periodically maintained. Deep tool joints, extending at least one-third (1/3) of the thickness of the slab into the slab, should be provided at a maximum spacing of six (6) feet.

7.5 Fence and Garden Walls

Block walls, if used, should be embedded a minimum of 2 feet below the lowest adjacent grade. Construction joints (not more than 20 feet apart) should be

included in the block wall construction. Side yard walls should be structurally separated from the rear yard wall.

7.6 Footing Excavations

Soils from the footing excavations should not be placed in slab-on-grade areas unless properly compacted and tested. The excavations should be cleaned of all loose/sloughed materials and be neatly trimmed at the time of concrete placement. The Project Geotechnical Consultant should observe the footing excavations prior to the placement of concrete to determine that the excavations are founded in suitably compacted material.

7.7 Retaining Walls

Retaining walls should be founded on engineered fill and should be backfilled with granular soils that allow for drainage behind the wall. Foundations may be designed in accordance with the recommendations presented in Table 7-1, above. Unrestrained walls, free to horizontally move 0.0005H (for dense cohesionless backfill), may be designed to resist lateral pressures imposed by a fluid with a unit weight determined in accordance with the Table 7-5 below. The table also presents design parameters for restrained (at-rest) retaining walls. These parameters may be used to design retaining walls that may be considered as restrained due to the method of construction or location (corner sections of unrestrained retaining walls).

TABLE 7-5
Equivalent Fluid Pressures for 90% Compacted Fill (Select Material)

Backfill	Active Pressure (psf/ft)	At-Rest Pressure (psf/ft)
Level	35	55

Per the requirements of the 2019 CBC, the seismic force acting on the retaining walls with backfill exceeding 6-feet in height may be resolved utilizing the formula $16H^2$ lb/lineal ft (H=height of the wall). This force acts at approximately 0.6H

above the base of the wall. The seismic value can be converted as required by the retaining wall engineer. Retaining walls should be designed in general accordance with Section 1807A.2 of the 2019 CBC.

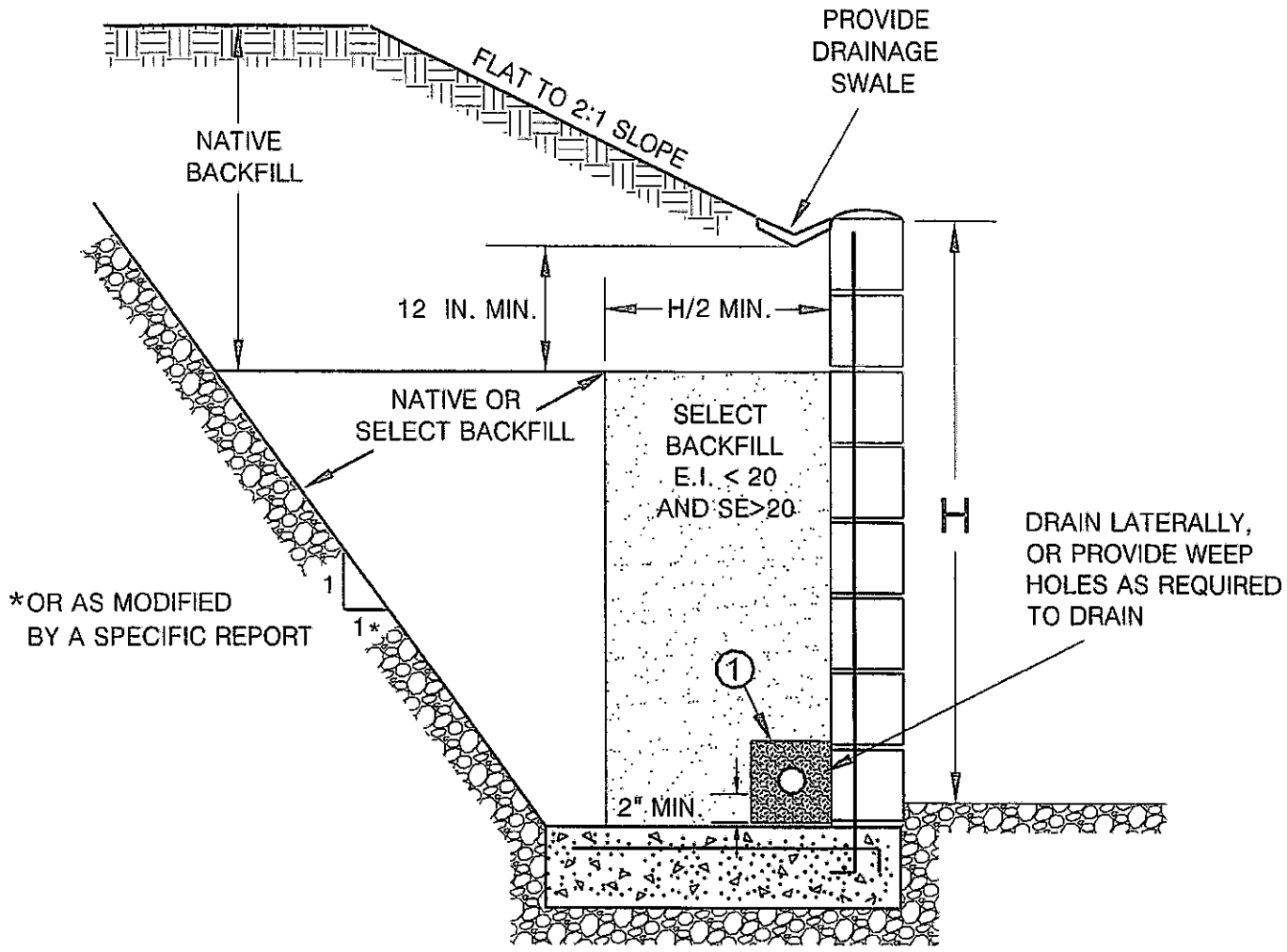
- Restrained retaining walls should be designed for "at-rest" conditions.
- The design loads presented in the above table are to be applied on the retaining wall in a horizontal fashion and as such friction between wall and retained soils should not be allowed in the retaining wall analyses.
- Additional allowances should be made in the retaining wall design to account for the influence of construction loads, temporary loads, and possible nearby structural footing loads.
- Select backfill should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an ASCE Expansion Index of 20 or less. The backfill must encompass the full active wedge area. The upper one foot of backfill should be comprised of native on-site soils (see Plate A).
- The wall design should include waterproofing (where appropriate) and backdrains or weep holes for relieving possible hydrostatic pressures. The backdrain should be comprised of a 4-inch perforated PVC pipe in a 1 ft. by 1 ft., ¾-inch gravel matrix, wrapped with a geofabric. The backdrain should be installed with a minimum gradient of 2 percent and should be outletted to an appropriate location. For subterranean walls this may include drainage by sump pumps.
- No backfill should be placed against concrete until minimum design strengths are achieved.

It should be noted that the allowable bearing and lateral bearing values presented in Table 7-1 are based on level conditions at the toe. Modified design parameters can be presented for retaining walls with sloping condition at the toe. Other conditions should be evaluated on a case by case basis.

7.8 Exterior Slabs and Walkways

Exterior concrete slabs and walkways should be designed and constructed in consideration of the following recommendations.

RETAINING WALL BACKFILL DETAIL



(1)

PIPE: 4-INCH PERFORATED PVC, SCHEDULE 40, SDR35 OR APPROVED ALTERNATE MINIMUM 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE

ROCK: MINIMUM VOLUME OF 1 CU. FT. OF 3/4-IN. MAX. ROCK PER. LINEAL FOOT OF PIPE, OR APPROVED ALTERNATE

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

7.8.1 Subgrade Compaction

The subgrade below exterior concrete slabs should be compacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method: D 1557.

7.8.2 Subgrade Moisture

The subgrade below concrete slabs should be moisture conditioned to a minimum of 110 percent of optimum moisture (low expansion) to 120 percent of optimum moisture (medium expansion) prior to concrete placement.

7.8.3 Concrete Slab Thickness

Concrete flatwork and driveways should be designed utilizing four-inch minimum thickness.

7.8.4 Concrete Slab Reinforcement

Utilization of reinforcement for flatwork and driveways is subject to a cost/benefit analysis. Reinforcement will decrease the amount of cracking that may occur in flatwork, however, planning for occasional repairs may be more cost effective. Utilizing closely spaced control joints is likely more cost-effective than utilizing reinforcement. The majority of the soils onsite are classified as low to medium in expansion potential. Consideration should be given to reinforcing flatwork with irregular (non-square/rectangular) shapes.

7.8.5 Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately eight feet (maximum) or less. Exterior slabs should be designed to withstand shrinkage of the concrete.

7.9 Concrete Design

As stated in Section 5.1.6, negligible concentrations of sulfates were detected in the onsite soils (Class S0). Therefore, the use of sulfate resistant concrete is not required per ACI 318-14 at this time. Post-grading conditions should be evaluated and final recommendations made at that time.

7.10 Corrosion

Based on preliminary testing, the onsite soils are corrosive to buried metal objects. Buried ferrous metals should be protected against the effects of corrosive soils in accordance with the manufacturer's recommendations. Typical measures may include using non-corrosive backfill, protective coatings, wrapping, plastic pipes, or a combination of these methods. A corrosion engineer should be consulted if specific design recommendations are required by the improvement designer.

Per ACI 318-14, an exposure class of C1 would be applicable to metals encased in concrete (rebar in footings) due to being exposed to moisture from surrounding soils. Per Table 19.3.2.1 of ACI 318-14, the requirements for concrete with an exposure class of C1 are a minimum compressive strength of 2500 psi and a maximum water-soluble chloride ion content in concrete of 0.30 (percent by weight of cement).

7.11 Pavement Design

Pavement sections for the proposed streets shall be designed based on laboratory testing conducted on samples taken from the soil subgrade. Preliminarily, based on an assumed R-Value of 10, the pavement may be designed utilizing the sections presented in Table 7-6. These sections should be verified upon the completion of grading, based on R-Value testing. The ultimate pavement section design for public streets is under the City of Riverside's purview.

Table 7-6 Preliminary Pavement Sections		
Traffic Index	Pavement Section Options OR	
5.0	3-inch AC on 9-inch AB	4-inch AC on 7-inch AB
5.5	3-inch AC on 11-inch AB	4-inch AC on 8.5-inch AB
6.0	3.5-inch AC on 12-inch AB	4-inch AC on 10.5-inch AB
AC-Asphalt Concrete AB-Caltrans Class II Base		

Construction of the streets should be accomplished in accordance with the current criteria of the City of Riverside. Prior to the placement of base material, the subgrade should be suitably moisture conditioned, processed and compacted to a minimum 95 percent of the laboratory maximum density (ASTM: D 1557) to at least twelve (12) inches below subgrade. After subgrade compaction, the exposed grade should then be "proof"-rolled with heavy equipment to ensure the grade does not "pump" and is verified as non-yielding. Aggregate base material should be placed on the compacted subgrade and compacted in-place to a minimum 95 percent of the laboratory standard obtained per ASTM: D 1557.

7.12 Site Drainage

Positive drainage away from the proposed structures should be provided and maintained. Roof, pad, and lot drainage should be collected and directed away from the structures toward approved disposal areas through drainage terraces, gutters, down drains, and other devices. Design fine grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures.

8.0 LOT MAINTENANCE

Ongoing maintenance of the improvements is essential to the long-term performance of structures. As such, the owners must implement certain maintenance procedures. The attached " Maintenance and Improvement Considerations" presented in the Appendix D

may be included as part of the sales packet to educate the owners in issues related to drainage, maintenance, improvements, etc. The following recommendations should also be implemented.

8.1 Lot Drainage

Roof, pad, and lot drainage should be collected and directed away from structures and slopes and toward approved disposal areas. Design fine grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures and slopes. Residents should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, down drains, and other devices that have been installed to promote structure and slope stability.

8.2 Burrowing Animals

Owners should undertake a program for the elimination of burrowing animals.

9.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the site. As the project design for the project progresses, site specific geologic and geotechnical issues should be considered in the design and construction of the project. Consequently, future plan reviews may be necessary. These reviews may include reviews of:

- Grading Plans
- Foundation Plans
- Utility Plans

These plans should be forwarded to the project Geotechnical Consultant for review.

10.0 CLOSURE

10.1 Geotechnical Review

For the purposes of this report, multiple working hypotheses were established for the project, utilizing the available data and the most probable model is used for the analysis. Future information collected during the proposed grading operations is intended to evaluate the hypothesis and as such, some of the assumptions summarized in this report may need to be changed. Some modifications of the grading recommendations may become necessary, should the conditions encountered in the field differ from the conditions hypothesized in this report.

Plans and sections of the project specifications should be reviewed by Alta to evaluate conformance with the intent of the recommendations contained in this report. If the project description or final design varies from that described in herein, Alta must be consulted regarding the applicability of the recommendations contained herein and whether any changes are required. Alta accepts no liability for any use of its recommendations if the project description or final design varies and Alta is not consulted regarding the alterations.

10.2 Limitations

This report is based on the following: 1) the project as presented on the attached plan; 2) the information obtained from Alta's laboratory testing included herein; and 3) from the information presented in the referenced reports. The findings and recommendations are based on the results of the subsurface investigation, laboratory testing, and office analysis combined with an interpolation and extrapolation of conditions between and beyond the subsurface excavation locations. However, the materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not

observed. The results reflect an interpretation of the direct evidence obtained. Work performed by Alta has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by a geotechnical consultant who is familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report.

The conclusions and recommendations included in this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of Alta.

Alta has no responsibility for construction means, methods, techniques, sequences, procedures, safety precautions, programs in connection with the construction, acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

APPENDIX A

REFERENCES

APPENDIX A

Selected References

1. Bryant, W.A., and Hart, E.W., 2007, Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Zoning Act with index to Earthquake Fault Zones Maps, Special Publication 42, interim revision, California Department of Conservation, California Geological Survey.
2. California Code of Regulations, 2016, California Building Code, Title 24, Part 2, Volume 2, Based on the 2012 International Building Code, Effective Date January 1, 2017.
3. California Department of Water Resources, online information: http://www.water.ca.gov/waterdatalibrary/index.cfm.
4. California Geological Survey, 2018, Earthquake Fault Zones, A guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California, Special Publication 42, revised 2018, 83 pages.
5. Cox, B.F., and Morton, D.M., 1978, Preliminary map of surficial materials in northwestern Riverside and southwestern San Bernardino Counties, California: U.S. Geological Survey, Open-File Report OF-78-977, scale 1:48,000.
6. Historic Aerials, 2020, www.historicaerials.com, by NETROnline, Copyright 2009, accessed January 31, 2020, online review of vintage air photos from 1948, 1966, 1967, 1980, 1995, 2003, 2004, 2005, 2009, 2010, 2012, and 2016.
7. Jennings, C.W., and Bryant, W.A., 2010, Fault Activity Map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
8. Jennings, C. W., and Bryant, W.A., 2010, An explanatory text to accompany the 1:750,000 scale fault and geologic map of California: California Division of Mines and Geology, special publication 42, revised 1985, 24 p.
9. Jennings, C. W., 1985, An explanatory text to accompany the 1:750,000 scale fault and geologic maps of California: California Division of Mines and Geology, Bulletin 201, 197 p.
10. Morton, D.M. and Miller, F.K., 2006, Geologic map of the San Bernardino and Santa Ana 30'x60' quadrangles, California: U.S. Geological Survey, Open-File Report OF-2006-1217, scale 1:100,000.
11. Riverside County Mapping Portal. https://gis.rivcoit.org/
12. Romanoff, Melvin, 1989, Underground Corrosion, NBS Circular 579, Reprinted by NACE, Houston, TX, 1989

APPENDIX B

Subsurface Investigation

APPENDIX B

Subsurface Investigation

Alta's subsurface investigation consisted of excavating, logging, and sampling twelve (12) hollow-stem auger borings. Details of the subsurface investigation are presented in Table B-1. The approximate location of the exploratory excavation is shown on the accompanying Concept Design plan (Plate 1) and the Geotechnical Logs are attached.

TABLE B-1
SURFACE INVESTIGATION DETAILS

Equipment	Range of Depths	Sampling Methods	Sample Locations
Hollow-stem auger	Up to 51.5 feet	1. Bulk 2. Ring Samples	1. Bulk-Select Depth 2. Every 5-feet

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravel and Gravelly Soils More than 50% of coarse fraction retained on No. 4 sieve		GW	Well-graded gravels or gravel sand mixtures, little or no fines
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines
			GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and Sandy Soils More than 50% of coarse fraction passes on No. 4 sieve		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, and-clay mixtures

Major Divisions		grf	ltr	
Fine Grained Soils More than 50% passes on No. 200 sieve	Silts And Clays LL,<50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silt-clays of low plasticity
	Silts And Clays LL,<50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
			VH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat and other highly organic soils

BOUNDARY CLASSIFICATION: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

200	40	10	4	3/4"	3"	12"

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot (SPT)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

CONSISTENCY CLASSIFICATION

Silts and Clays	Criteria
Very Soft	Thumb penetrates soil >1 in.
Soft	Thumb penetrates soil 1 in.
Firm	Thumb penetrates soil 1/4 in.
Stiff	Readily indented with thumbnail
Very Stiff	Thumbnail will not indent soil

HARDNESS

Bedrock
Soft
Moderately Hard
Hard
Very Hard

LABORATORY TESTS

Symbol	Test
DS	Direct Shear
DSR	Direct Shear (Remolded)
CON	Consolidation
SA	Sieve Analysis
MAX	Maximum Density
RV	Resistance (R) Value
EI	Expansion Index
SE	Sand Equivalent
AL	Atterberg Limits
CHEM	Chemical Analysis
HY	Hydrometer Analysis

SOIL MOISTURE

Increasing Visual Moisture Content

Dry - Dry to touch

Moist - Damp, but no visible free water

wet - Visible free water

SIZE PROPORTIONS

Trace - <5%

Few - 5 to 10%

Some - 15 to 25%

KEY TO EXPLORATORY BORING LOGS

ALTA CALIFORNIA GEOTECHNICAL INC.

PLATE B

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-01
DATE STARTED	1/28/20	GROUND ELEV.	779	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					ML	3" Asphaltic Concrete over 3" of 3/4" Base **ARTIFICIAL FILL-UNDOCUMENTED**(afu): SILT, brown, slightly moist, firm, trace very fine to fine grained sand.				
	775	R	7				8.5	104	38	
5		R	19		ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): SANDY SILT, very fine grained, brown, slightly moist, very stiff, trace pores.	13.2	114	78	CON, HY
	770									
10		R	20		SP	@10.0ft. SAND, medium to coarse grained, brown, dry, medium dense.	3.6	107	17	
	765									
15		R	22			@15.0ft. very fine to fine grained, tannish brown.	7.5	109	39	
	760									
20		R	37		CL	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SANDY CLAY, very fine grained, gray with orange mottling, slightly moist, very stiff.	23.4	102	99	
	755									
25		R	45		SP	@25.0ft. SAND, fine to coarse grained, tan, dry, dense.	4.2	121	30	
						TOTAL DEPTH 26 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-1

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-02
DATE STARTED	1/28/20	GROUND ELEV.	778	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)	42	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						3" Asphaltic Concrete over 5" of 3/4" Base				
					ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SILT, brown, slightly moist, firm, trace very fine to fine grained sand.				
	775	R	15				15.6	111	83	
		B			CL-ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): SILTY CLAY, brown, slightly moist, very stiff, trace very fine grained sand.				
5		R	41				15.4	117	98	DSR, MAX, EI, HY, CHEM
	770									
10		R	18		SP	@10ft. SAND, very fine to fine grained, light brown, dry, medium dense.	4.9	109	25	
	765									
15		R	36		SC	**OLD ALLUVIAL FAN DEPOSITS**(Qof): CLAYEY SAND, very fine grained, gray, slightly moist, dense, trace calcium carbonates.	15.4	113	88	
	760									
20		R	53		SP	@20.0ft. SAND, medium to coarse grained, dry, dense.	3.3	107	16	
	755									
25		R	46				2.4	102	10	
	750									
30		S	37		SM	@30.0ft. SILTY SAND, medium to coarse grained, dry, dense, trace fine gravel <1/2".				SIEVE HY
	745									
35		S	37							
	740									
						Continued.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-02
DATE STARTED	1/28/20	GROUND ELEV.	778	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)	42	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		S	54		SP	**OLD ALLUVIAL FAN DEPOSITS**(Qof): Continued; SAND, medium to coarse grained, wet, dense.				SIEVE HY
						▼ @42.0ft. GROUNDWATER ENCOUNTERED				
	735									
45		S	42							
	730									
50		S	53			@50.0ft. few fine to coarse gravel <3".				
						TOTAL DEPTH 51.5 FEET GROUNDWATER ENCOUNTERED AT 42.0 FEET NO CAVING OBSERVED.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-03
DATE STARTED	1/28/20	GROUND ELEV.	777	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						3" Asphaltic Concrete over 3" of 3/4" Base				
					ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, slightly moist, stiff.				
	775	R	10				16.5	109	83	
5		R	30		ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): SANDY SILT, very fine to fine grained, brown, slightly moist, very stiff.	17.0	112	95	
	770									
10		R	42		ML	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SANDY SILT, very fine grained, tannish gray, dry, stiff, trace pores, trace calcium carbonates.	15.3	93	52	CON, HY
	765									
15		R	41				20.2	107	98	
	760									
20		R	31			@20.0ft. very fine to medium grained, brown, slightly moist, stiff.	8.8	112	49	
	755									
25		R	42		SP	@25.0ft. SAND, fine grained, gray, dry, dense.	2.7	97	10	
						TOTAL DEPTH 26 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-3

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-04
DATE STARTED	1/29/20	GROUND ELEV.	776	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)	43	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						3" Asphaltic Concrete over 3" of 3/4" Base				
	775				ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, slightly moist, stiff.				
		R	14				16.0	110	84	
5					ML	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SANDY SILT, very fine grained, brown, slightly moist, stiff.				
	770	R	31				13.1	121	94	DS, HY
10		R	33		SP	@10.0ft. SAND, very fine to fine grained, tan, dry, dense, trace fine gravel <1/2".	11.7	101	49	
	765									
15		R	65		SM	@15.0ft. SILTY SAND, very fine grained, gray, dry, very dense, trace pores.	14.1	116	88	
	760									
20		R	31		SP	@20.0ft. SAND, very fine to fine grained, light brown with orange mottling, slightly moist, dense.	14.7	101	61	
	755									
25		R	29				5.0	98	19	
	750									
30		S	38		SP	@30.0ft. GRAVELLY SAND, coarse grained, tan, dry, dense, fine gravel <1/2".				
	745									
35		S	39							
	740									
						Continued.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-4

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-04
DATE STARTED	1/29/20	GROUND ELEV.	776	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)	43	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	735	S	48		SP	**OLD ALLUVIAL FAN DEPOSITS**(Qof): Continued; orangish tan, wet.				
						▼ @43.0ft. GROUNDWATER ENCOUNTERED.				
45	730	S	65			@45.0ft. fine to coarse gravel <3".				
50	725	S	86							
						TOTAL DEPTH 51.5 FEET GROUNDWATER ENCOUNTERED AT 43.0 FEET NO CAVING OBSERVED.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-4

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-05
DATE STARTED	1/28/20	GROUND ELEV.	775	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	775					Highly Weathered Asphaltic Concrete 3" over 4" of 3/4" Base.				
					ML	@0.7ft. **ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, slightly moist, stiff.				
		R	39		SM	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SILTY SAND, very fine to fine grained, tan, dry, dense, trace pores, trace calcium carbonates.	5.6	113	32	
5	770	R	52		SP	@5.0ft. SAND, fine to coarse grained, grayish brown, dry, dense.	6.5	128	59	
10	765	R	41			@10.0ft. very fine to fine grained, gray, some clay.	7.7	98	29	
15	760	R	48			@15.0ft. grayish brown.	10.2	118	68	
20	755	R	37			@20.0ft. gray, slightly moist, trace clay	18.3	103	80	
25	750	R	37			@25.0ft. fine to medium grained, dry.	2.7			
						TOTAL DEPTH 26 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-5

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-06
DATE STARTED	1/29/20	GROUND ELEV.	776	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	775				ML	3" Asphaltic Concrete over 2" of 3/4" Base **ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, slightly moist, very stiff.				
		R	16				10.9	99	43	
5		R	23		ML	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SANDY SILT, very fine to fine grained, grayish tan, dry, firm, few calcium carbonates.	8.2	111	45	
	770	B								MAX, EI, HY, CHEM
10		R	49		SP	@10.0ft. SAND, very fine grained, gray, dry, dense, trace calcium carbonates.	4.0	113	23	
	765									
15		R	50				7.6	108	38	
	760									
20		R	51			@20.0ft. fine to medium grained, gray and tan.	2.8	101	12	
	755									
25		R	64				8.0	107	38	
	750					TOTAL DEPTH 26 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-6

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-07
DATE STARTED	1/29/20	GROUND ELEV.	774	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)	43	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					ML	3" Asphaltic Concrete over 4" of 3/4" Base **ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, slightly moist, stiff.				
		R	13				16.8	109	86	
	770									
5		R	17		ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): SANDY SILT, very fine grained, brown, dry, very stiff.	11.7	114	69	
	765									
10		R	35		CL	**OLD ALLUVIAL FAN DEPOSITS**(Qof): CLAYEY SILT, very fine grained, brown, slightly moist, stiff, trace pores, some calcium carbonates.	15.1	115	91	CON, HY
	760									
15		R	53			@10.0ft. tannish gray, dry, very dense.	19.2	105	89	
	755									
20		R	40		SP	@20.0ft. SAND, very fine grained to fine grained, gray, dry, dense.	14.4	100	58	
	750									
25		R	38			@25.0ft. gray with orange mottling.	7.9	100	32	
	745									
30		S	36		SP	@30.0ft. GRAVELLY SAND, medium to coarse grained, gray, dry, medium dense, fine gravel <3/4".				
	740									
35		S	52		SP	@35.0ft. SAND, very fine to fine grained, grayish tan, dry, dense.				
	735					Continued.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-7

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington		
DATE STARTED	1/29/20	GROUND ELEV.	774	BORING DESIG.	B-07
DATE FINISHED	1/29/20	GW DEPTH (FT)	43	LOGGED BY	JC
DRILLER	2R	DRIVE WT.	140 lbs.	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		S	23		SP	**OLD ALLUVIAL FAN DEPOSITS**(Qof): Continued; GRAVELLY SAND, coarse grained, gray, wet, medium dense, fine to coarse gravel <3".				
						▼ @42.5ft. GROUNDWATER ENCOUNTERED.				
	730									
45		S	44			@45.0ft. fine gravel <1/2".				
	725									
50		S	73							
						TOTAL DEPTH 51.5 FEET GROUNDWATER ENCOUNTERED AT 42.5 FEET NO CAVING OBSERVED.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-7

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-08
DATE STARTED	1/29/20	GROUND ELEV.	774	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)	41	NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					ML	3" Asphaltic Concrete over 3" of 3/4" Base **ARTIFICIAL FILL-UNDOCUMENTED**(afu): SILT, brown, slightly moist, stiff, trace clay, trace fine grained sand.				
		R	10				15.1	108	75	
	770									
5		R	26		ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): CLAYEY SILT, brown, slightly moist, very stiff, trave very fine grained, sand, trace pores.	15.0	116	92	CON, HY
	765	B								
10		R	27			@10.0ft. some very fine to fine grained sand.	19.5	107	95	
	760									
15		R	42		SM	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SILTY SAND, very fine to fine grained, tannish gray, dry, dense, trace clay.	19.0	110	97	
	755									
20		R	29		SP	@20.0ft. SAND, very fine to fine grained, tan with orange mottling, dry, medium dense.	15.2	95	54	
	750									
25		R	54			@25.0ft. coarse grained, gray, dry, very dense, trace fine gravel <1/2".	2.1	101	9	
	745									
30		S	29			@30.0ft. very fine to fine grained, slightly moist, medium dense.				
	740									
35		S	30			@35.0ft. some clay.				
	735					Continued.				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-8

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington		
DATE STARTED	1/29/20	GROUND ELEV.	774	BORING DESIG.	B-08
DATE FINISHED	1/29/20	GW DEPTH (FT)	41	LOGGED BY	JC
DRILLER	2R	DRIVE WT.	140 lbs.	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		S	35		SP	**OLD ALLUVIAL FAN DEPOSITS**(Qof): Continued; @40.8ft. GRAVELLY SAND, coarse grained, gray, wet, medium dense, fine gravel <3/4". @41.0ft. GROUNDWATER ENCOUNTERED				
	730									
45		S	69			@45.0ft. very dense.				
	725									
50		S	48			@50.0ft. fine to coarse gravel <3".				
						TOTAL DEPTH 51.5 FEET GROUNDWATER ENCOUNTERED AT 41.0 FEET NO CAVING OBSERVED.				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-8

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	B-09
DATE STARTED	1/28/20	GROUND ELEV.	776	LOGGED BY	JC
DATE FINISHED	1/28/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						4" Asphaltic Concrete over 4" of 3/4" Base				
	775				ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SILT, brown, dry, firm, trace fine grained sand, trace gravel <3/4".				
		R	14				14.4	108	72	
5		R	25			@5.0ft. very stiff.	16.1	112	89	
	770				ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): SANDY SILT, fine grained, brown, slightly moist, very stiff, trace clay.				
10		R	21				16.8	112	93	
	765									
15		R	30		SC	@15.0ft.CLAYEY SAND, fine to medium grained, brown with orange mottling, slightly moist, medium dense.	10.5	114	61	
	760									
20		R	40		SC	**OLD ALLUVIAL FAN DEPOSITS**(Qof): CLAYEY SAND, very fine to fine grained, gray with orange mottling, moist, dense.	26.7	91	87	
	755									
25		R	84		SP	@25.0ft. SAND, medium to coarse grained, tan, dry, very dense.				
	750					TOTAL DEPTH 26 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-9

GEOTECHNICAL BORING LOG

PROJECT NO. 1-0312
DATE STARTED 1/28/20
DATE FINISHED 1/28/20
DRILLER 2R
TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 5261 Arlington
GROUND ELEV. 774
GW DEPTH (FT)
DRIVE WT. 140 lbs.
DROP 30 in.

BORING DESIG. P-01
LOGGED BY JC
NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						3" Asphaltic Concrete over 5" of 3/4" Base				
					ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, very fine grained, brown, dry, stiff.				
					SM	**OLD ALLUVIAL FAN DEPOSITS**(Qof): SILTY SAND, very fine to fine grained, tan, dry, dense.				
	770									
5						TOTAL DEPTH 5 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-10

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	P-02
DATE STARTED	1/29/20	GROUND ELEV.	772	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
						Highly Weathered Asphaltic Concrete 3" over 4" of 3/4" Base.				
					ML	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SILT, brown, slightly moist, stiff, trace very fine grained sand.				
	770				SM	@1.0ft. concrete debris				
						OLD ALLUVIAL FAN DEPOSITS(Qof): SILTY SAND, very fine to fine grained, tan, dry, dense.				
5										
						TOTAL DEPTH 5 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE B-11

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0312	PROJECT NAME	5261 Arlington	BORING DESIG.	P-03
DATE STARTED	1/29/20	GROUND ELEV.	777	LOGGED BY	JC
DATE FINISHED	1/29/20	GW DEPTH (FT)		NOTE	
DRILLER	2R	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SM	**ARTIFICIAL FILL-UNDOCUMENTED**(afu): SANDY SILT, fine grained, brown, slightly moist, medium dense, with roots.				
	775									
5										
	770				ML	**YOUNG ALLUVIAL FAN DEPOSITS**(Qyf): CLAYEY SILT, brown, moist, firm to stiff.				
10						TOTAL DEPTH 10.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE B-12

APPENDIX C

Laboratory Testing

LABORATORY TESTING

The following laboratory tests were performed on a representative sample in accordance with the applicable latest standards or methods from the ASTM, California Building Code (CBC) and California Department of Transportation.

Classification

Soils were classified with respect to the Unified Soil Classification System (USCS) in accordance with ASTM D-2487 and D-2488.

Particle Size Analysis

Modified hydrometer testing was conducted to aid in classification of the soil. The results of the particle size analysis are presented in Table C.

Maximum Density/Optimum Moisture

The maximum dry density and optimum moisture content of two representative bulk samples were evaluated in accordance with ASTM D-1557. The results are summarized in Table C.

Expansion Index Tests

Two (2) expansion index tests were performed to evaluate the expansion potential of typical on-site soil. Testing was carried out in general conformance with ASTM Test Method D-4829. The results are presented in Table C.

Consolidation Tests

Consolidation testing was performed on four (4) relatively "undisturbed" soil samples at their natural moisture content in accordance with procedures outlined in ASTM D-2435. The samples were placed in a consolidometer and loads were applied incrementally in geometric progression. The samples (2.42-inches in diameter and 1-inch in height) were permitted to consolidate under each load increment until the slope of the characteristic linear secondary compression portion of the thickness versus log of time plot was apparent. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical

compression to the original 1-inch height. The consolidation test results are shown on Plates C-1 through C-4.

Direct Shear Testing

Direct shear testing in general conformance with ASTM test method D 3080, was performed on one sample remolded to 90% of the maximum density, and on one relatively "undisturbed" sample. The results of these tests are presented on Plates C-5 and C-6.

Sieve Analyses

Sieve analysis testing, in general conformance with ASTM test method D 6913, was performed on two select samples. The results of these tests are presented on Plates C-7 and C-8.

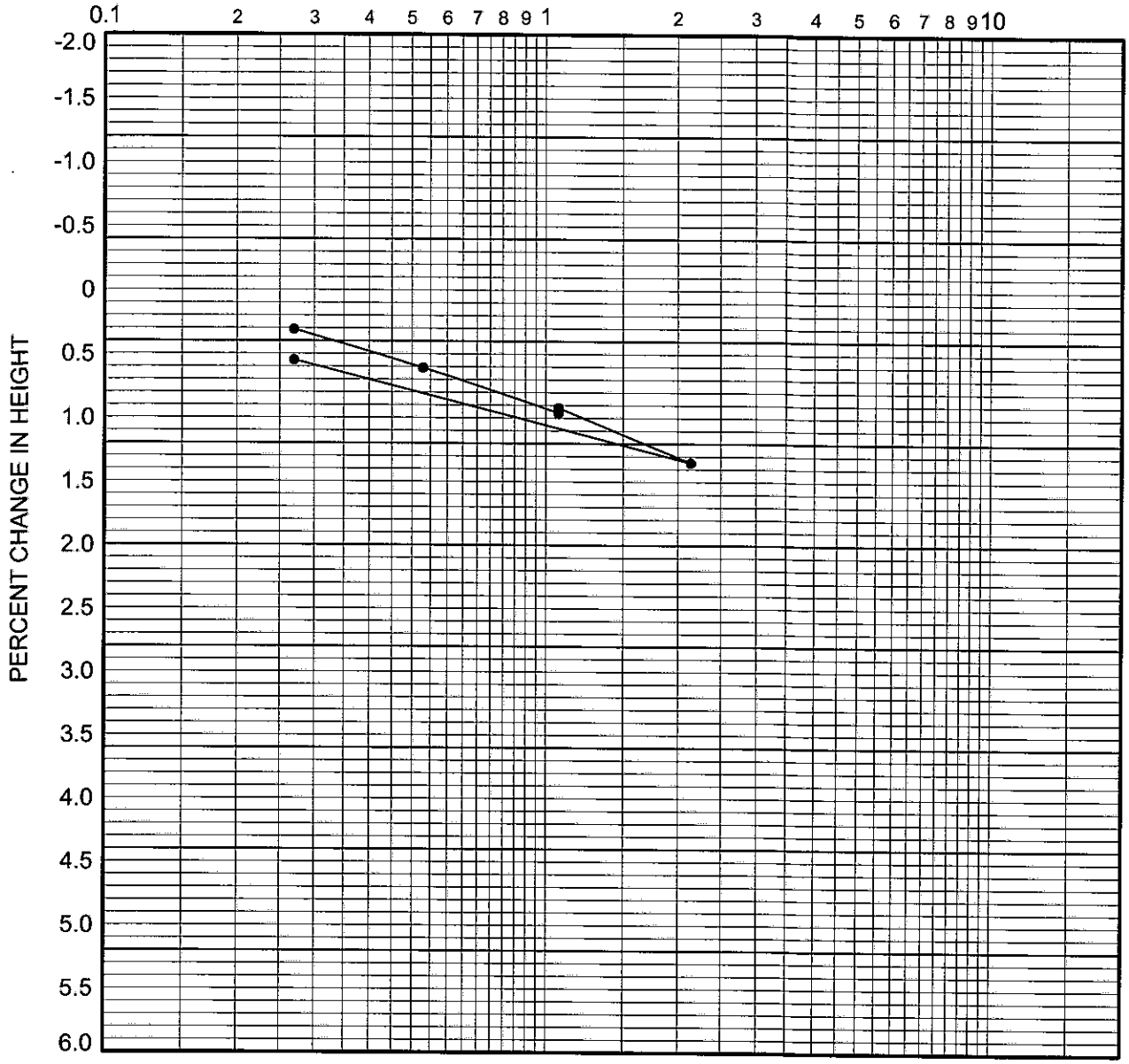
Chemical Analyses

Chemical testing was performed on two select samples. The results of these tests (sulfate content, resistivity, chloride content and pH) are presented on Table C.

TABLE C
SUMMARY OF LABORATORY TEST DATA
P.N. 1-0312

BORING	DEPTH (FEET)	SOIL DESCRIPTION	GROUP SYMBOL	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	DIRECT SHEAR	PLUS NO.4 SEIVE (plus 4.76mm) (%)	SAND (4.76mm-0.075mm) (%)	SILT (0.075mm-0.005mm) (%)	CLAY (minus 0.005mm) (%)	EXPANSION INDEX UBC 18-2	CONSOL	OTHER TESTS REMARKS
B-01	5	Sandy Silt (Qyf)	ML				0	30	50	20		SEE PLATE C-1	
B-02	4.5	Silty Clay (Qyf)	CL	128.7	9.9	SEE PLATE C-5	1	24	49	26	53		Sulf: ND, Chlor: 15ppm, pH:8.2, Res.: 2500 ohm cm
B-02	30	Silty Sand (Qof)	SM				16	66	12	8			
B-02	40	Sand (Qof)	SP				0	92	4	4			
B-03	10	Sandy Silt (Qof)	ML				0	21	73	6		SEE PLATE C-2	
B-04	5	Sandy Silt (Qof)	ML			SEE PLATE C-6	0	33	40	27			
B-06	8	Sandy Silt (Qof)	ML	126.5	10.3		4	44	30	22	31		Sulf: 110 ppm, Chlor: 15ppm, pH:8.4, Res.: 2200 ohm cm
B-07	10	Clayey Silt (Qof)	ML				0	20	46	34		SEE PLATE C-3	
B-08	5	Clayey Silt (Qyf)	ML				0	20	56	24		SEE PLATE C-4	

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-01	5.0	114	13.2	78	70	ML	Sandy Silt (Qyf)

REMARKS: WATER ADDED AT 1.07 TSF

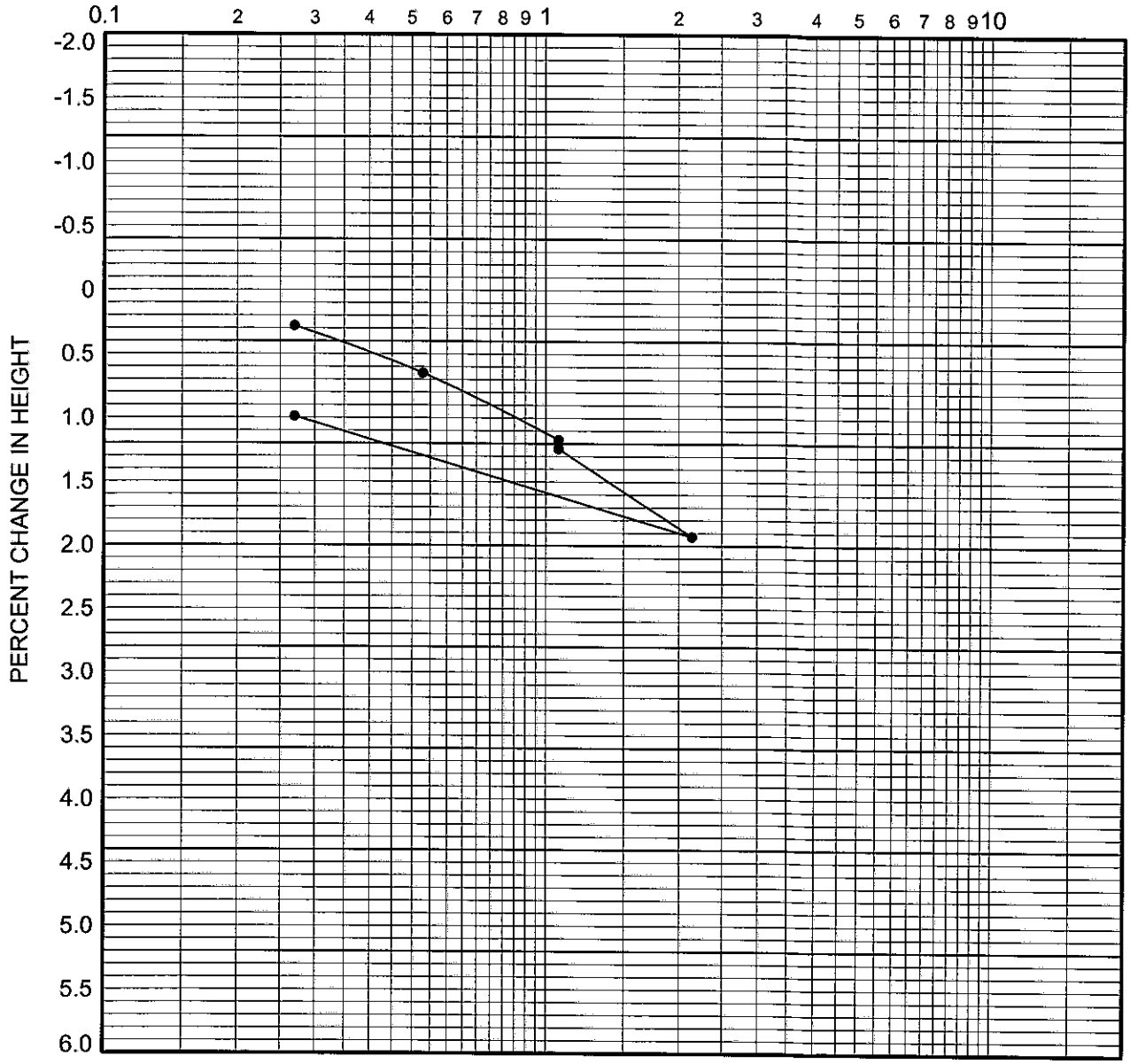
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-1

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-03	10.0	93	15.3	52	79	ML	Sandy Silt (Qof)

REMARKS: WATER ADDED AT 1.07 TSF

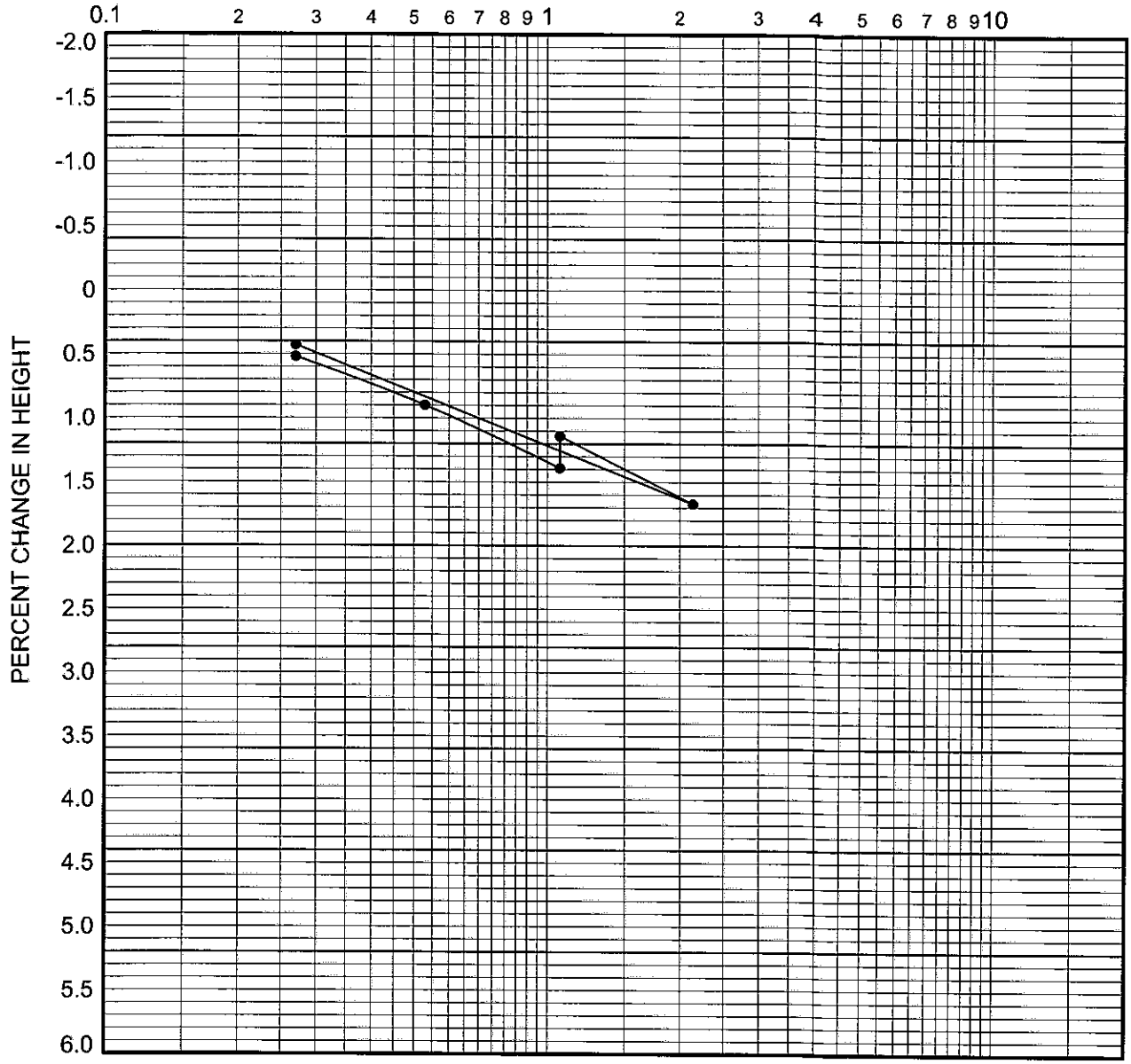
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-2

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-07	10.0	115	15.1	91	80	ML	Clayey Silt (Qof)

REMARKS: WATER ADDED AT 1.07 TSF

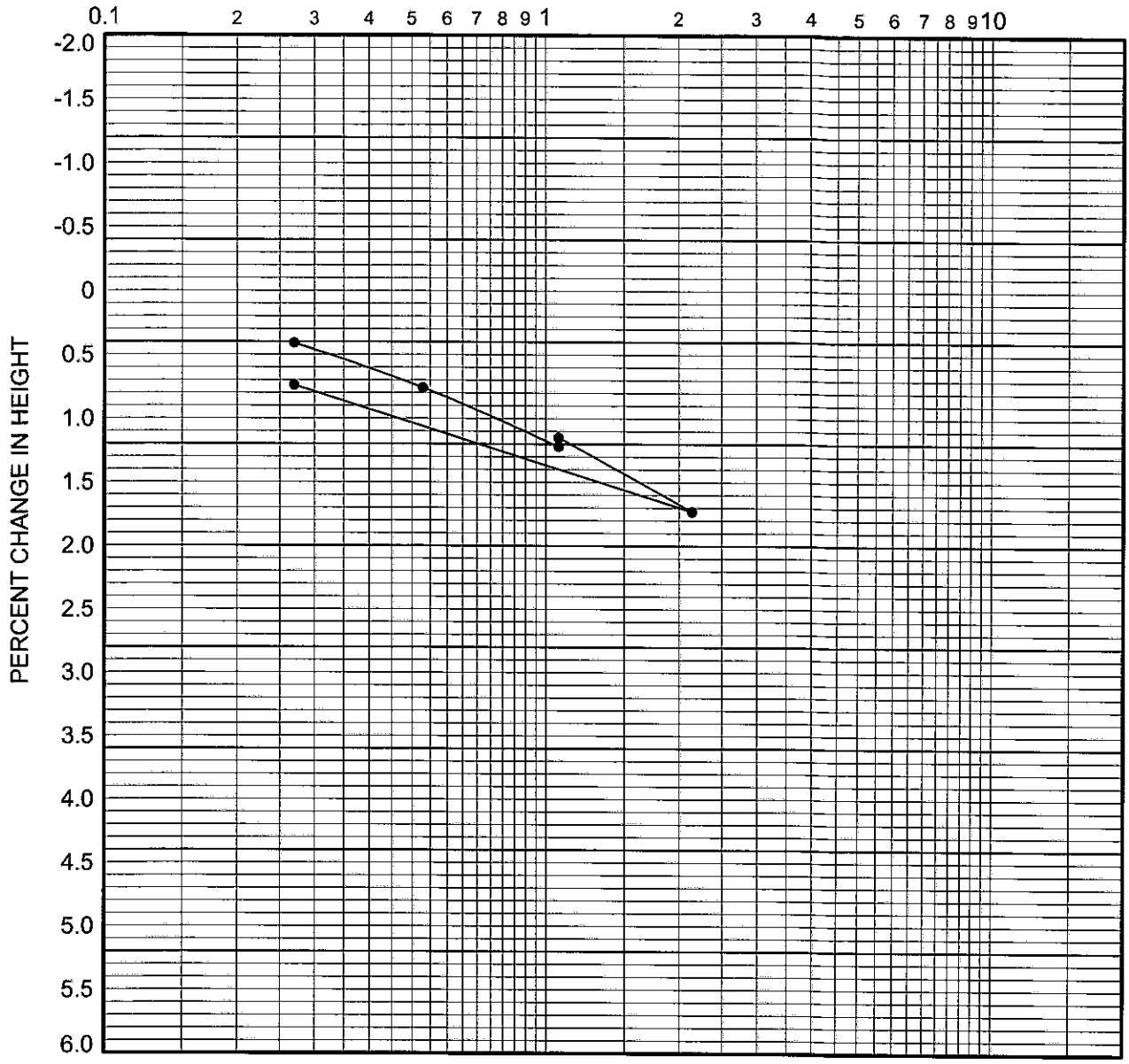
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-3

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-08	5.0	116	15.0	92	80	ML	Clayey Silt (Qyf)

REMARKS: WATER ADDED AT 1.07 TSF

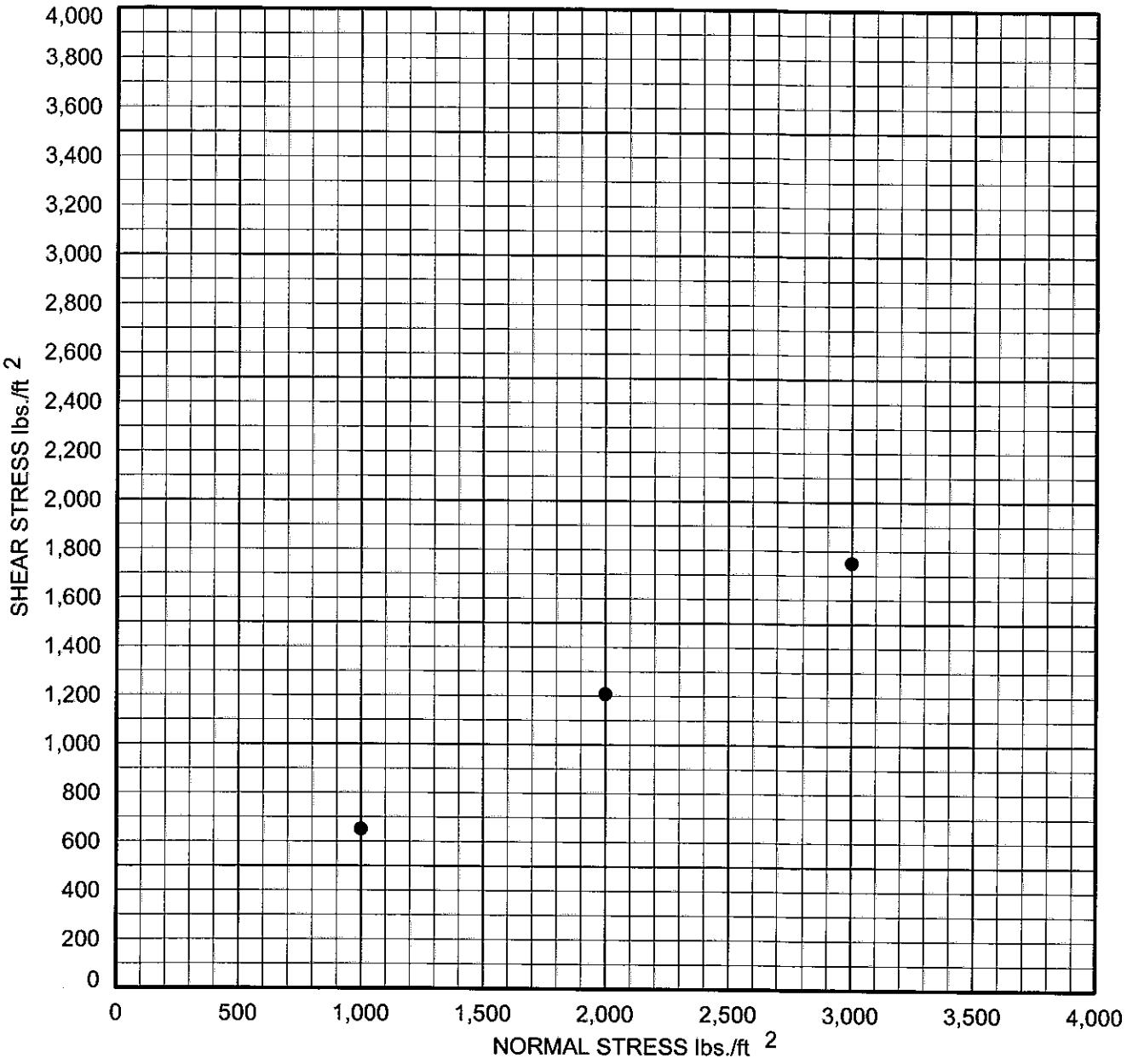
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-4

DIRECT SHEAR TEST
Remolded at 90% Relative Compaction



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
B-02	4.5			75	CL	Silty Clay (Qyf)

COHESION	100	psf.
FRICTION ANGLE	28.0	degrees

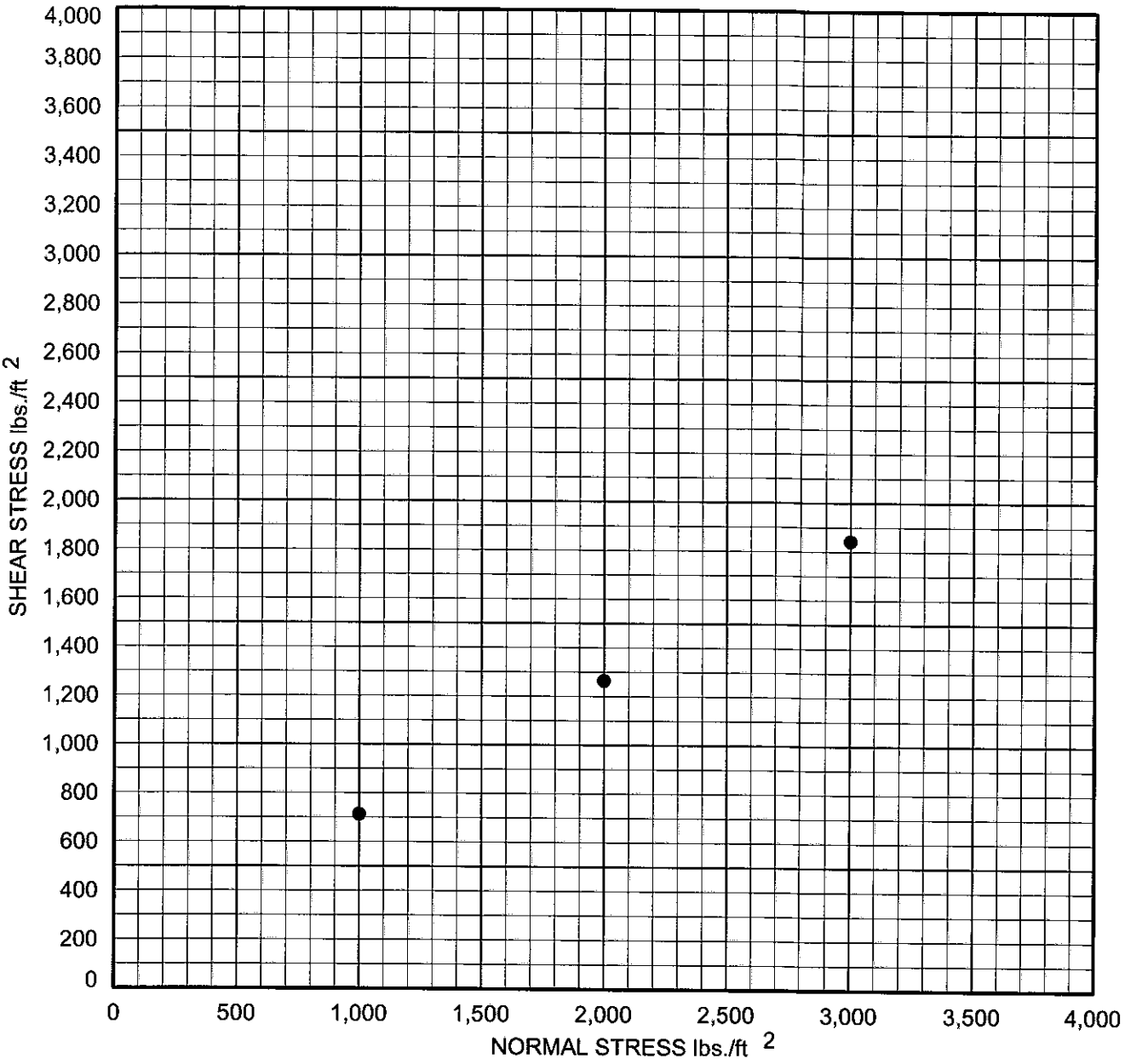
DIRECT SHEAR TEST

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-5

DIRECT SHEAR TEST
Undisturbed



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	-200 sieve (%)	group symbol	typical names
B-04	5.0	121	13.1	67	ML	Sandy Silt (Qof)

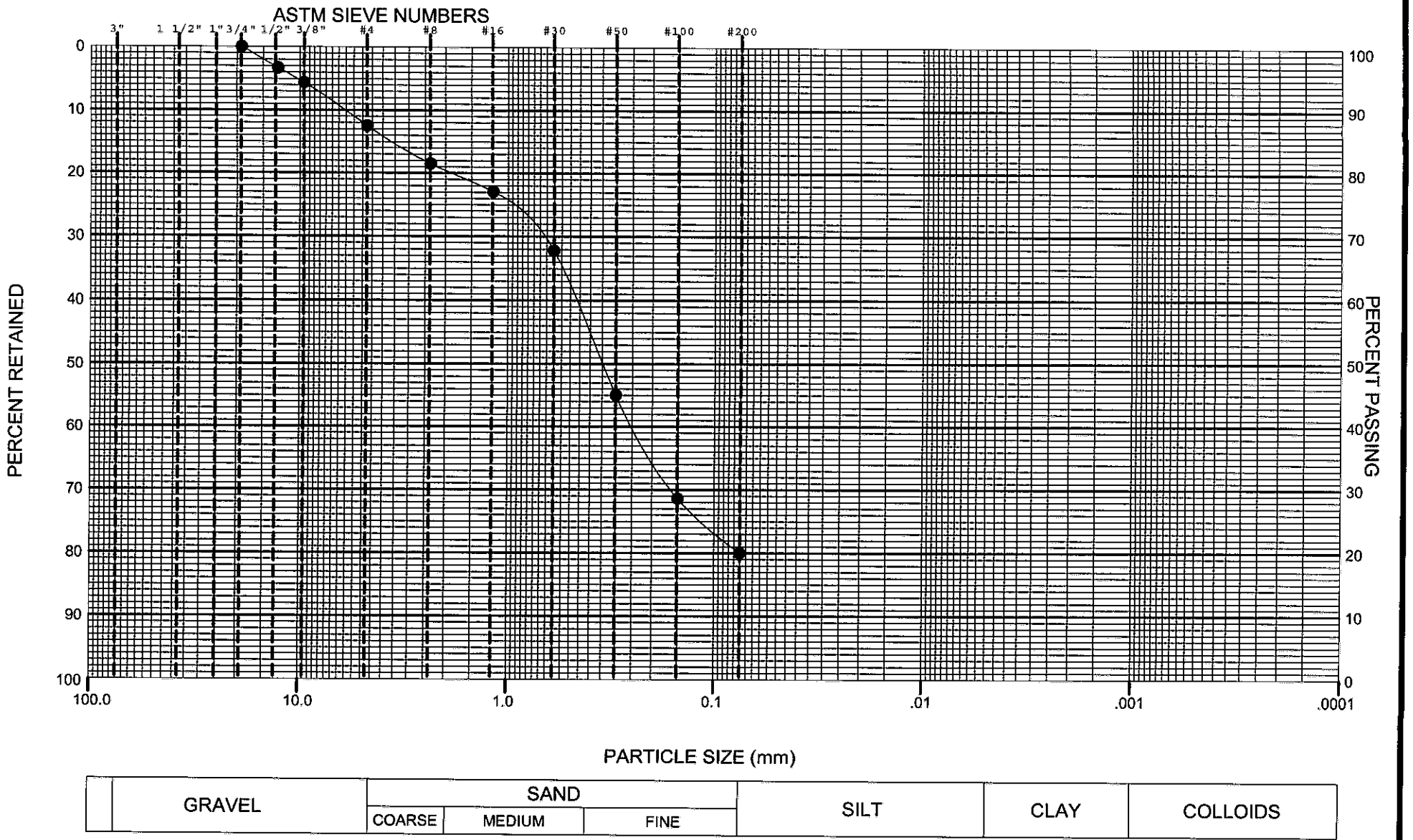
COHESION	145	psf.
FRICTION ANGLE	30.0	degrees

DIRECT SHEAR TEST

Alta California Geotechnical, Inc.

P.N. 1-0312

PLATE C-6

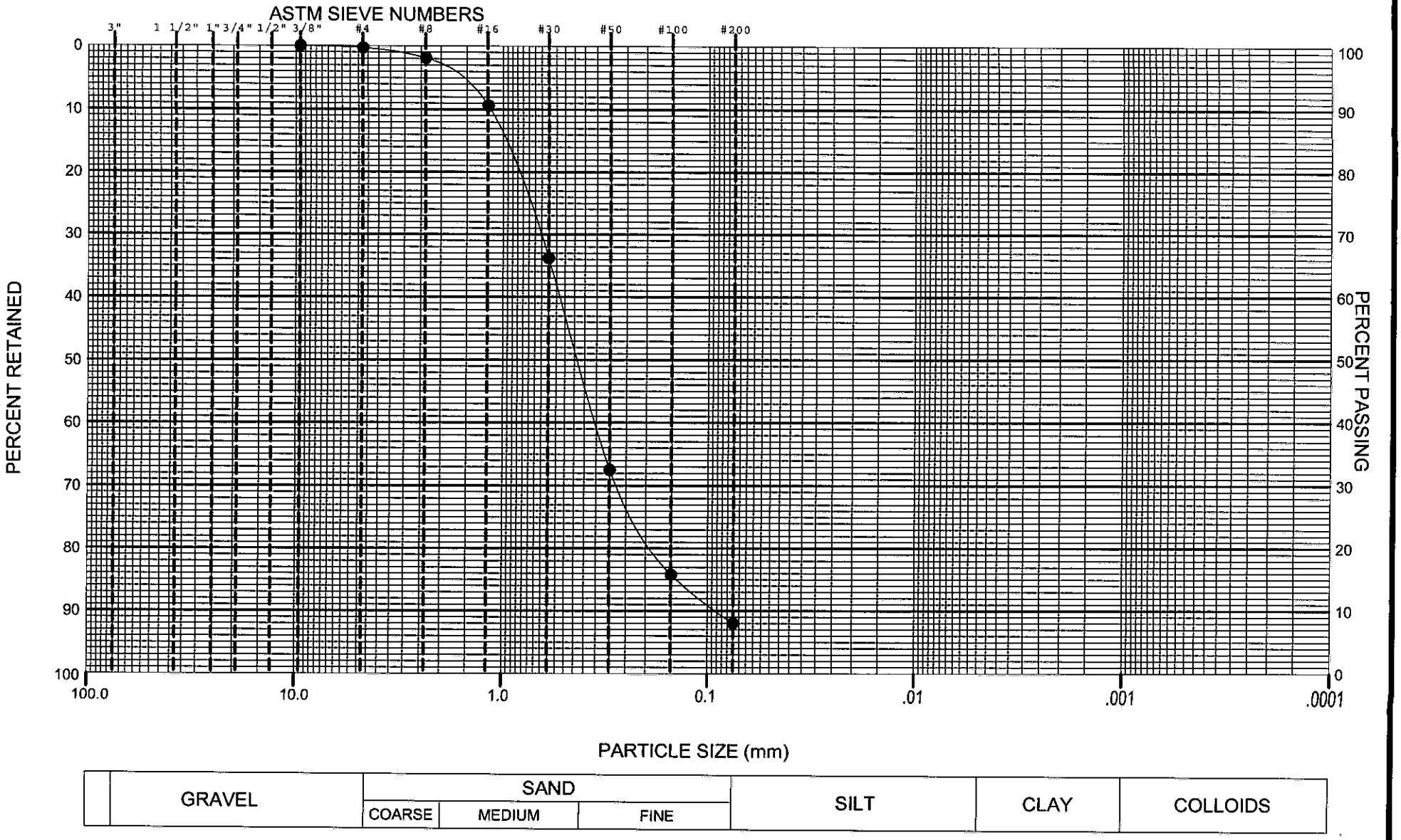


symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	B-02	30				20.0	SM	Silty Sand (Qof)

GRAIN SIZE DISTRIBUTION

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE C-7



symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	B-02	40				8.0	SP	Sand (Qof)

GRAIN SIZE DISTRIBUTION

Alta California Geotechnical, Inc.

P.N. 1-0312 PLATE C-8

APPENDIX D

Liquefaction Analysis

APPENDIX D

LIQUEFACTION ANALYSIS

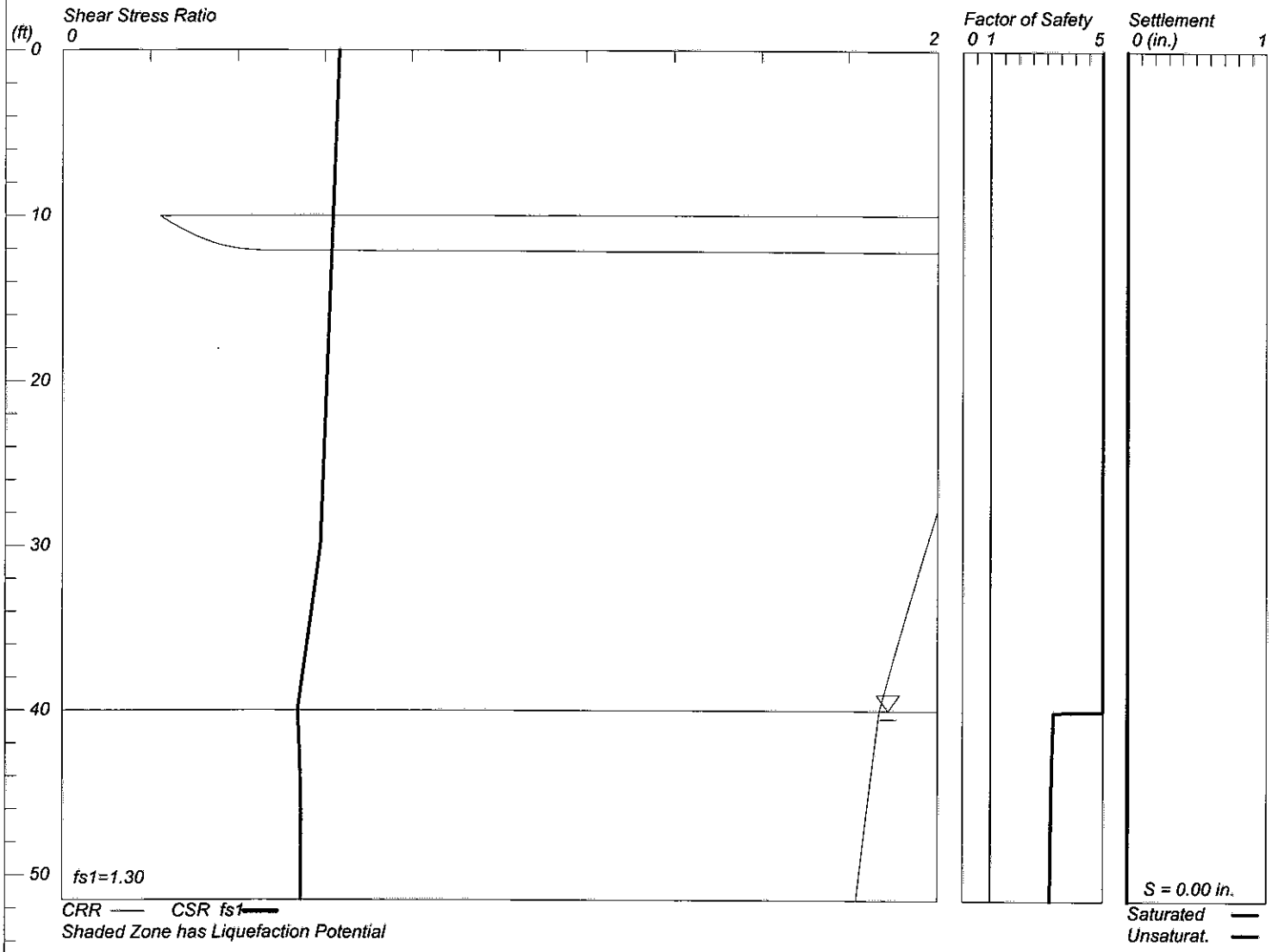
A liquefaction analysis was performed for the site based on SPT data gained from the hollow stem auger drilling. The Ishihara/Yoshimine method to analyze dynamic settlement for the SPT data. The calculations used the following constants: 0.75g for site acceleration, 7.7 for the magnitude of the earthquake, and a groundwater depth of 40 feet below existing grade. A factor of safety of 1.3 was utilized. The results are presented on Plate D-1 through D-4.

LIQUEFACTION ANALYSIS

5261 Arlington Avenue

Hole No.=B-2 Water Depth=40 ft Surface Elev.=777

Magnitude=7.7
Acceleration=0.75g

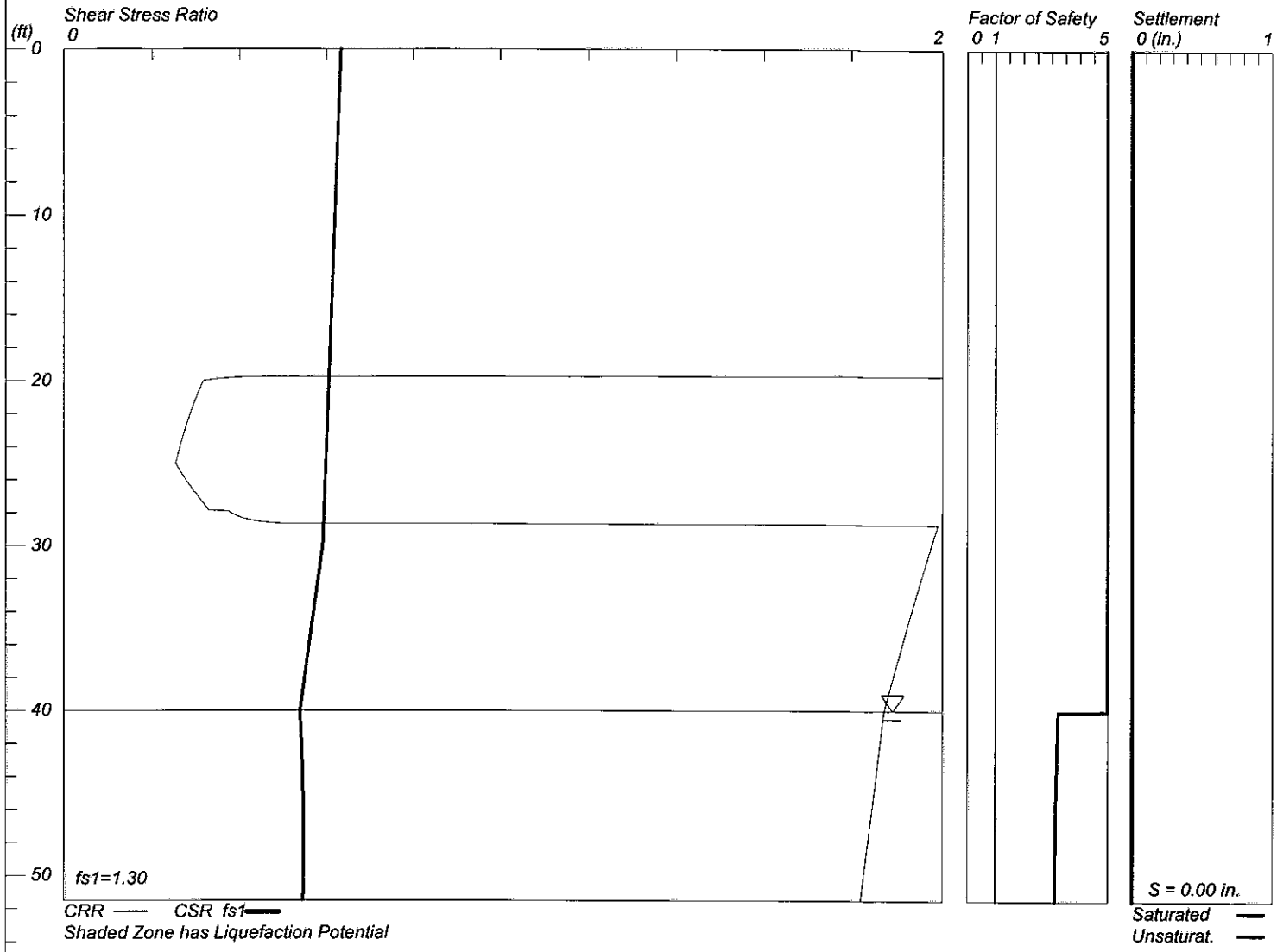


LIQUEFACTION ANALYSIS

5261 Arlington Avenue

Hole No.=B-4 Water Depth=40 ft Surface Elev.=777

Magnitude=7.7
Acceleration=0.75g

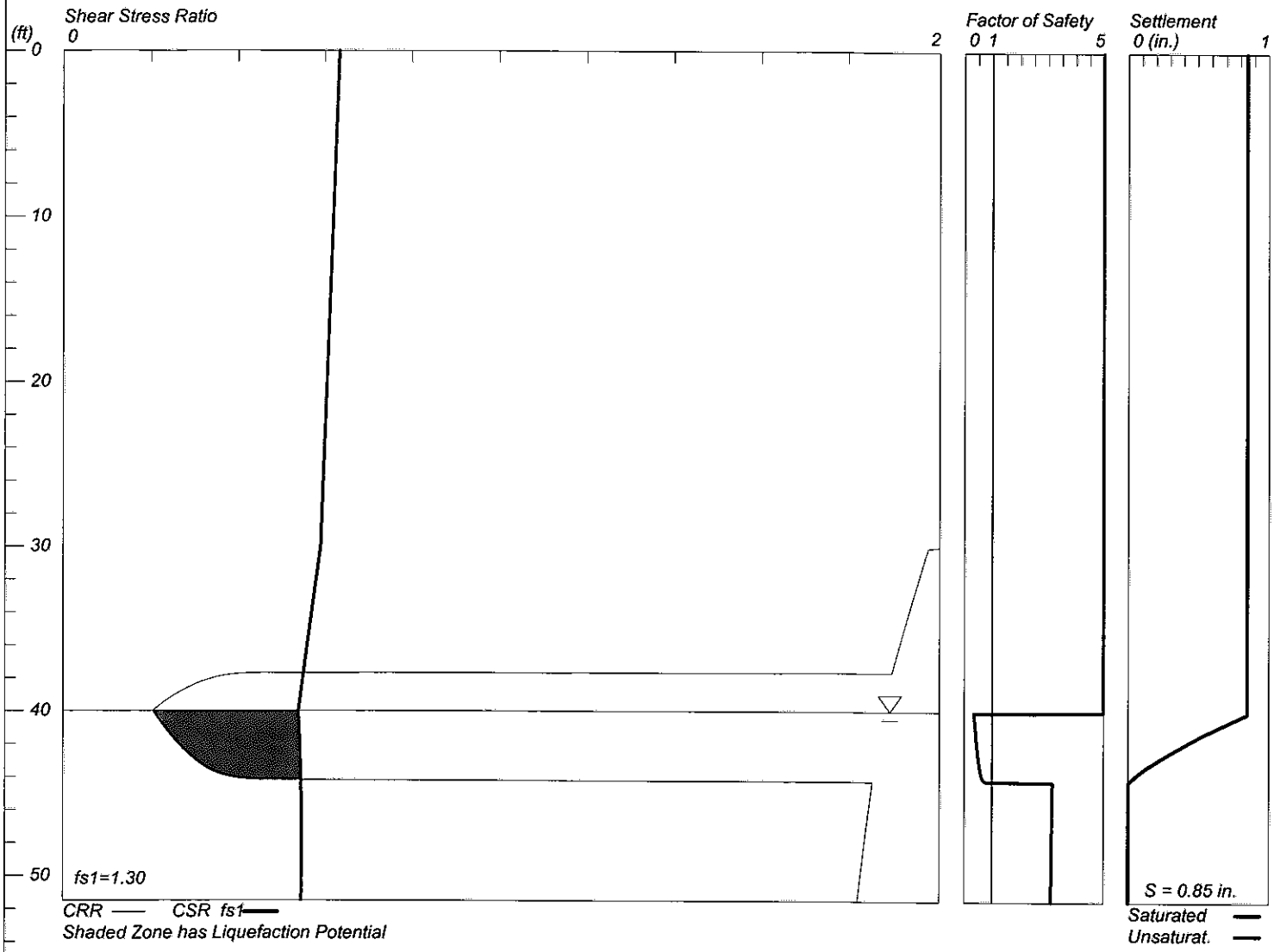


LIQUEFACTION ANALYSIS

5261 Arlington Avenue

Hole No.=B-7 Water Depth=40 ft Surface Elev.=777

Magnitude=7.7
Acceleration=0.75g

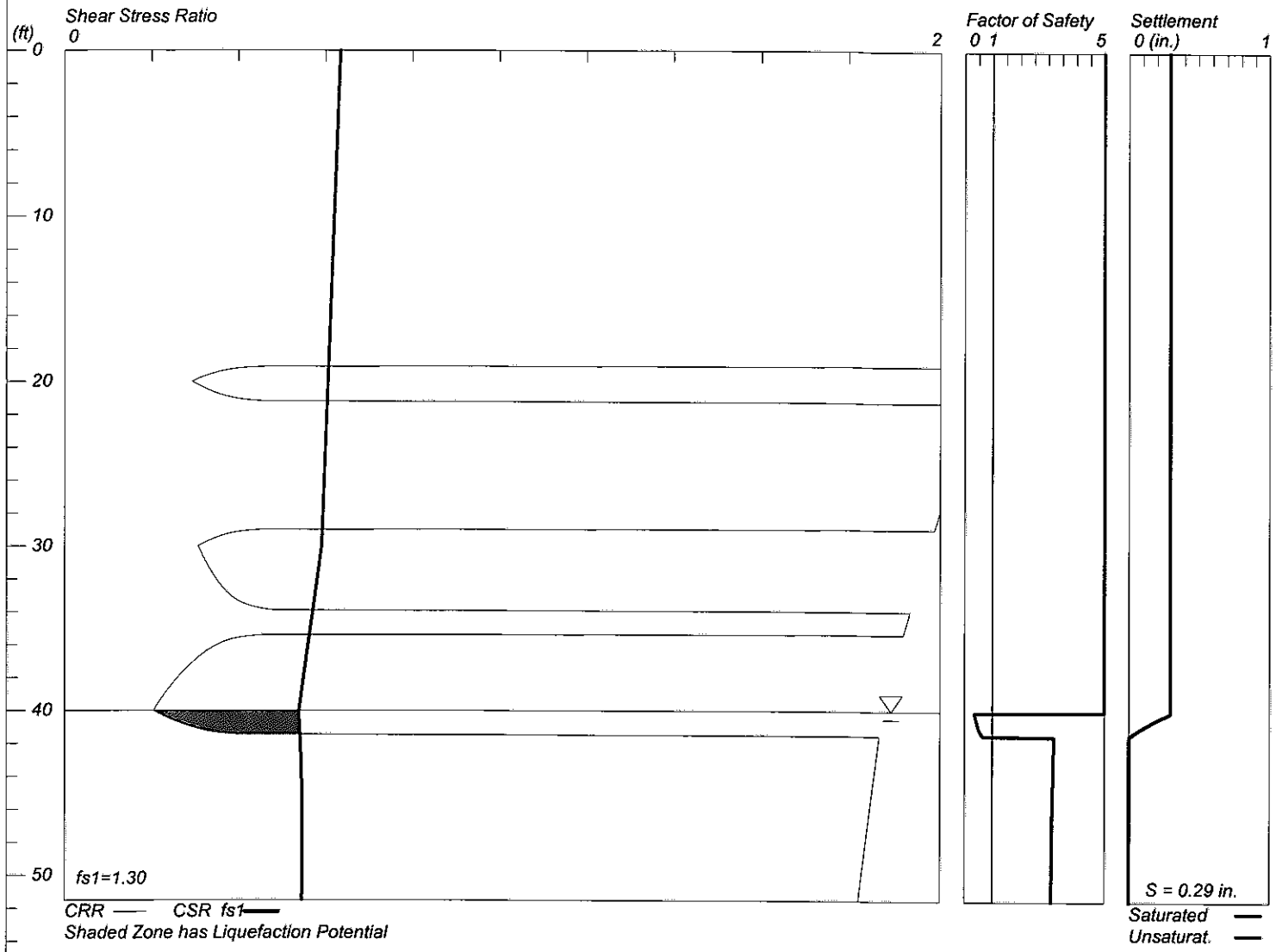


LIQUEFACTION ANALYSIS

5261 Arlington Avenue

Hole No.=B-8 Water Depth=40 ft Surface Elev.=777

Magnitude=7.7
Acceleration=0.75g



APPENDIX E

Maintenance and Improvement Considerations

MAINTENANCE AND IMPROVEMENT CONSIDERATIONS

General

Owners purchasing property must assume a certain degree of responsibility for improvements and for maintaining conditions around their home. Of primary importance from a geotechnical standpoint are maintaining drainage patterns and minimizing the soil moisture variation below all improvements. Such design, construction and owner maintenance provisions may include:

- Employing contractors for improvements who design and build in recognition of local building codes and specific site soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other improvements.
- Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- Utilizing landscaping schemes with vegetation that requires minimal watering. Watering should be done in a uniform manner, as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts that are designed to carry roof runoff directly into area drains or discharged well away from the foundation areas.
- Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively uniform moisture conditions.

Sulfates

Owners should be cautioned against the import and use of certain inorganic fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils and increase the sulfate concentrations to potentially detrimental levels.

Site Drainage

- The owners should be made aware of the potential problems that may develop when drainage is altered through construction of hardscape improvements. Ponded water, drainage over the slope face, leaking irrigation systems, overwatering, or other conditions which could lead to ground saturation must be avoided.
- No water should be allowed to flow over the slopes. No alteration of pad gradients should be allowed that would prevent pad and roof runoff from being directed to approved disposal areas.
- Drainage patterns have been established at the time of the fine grading should be maintained throughout the life of the structure. No alterations to these drainage patterns should be made unless designed by qualified professionals in compliance with local code requirements and site-specific soils conditions.

Slope Drainage

- Residents should be made aware of the importance of maintaining and cleaning all interceptor ditches, drainage terraces, down drains, and any other drainage devices, which have been installed to promote slope stability.
- Subsurface drainage pipe outlets may protrude through slope surfaces and/or wall faces. These pipes, in conjunction with the graded features, are essential to slope and wall stability and must be protected in-place. They should not be altered or damaged in any way.

Planting and Irrigation of Slopes

- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.
- It is the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.
- The resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately.
- Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful runoff and serious ground saturation must be avoided.
- If automatic sprinkler systems are installed, their use must be adjusted to account for seasonal and natural rainfall conditions.

Burrowing Animals

- Residents must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability.

Owner Improvement

Owner improvements (pools, spas, patio slabs, retaining walls, planters, etc.) should be designed to account for the terrain of the project, as well as expansive soil conditions and chemical characteristics. Design considerations on any given lot may need to include provisions for differential bearing materials, ascending/descending slope conditions, bedrock structure, perched (irrigation) water, special geologic surcharge loading conditions, expansive soil stresses, and long-term creep/settlement.

All owner improvements should be designed and constructed by qualified professionals utilizing appropriate design methodologies, which account for the on-site soils and geologic conditions. Each lot and proposed improvement should be evaluated on an individual basis.

Setback Zones

Manufactured slopes maybe subject to long-term settlement and creep that can manifest itself in the form of both horizontal and vertical movement. These movements typically are produced as a result of weathering, erosion, gravity forces, and other natural phenomenon. A setback adjacent to slopes is required by most building codes, including the California Building Code. This zone is intended to locate and support the residential structures away from these slopes and onto soils that are not subject to the potential adverse effects of these natural phenomena.

The owner may wish to construct patios, walls, walkways, planters, swimming pools, spas, etc. within this zone. Such facilities may be sensitive to settlement and creep and should not be constructed within the setback zone unless properly engineered. It is suggested that plans for such improvements be designed by a professional engineer who is familiar with grading ordinances and design and construction requirements. In addition, we recommend that the

designer and contractor familiarize themselves with the site specific geologic and geotechnical conditions on the specific lot.

APPENDIX F

Earthwork Specifications

ALTA CALIFORNIA GEOTECHNICAL, INC.
EARTHWORK SPECIFICATIONS

These specifications present the generally accepted standards and minimum earthwork requirements for the development of the project. These specifications shall be the project guidelines for earthwork except where specifically superseded in preliminary geology and soils reports, grading plan review reports or by the prevailing grading codes or ordinances of the controlling agency.

A. GENERAL

1. The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications.

2. The project Geotechnical Engineer and Engineering Geologist, or their representatives, shall provide observation and testing services, and Geotechnical consultation for the duration of the project.

3. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Geotechnical Engineer/Engineering Geologist.

4. It is the Contractor's responsibility to prepare the ground surface to receive fill to the satisfaction of the Geotechnical Engineer and to place, spread, mix, moisture condition, and compact the fill in accordance with the job specifications and as required by the Geotechnical Engineer. The Contractor shall also remove all material considered by the Geotechnical Engineer to be unsuitable for use in the construction of engineered fills.

5. The Contractor shall have suitable and sufficient equipment in operation to handle the amount of fill being placed. When necessary, equipment will be shut down temporarily in order to permit the proper preparation of fills.

B. PREPARATION OF FILL AREAS

1. Excessive vegetation and all deleterious material should be disposed of offsite as required by the Geotechnical Engineer.

   Existing fill, soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and hauled from the site. Where applicable, the Contractor may obtain the

approval of the Soils Engineer and the controlling authorities for the project to dispose of the above described materials, or a portion thereof, in designated areas onsite.

After removal of the deleterious materials have been accomplished, earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Geotechnical Engineer/Engineering Geologist.

2. Upon achieving a suitable bottom for fill placement, the exposed removal bottom shall be disced or bladed by the Contractor to the satisfaction of the Geotechnical Engineer. The prepared ground surfaces shall then be brought to the specified moisture content mixed as required, and compacted and tested as specified. In localities where it is necessary to obtain the approval of the controlling agency prior to placing fill, it will be the Contractor's responsibility to contact the proper authorities to visit the site.

3. Any underground structure such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other structures not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer and/or the controlling agency for the project.

C. ENGINEERED FILLS

1. Any material imported or excavated on the property may be utilized as fill, provided the material has been determined to be suitable by the Geotechnical Engineer. Deleterious materials shall be removed from the fill as directed by the Geotechnical Engineer.

2. Rock or rock fragments less than twelve inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets and the distribution of the rocks is approved by the Geotechnical Engineer.

3. Rocks greater than twelve inches in the largest dimension shall be taken offsite, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.

4. All materials to be used as fill, shall be tested in the laboratory by the Geotechnical Engineer. Proposed import materials shall be approved by the Geotechnical Engineer 48 hours prior to importation.

5. The fill materials shall be placed by the Contractor in lifts, that when compacted, shall not exceed six inches. Each lift shall be spread evenly and shall be

thoroughly mixed to achieve a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at or above the optimum moisture content, as determined by the applicable laboratory standard. The Contractor will be notified if the fill materials are too wet or too dry to achieve the required compaction standard.

6. When the moisture content of the fill material is below the limit specified by the Geotechnical Engineer, water shall be added and the materials shall be blended until a uniform moisture content, within specified limits, is achieved. When the moisture content of the fill material is above the limits specified by the Geotechnical Engineer, the fill materials shall be aerated by discing, blading, mixed with dryer fill materials, or other satisfactory methods until the moisture content is within the specified limits.

7. Each fill lift shall be compacted to the minimum project standards, in compliance with the testing methods specified by the controlling governmental agency, and in accordance with recommendations of the Geotechnical Engineer.

   In the absence of specific recommendations by the Geotechnical Engineer to the contrary, the compaction standard shall be the most recent version of ASTM:D 1557.

8. Where a slope receiving fill exceeds a ratio of five-horizontal to one-vertical, the fill shall be keyed and benched through all unsuitable materials into sound bedrock or firm material, in accordance with the recommendations and approval of the Geotechnical Engineer.

9. Side hill fills shall have a minimum key width of 15 feet into bedrock or firm materials, unless otherwise specified in the soil report and approved by the Geotechnical Engineer in the field.

10. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency and/or with the recommendations of the Geotechnical Engineer and Engineering Geologist.

11. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as directed by the Geotechnical Engineer and/or the governing agency for the project. This may be achieved by either overbuilding the slope and cutting

back to the compacted core; by direct compaction of the slope face with suitable equipment; or by any other procedure which produces the required result.

12. The fill portion of fill-over-cut slopes shall be properly keyed into rock or firm material; and the fill area shall be stripped of all soil or unsuitable materials prior to placing fill.

    The design cut portion of the slope should be made first and evaluated for suitability by the Engineering Geologist prior to placement of fill in the keyway above the cut slope.

13. Pad areas in cut or natural ground shall be approved by the Geotechnical Engineer. Finished surfaces of these pads may require scarification and recompaction, or over excavation as determined by the Geotechnical Engineer.

D. CUT SLOPES

1. The Engineering Geologist shall observe all cut slopes and shall be notified by the Contractor when cut slopes are to be started.

2. If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the Engineering Geologist and Soil Engineer shall investigate, analyze and make recommendations to remediate these problems.

3. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the superjacent, prevailing drainage.

4. Unless otherwise specified in specific geotechnical reports, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

5. Drainage terraces shall be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the Geotechnical Engineer or Engineering Geologist.

E. GRADING CONTROL

1. Fill placement shall be observed and tested by the Geotechnical Engineer and/or his representative during grading.

   Field density tests shall be made by the Geotechnical Engineer and/or his representative to evaluate the compaction and moisture compliance of each fill lift. Density tests shall be conducted at intervals not to exceed two feet of fill

height. Where sheepsfoot rollers are used, the fill may be disturbed to a depth of several inches. Density determinations shall be taken in the compacted material below the disturbed surface at a depth determined by the Geotechnical Engineer or his representative.

2. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture content is in evidence, that particular layer or portion thereof shall be reworked until the required density and/or moisture content has been attained. Additional fills shall not be placed over an area until the previous lift of fill has been tested and found to meet the density and moisture requirements for the project and the previous lift is approved by the Geotechnical Engineer.

3. When grading activities are interrupted by heavy rains, fill operations shall not be resumed until field observations and tests by the Geotechnical Engineer indicate the moisture content and density of the fill are within the specified limits.

4. During construction, the Contractor shall properly grade all surfaces to maintain good drainage and prevent the ponding of water. The Contractor shall take remedial action to control surface water and to prevent erosion of graded areas until such time as a permanent drainage and erosion devices have been installed.

5. Observation and testing by the Geotechnical Engineer and/or his representative shall be conducted during filling and compacting operations in order that he will be able to state in his opinion that all cut and filled areas are graded in accordance with the approved specifications.

6. Upon the completion of grading activities and after the Geotechnical Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or fill placement shall be undertaken without prior notification of the Geotechnical Engineer and/or Engineering Geologist.

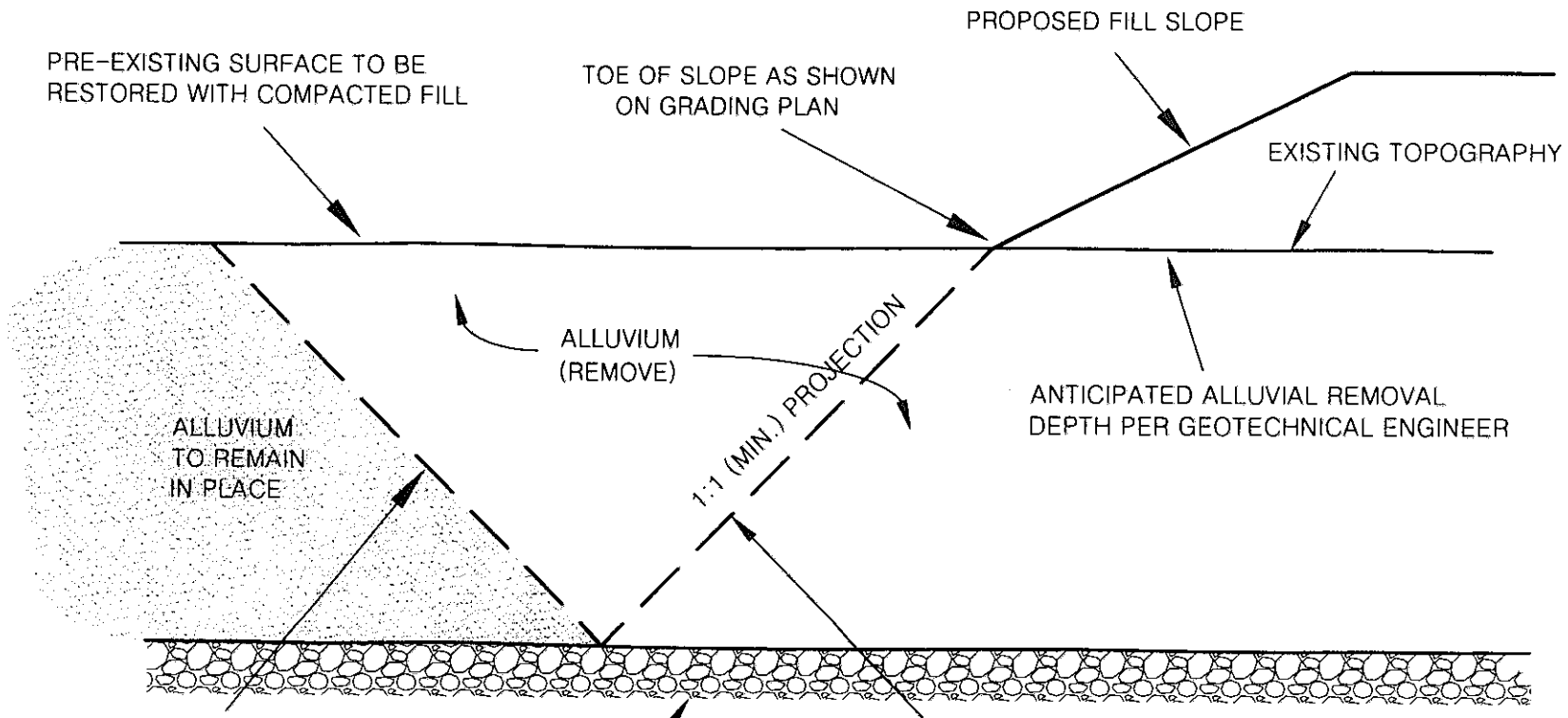
F. FINISHED SLOPES

All finished cut and fill slopes shall be planted and irrigated and/or protected from erosion in accordance with the project specifications, governing agencies, and/or as recommended by a landscape architect.

APPENDIX G

Grading Details

DETAIL FOR FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON

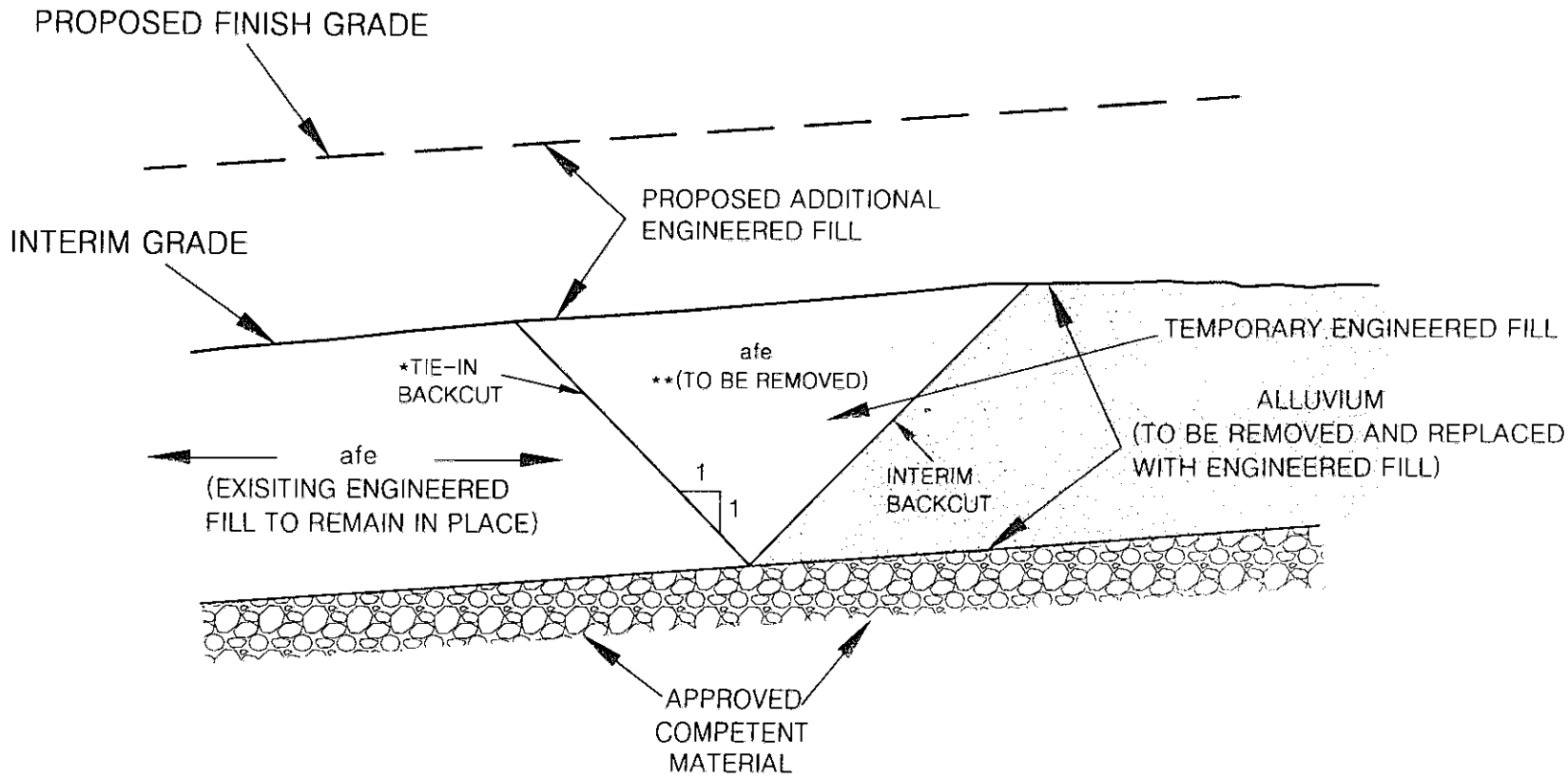


ALTA CALIFORNIA GEOTECHNICAL, INC.
VER. 3/12

PLATE G-1

PATH: C:\Users\Jinks\Desktop\Drafting\GRADING DETAILS\G-1.dwg

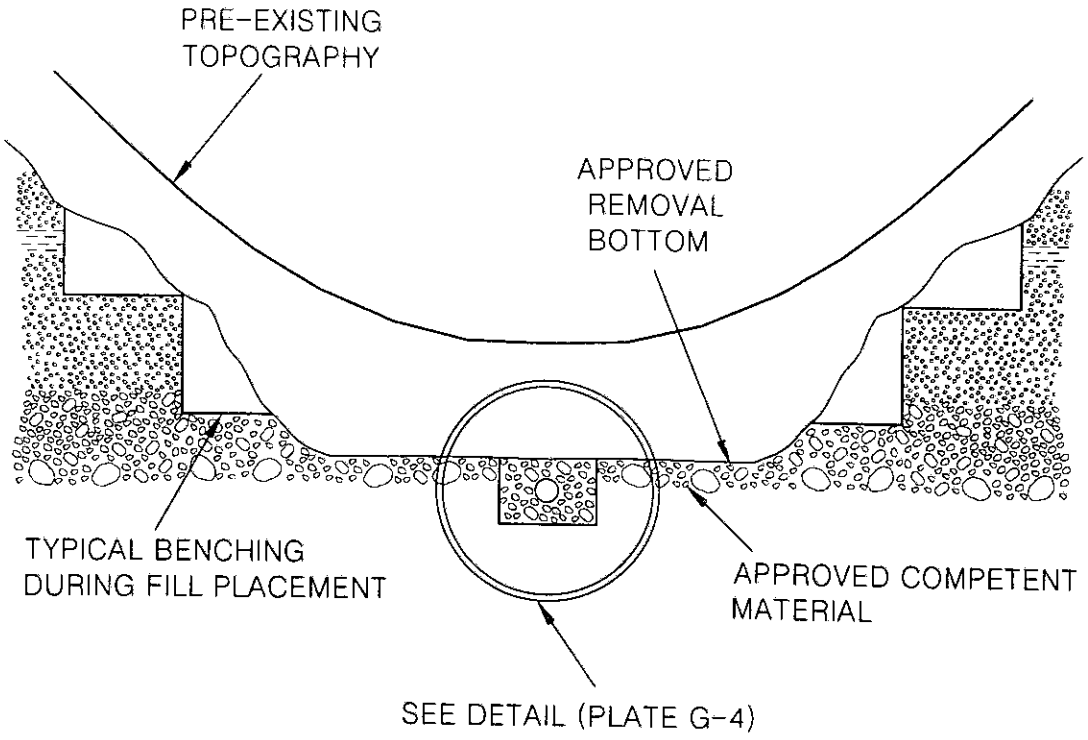
REMOVAL ADJACENT TO EXISTING FILL



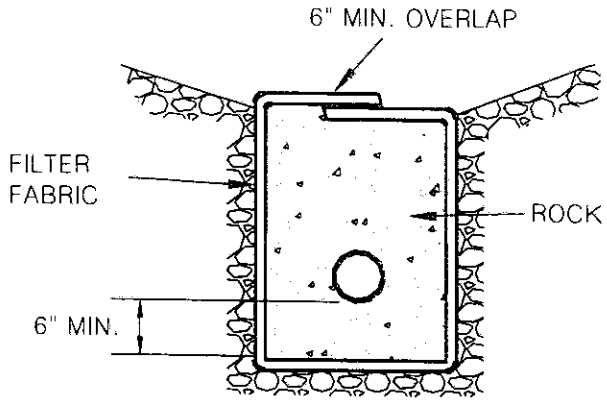
*INITIATE 1:1 TIE-IN BACKCUT TO INTERCEPT TOE OF INTERIM BACKCUT

**AS PART OF TIE-IN FOR ADDITIONAL ENGINEERED FILL

CANYON SUBDRAIN



CANYON SUBDRAIN DETAIL



PERFORATED PIPE SURROUNDED WITH ROCK AND FILTER FABRIC

ROCK: MIN. VOLUME OF 9 CU.FT. PER LINEAR FT. OF 3/4 IN. MAX. ROCK

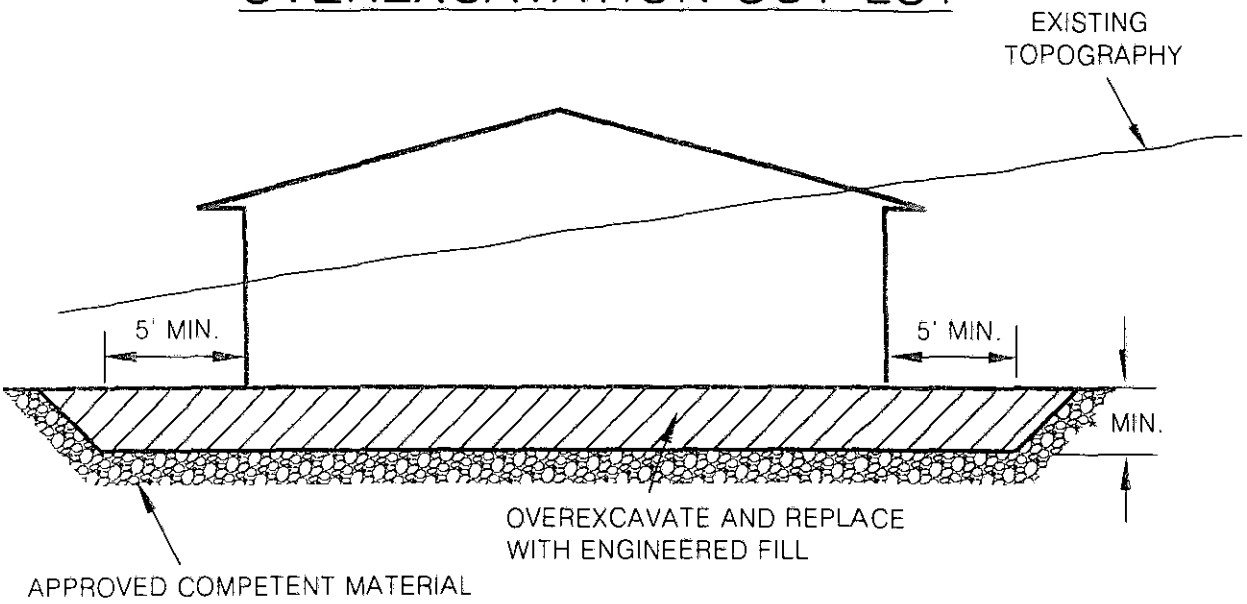
PIPE: 6 IN. ABS OR PVC PIPE WITH A MINIMUM OF 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

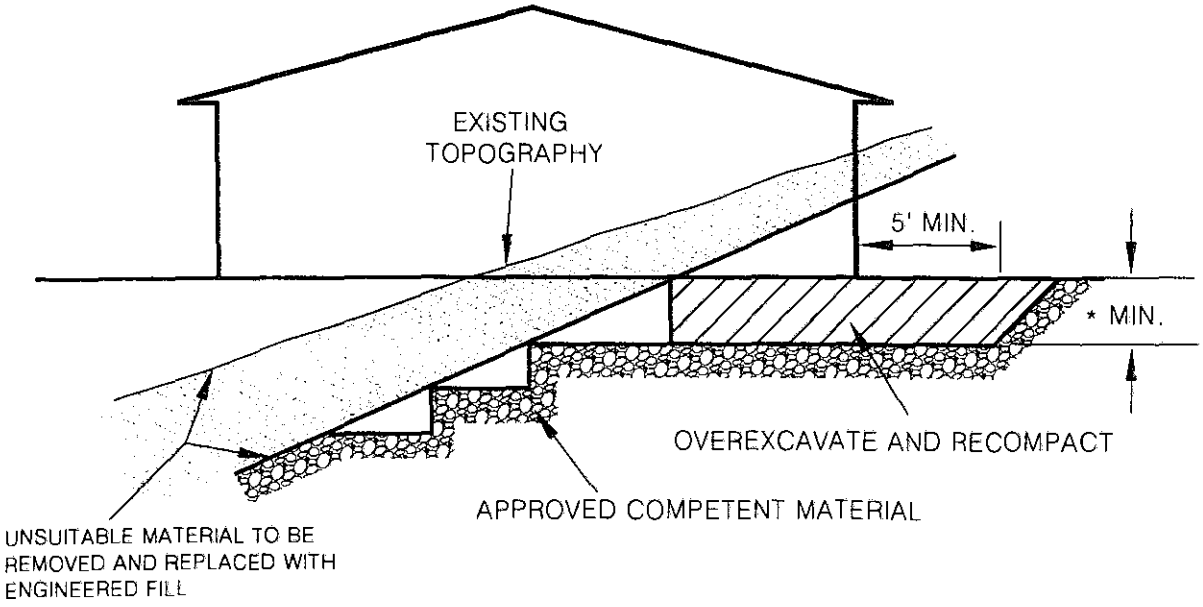
NOTES:

1. FOR CONTINUOUS RUN IN EXCESS OF 500. FT USE 8 IN. DIA. PIPE
2. ENGINEERED FILL PLACED BELOW DRAINS SHALL BE COMPACTED TO 93% OF THE LABORATORY MAXIMUM DRY DENSITY (ASTM:D1557)

OVEREXCAVATION CUT LOT



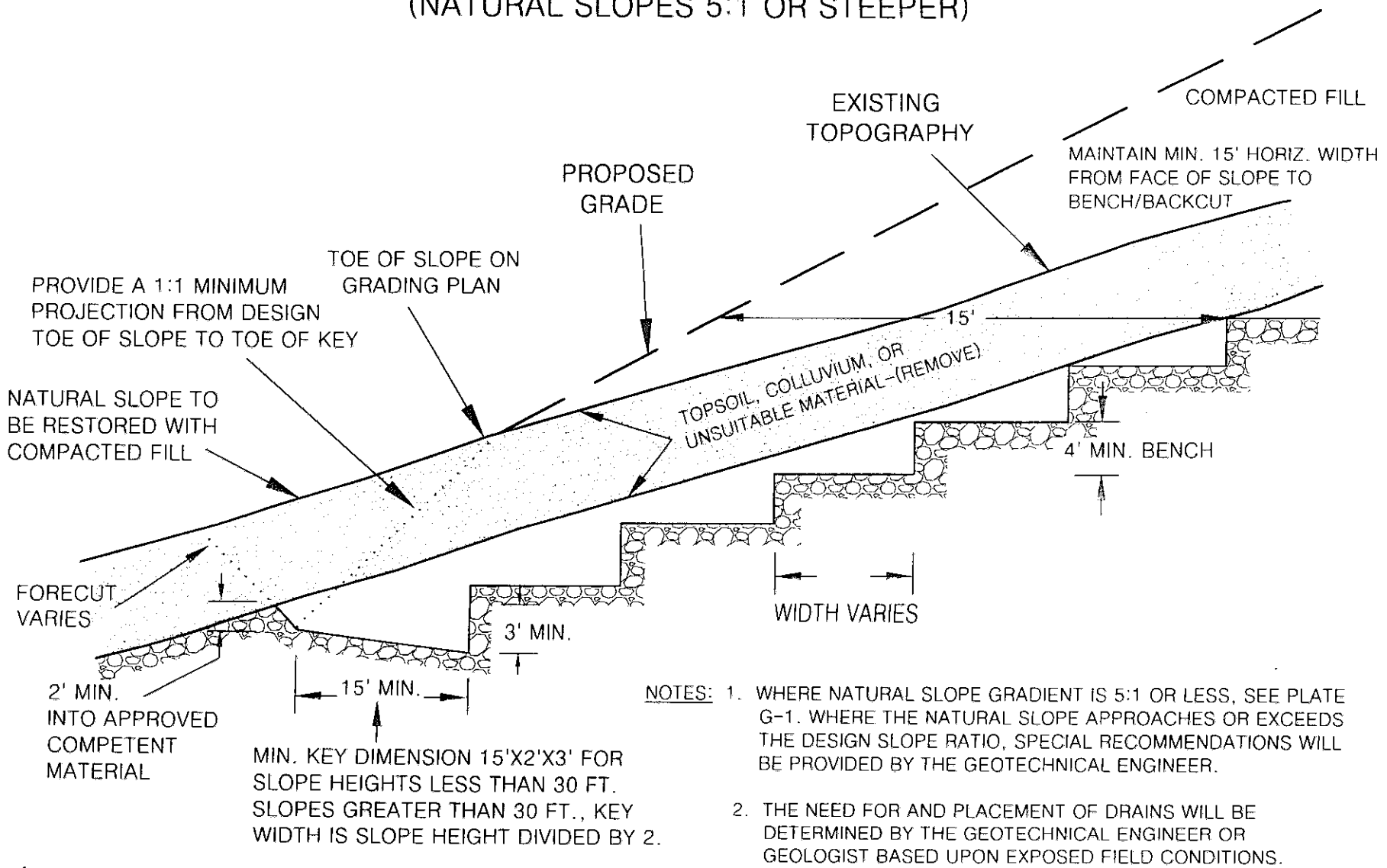
CUT-FILL LOT (TRANSITION)



*NOTE ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF ⅓ OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET (SEE PLATE G-16)

SIDE HILL SLOPE FILL DETAIL

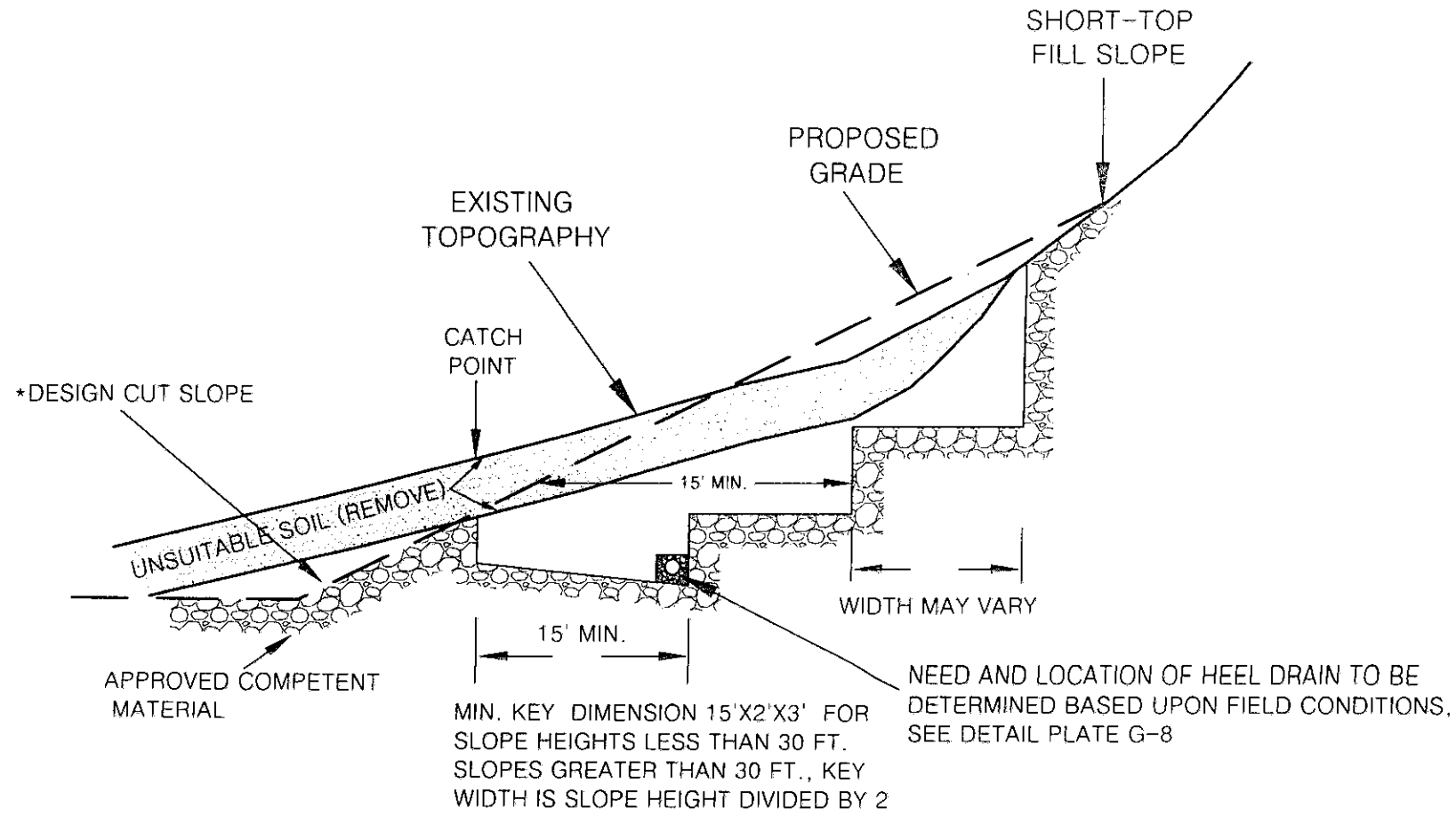
(NATURAL SLOPES 5:1 OR STEEPER)



NOTES:

1. WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, SEE PLATE G-1. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.
2. THE NEED FOR AND PLACEMENT OF DRAINS WILL BE DETERMINED BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST BASED UPON EXPOSED FIELD CONDITIONS.

FILL OVER CUT SLOPE DETAIL

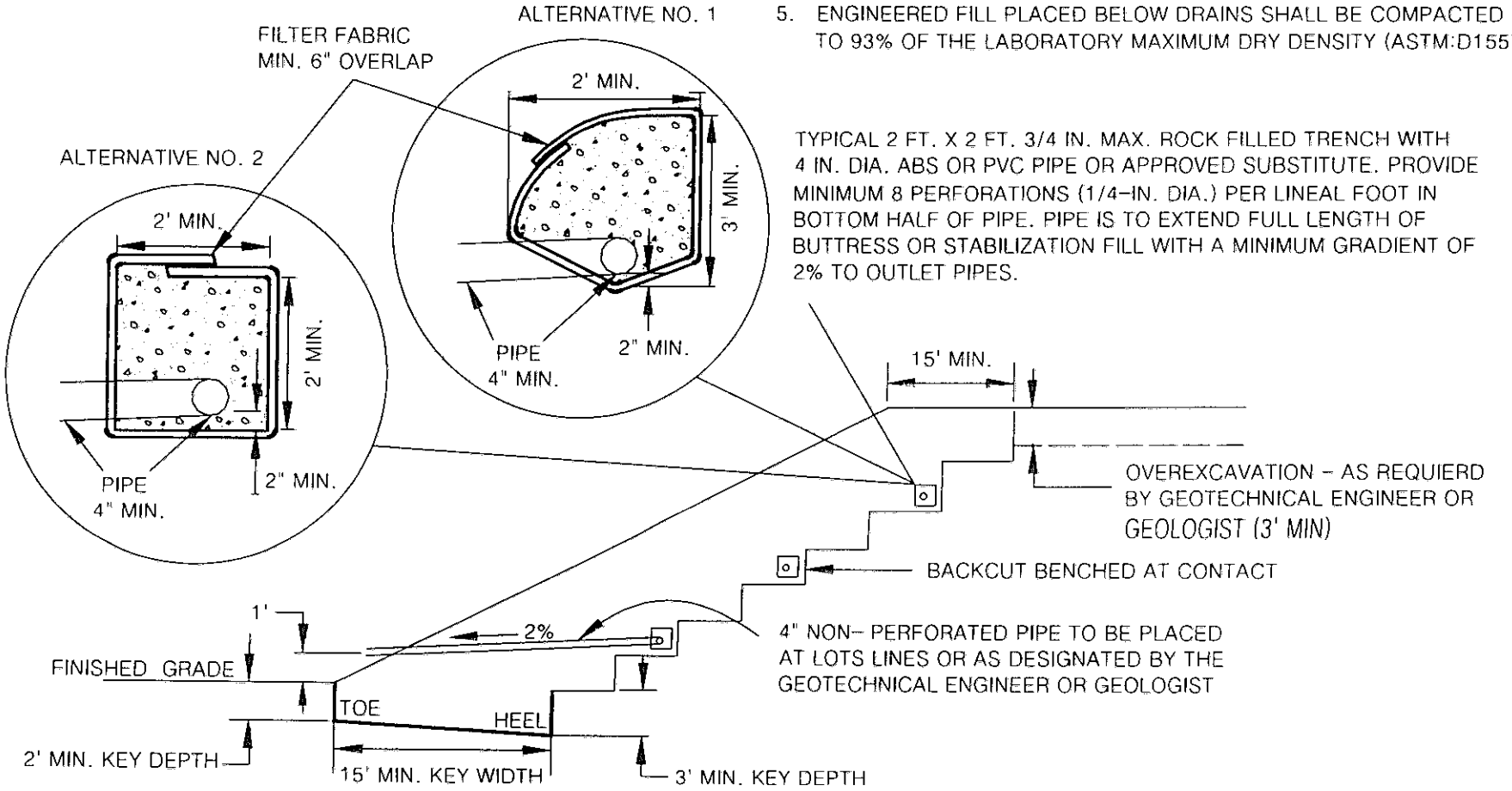


*THE CUT PORTION OF THE SLOPE SHOULD BE EXCAVATED AND EVALUATED BY THE ENGINEERING GEOLOGIST/GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTING THE FILL SLOPE

STABILIZATION/BUTTRESS FILL BACKDRAIN

NOTE:

1. ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40
2. SOLID PIPE OUTLETS TO BE PROVIDED EVERY 100 FT. AND JOINED TO PERFORATED BACKDRAIN PIPE WITH "L" OR "T"s. MIN. 2% GRADIENT.
3. GRAVEL TRENCH TO BE FILLED WITH 3/4 IN. MAXIMUM ROCK
4. THE NECESSITY FOR UPPER TIER BACKDRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST. UPPER TIER OUTLETS SHOULD DRAIN INTO PAVED TERRACE DRAINS.
5. ENGINEERED FILL PLACED BELOW DRAINS SHALL BE COMPACTED TO 93% OF THE LABORATORY MAXIMUM DRY DENSITY (ASTM:D1557)



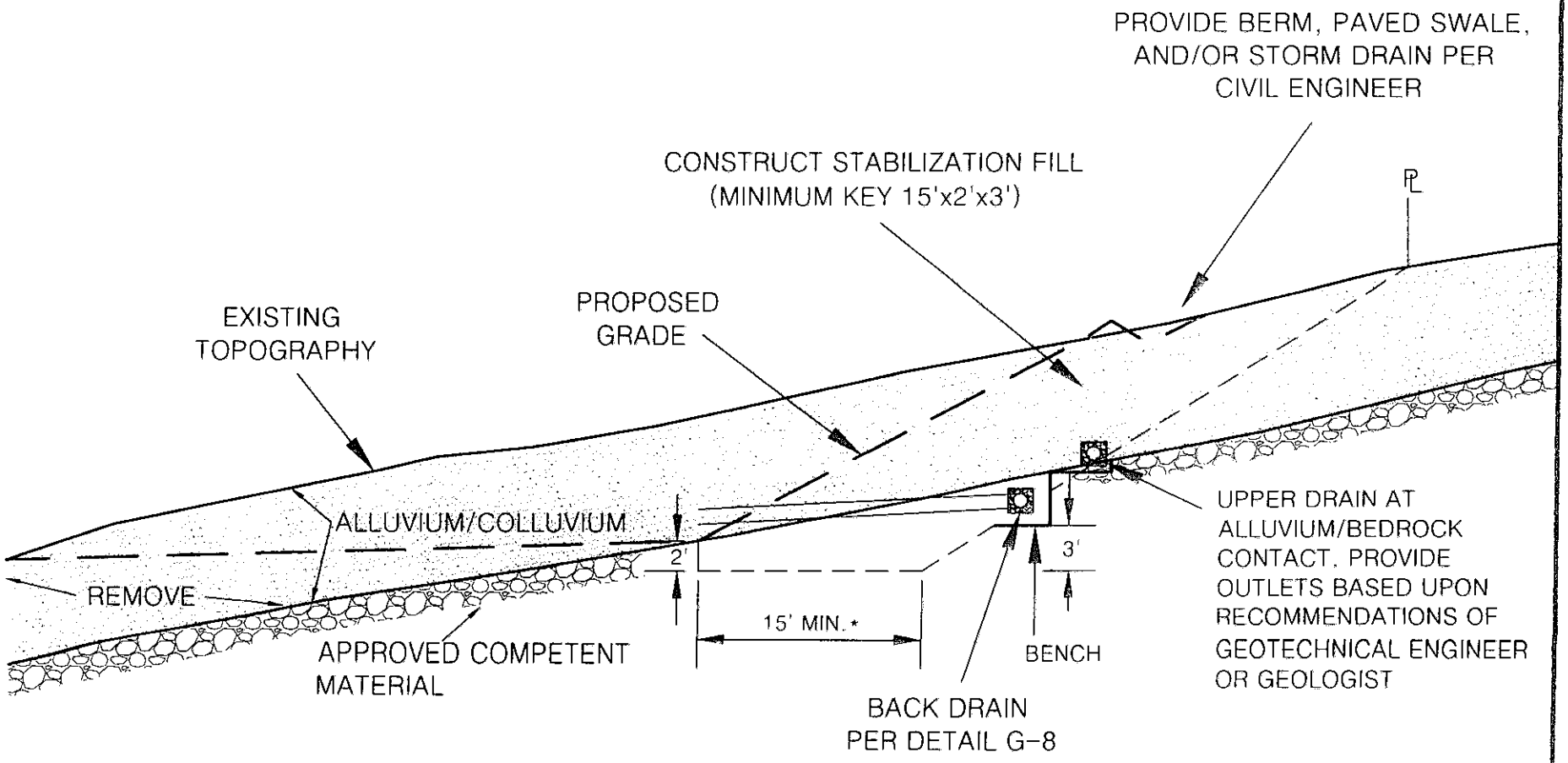
ALTA CALIFORNIA GEOTECHNICAL, INC.
VER. 3/12

PLATE G-8

PATH: C:\Users\Jinks\Desktop\Drafting\GRADING DETAILS\G-8.dwg

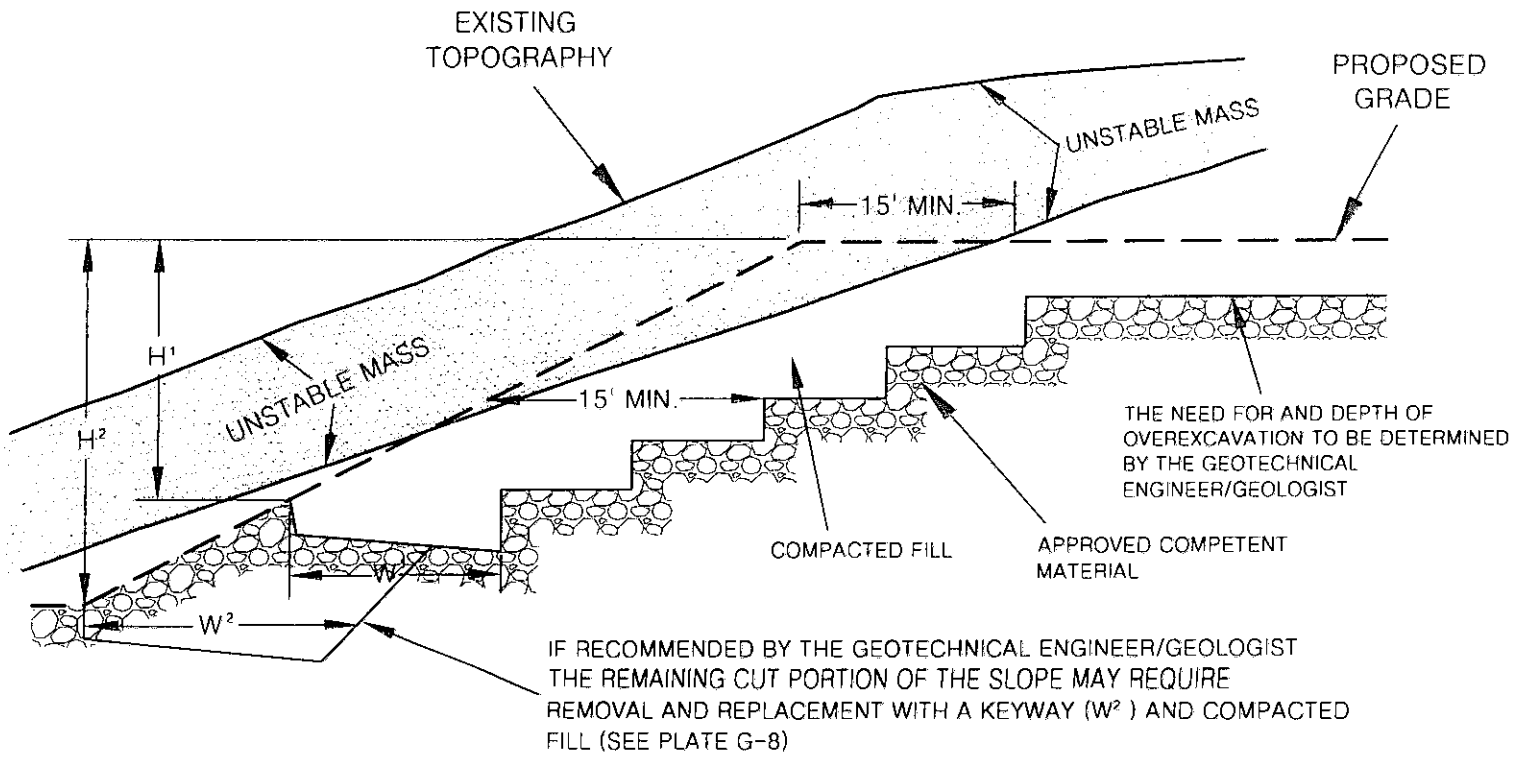
STABILIZATION FILL

(UPSLOPE ALLUVIATED AREA)



* FOR SLOPE HEIGHTS LESS THAN 30 FT. SLOPES GREATER THAN 30 FT., KEY WIDTH IS SLOPE HEIGHT DIVIDED BY 2

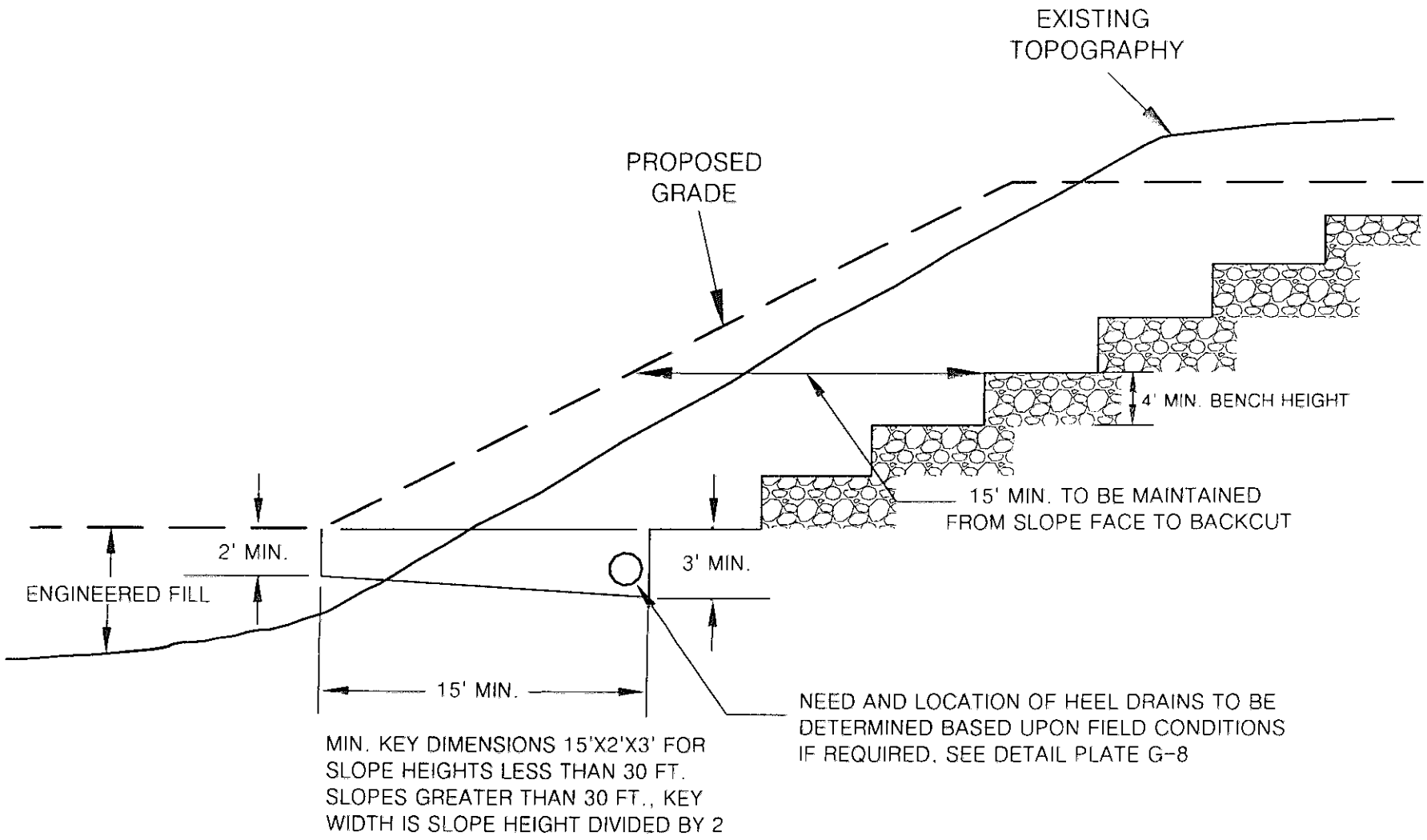
SELECTIVE GRADING DETAIL FOR STABILIZATION FILL
UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE



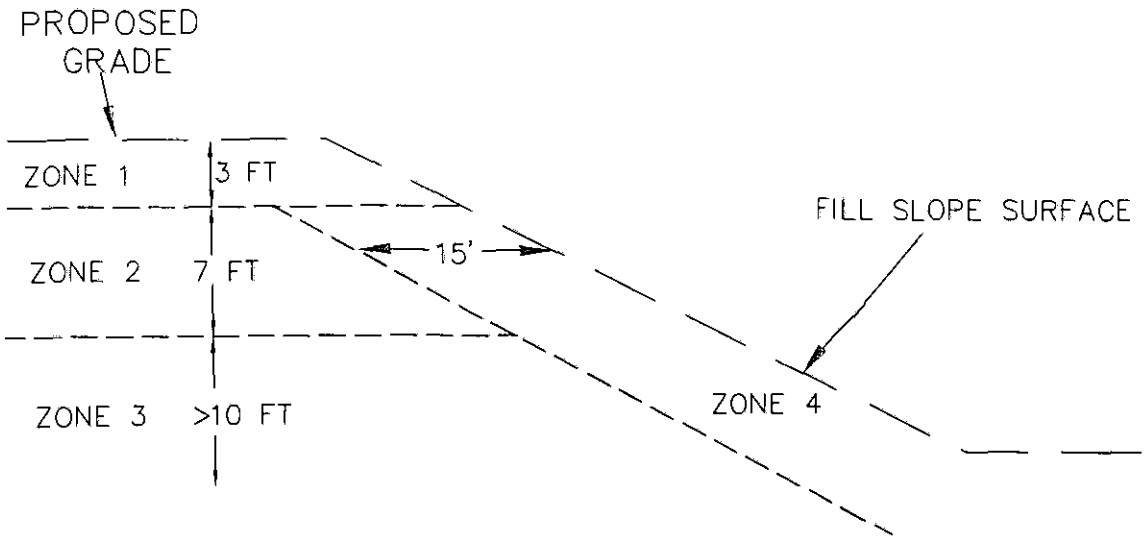
NOTES: 1. BACKDRAINS ARE NOT REQUIRED UNLESS SPECIFIED.

2. "W" SHALL BE EQUIPMENT WIDTH (15') FOR SLOPE HEIGHT LESS THAN 25 FEET. FOR SLOPES GREATER THAN 25 FEET, "W" SHALL BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER/GEOLOGIST. AT NO TIME SHALL "W" BE LESS THAN H/2.

SKIN FILL SLOPE OVER NATURAL GROUND



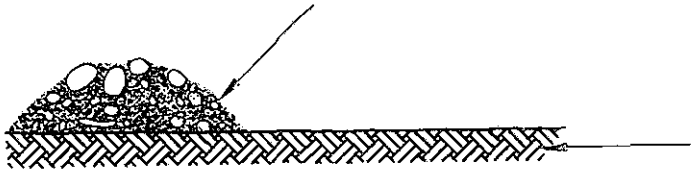
DETAIL FOR MAXIMUM PARTICLE DIMENSION



ZONE	DEPTH	PARTICLE MAX. DIMENSION	PLACEMENT METHOD
1	0-3 ft.	≤1.0 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)
2	3-10 ft.	≤2.0 ft.	ROCK BLANKETS (SEE PLATE G-13)
3	>10 ft.	≤8.0 ft.	ROCK BLANKETS (PLATE G-13) ROCK WINDROW (PLATE G-14) INDIVIDUAL ROCK BURIED (PLATE G-15)
4	15 HORIZONTAL FEET FROM FILL SLOPE FACE	≤1.0 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)

ROCK BLANKET DETAILS

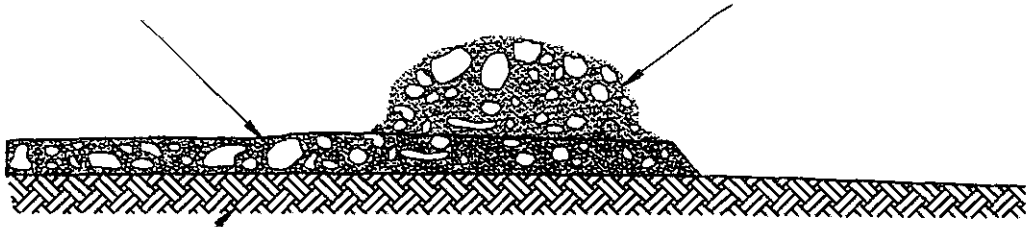
LOOSE PILE 1
LOOSE, DUMPED ROCK, GRAVEL AND SAND MIXTURE REMOVE FRAGMENTS LARGER THAT 2 FEET FOR ISOLATED BURIAL (PLATE G-15) OR WINDROW (PLATE G-10)



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

COMPACT PILE 1
SPREAD LOOSE PILE FORWARD WITH HEAVY TRACKED DOZER (D-8 OR LARGER). HEAVILY WATER, TRACK, AND APPLY ADDITIONAL SAND AND GRAVEL AS NECESSARY TO FILL VOIDS AND CREATE A DENSE MATRIX OF ROCK, COBBLES, GRAVEL AND SAND (2 FOOT MAXIMUM THICKNESS)

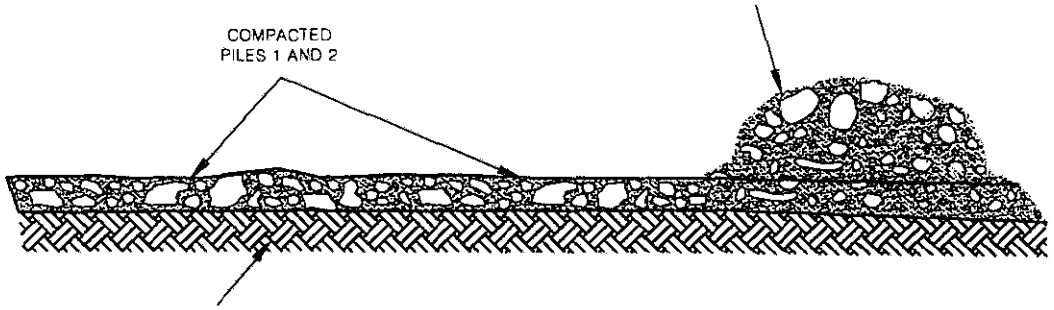
LOOSE PILE 2
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT PILE 1.



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

LOOSE PILE 3
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT EXISTING BLANKET.

COMPACTED PILES 1 AND 2

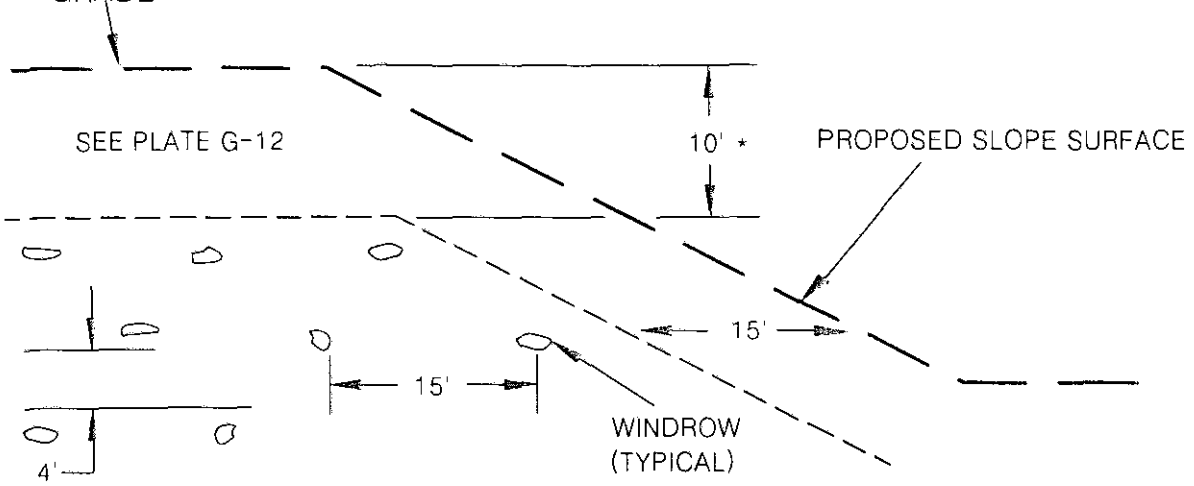


APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

OBSERVATION TESTING AND APPROVAL PROCEDURES

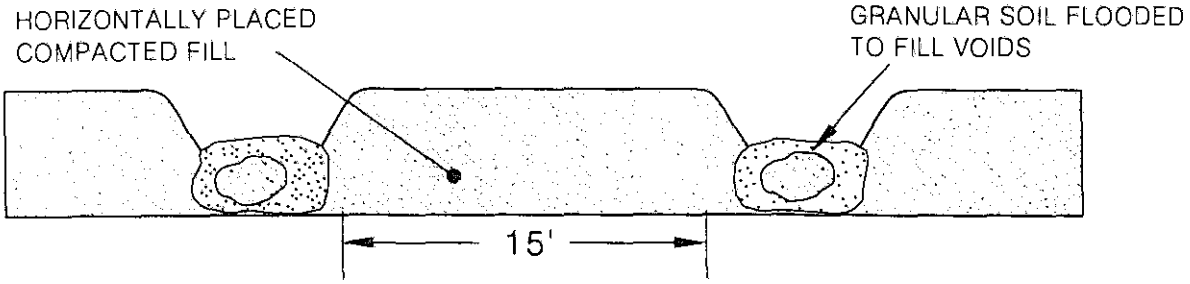
OBSERVE EQUIPMENT. SCRAPERS AND TRUCKS SHOULD BE FULLY SUPPORTED ON BLANKET WITHOUT SIGNIFICANT YIELDING. EXCAVATE TEST/OBSERVATION PITS TO CONFIRM EXISTENCE OF MIXTURE OF VARIOUS PARTICLE SIZES, WITHOUT SIGNIFICANT VOIDS, AND FORMING A DENSE, COMPACTED FILL MATRIX. TEST BY ASTM D1556, D2922 AND/OR D3017 WHEN APPROPRIATE. RECORD LIMITS AND ELEVATION OF BLANKET. ALL FILL AND COMPACTION OPERATIONS TO BE CONDUCTED UNDER THE OBSERVATION OF THE GEOTECHNICAL ENGINEER. SUBSEQUENT LIFTS TO BE APPLIED ONLY AFTER OBSERVATION AND CONFIRMATION OF SUITABILITY OF FILL AND RELEASE BY THE GEOTECHNICAL ENGINEER. BLANKETS TO BE CONSTRUCTED IN ACCORDANCE WITH PLATE G-12.

ROCK WINDROW DETAIL



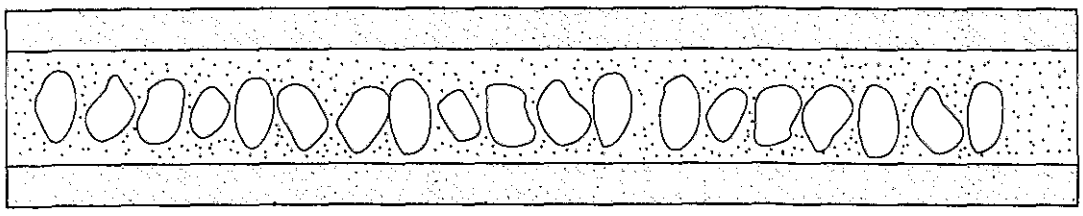
NOTE: OVERSIZED MATERIAL SHOULD BE REMOVED FROM THE 15' CLEAR ZONES WITH SPECIAL EQUIPMENT, SUCH AS A ROCK RAKE, PRIOR TO PLACING THE NEXT FILL LIFT.
*VARIANCES TO THE ABOVE ROCK HOLD DOWN MAY BE GRANTED SUBJECT TO APPROVAL BY THE OWNER, GEOTECHNICAL ENGINEER, AND GOVERNING AGENCY

TYPICAL WINDROW DETAIL (END VIEW)

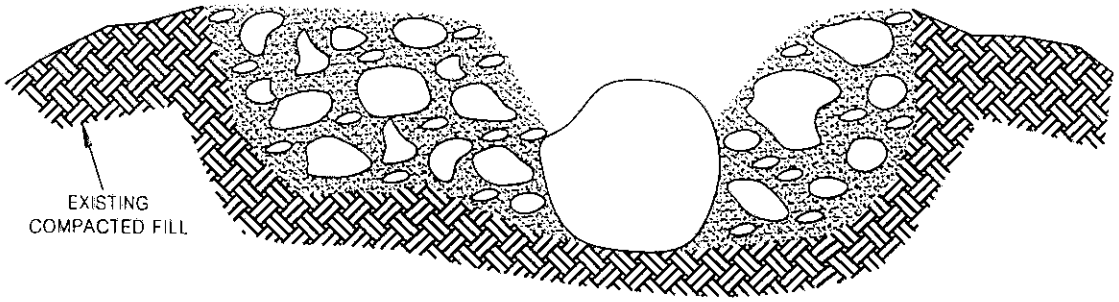


NOTE: COMPACTED FILL SHALL BE BROUGHT UP TO A HIGHER ELEVATION ALONG EACH WINDROW SO GRANULAR SOIL CAN BE FLOODED IN A "TRENCH CONDITION".

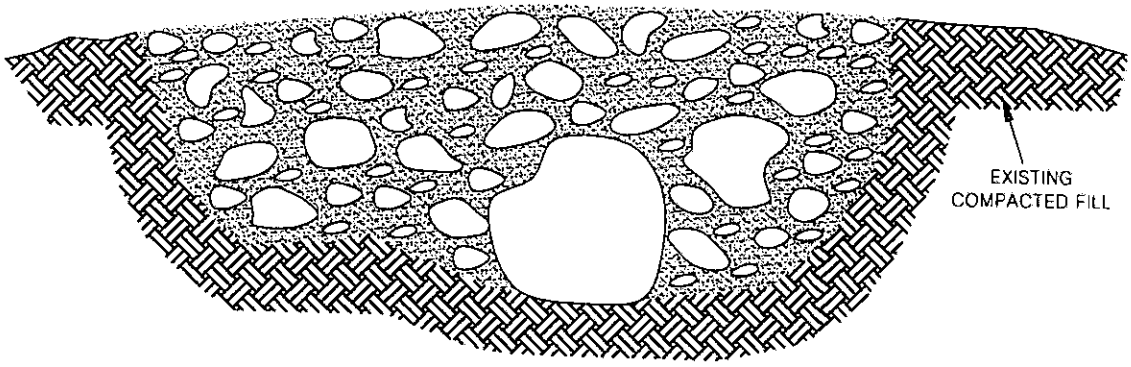
PROFILE VIEW



ISOLATED ROCK BURIAL DETAILS

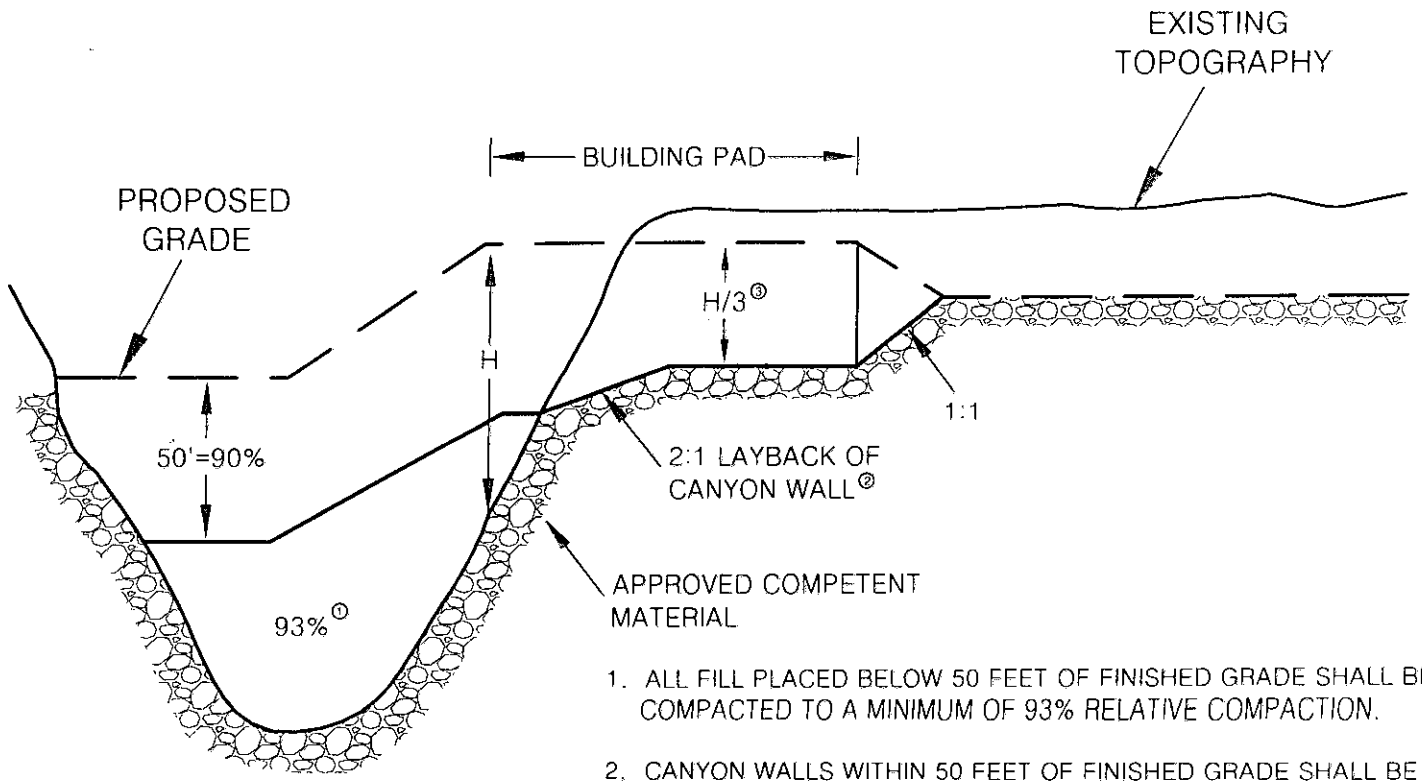


EXCAVATE HOLE INTO EXISTING FILL PRISM, PLACE BOULDER (< 8 feet in maximum dimension) INTO EXISTING COMPACTED FILL. SURROUND WITH SAND, GRAVEL, COBBLES AND WATER HEAVILY. TRACK WITH D8 OR LARGER EQUIPMENT UNTIL RESULTING FILL FULLY SUPPORTS EQUIPMENT. OBSERVE AND/OR TEST IN ACCORDANCE WITH ASTM D1556, D2922 OR D3017. ROCKS LARGER THAN 8 FEET SHALL BE FURTHER REDUCED IN SIZE BY SECONDARY BREAKING.



RELATIVE COMPACTION VS. DEPTH

CANYON WALL LAY BACK
DIFFERENTIAL FILL OVEREXCAVATION DETAILS



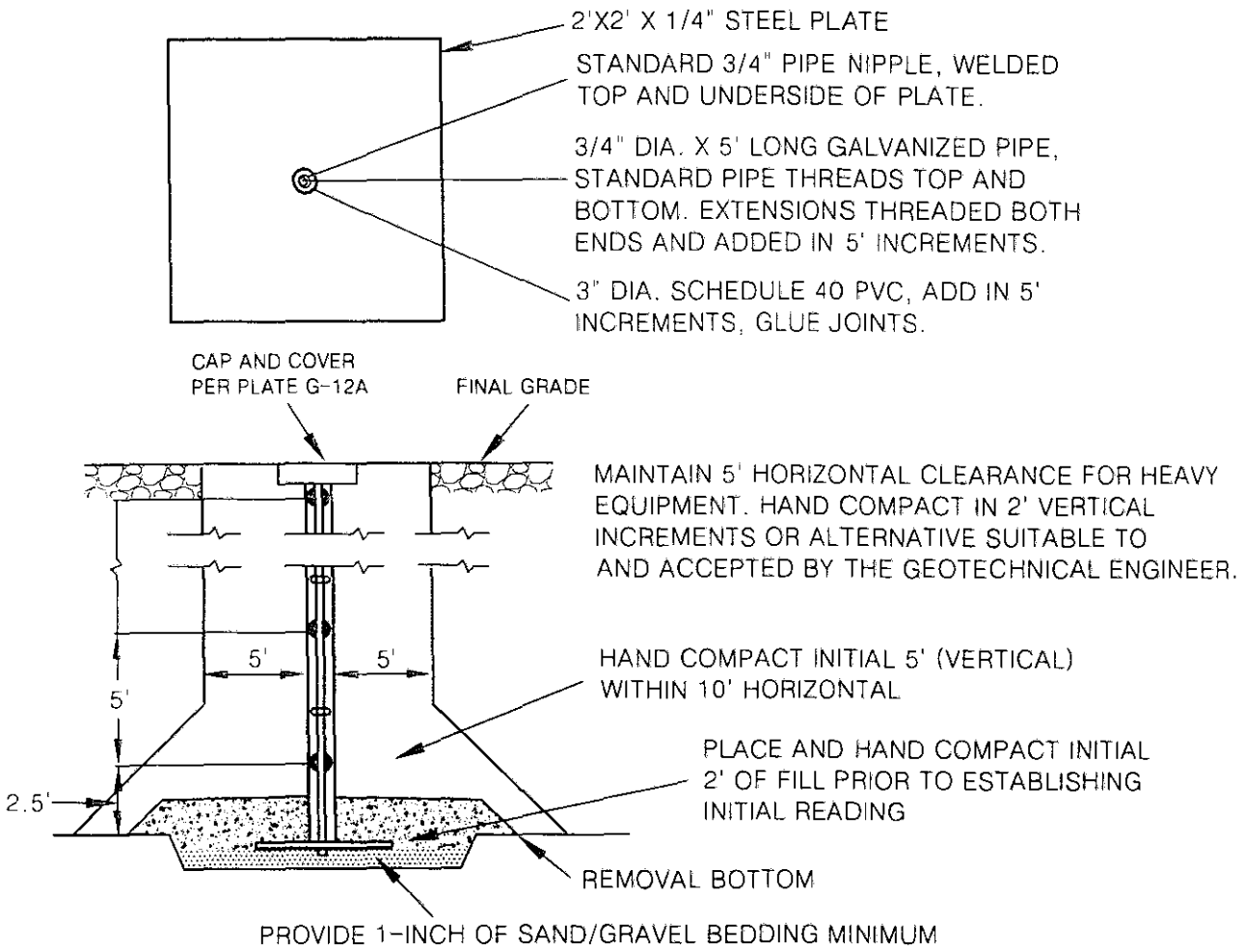
1. ALL FILL PLACED BELOW 50 FEET OF FINISHED GRADE SHALL BE COMPACTED TO A MINIMUM OF 93% RELATIVE COMPACTION.

2. CANYON WALLS WITHIN 50 FEET OF FINISHED GRADE SHALL BE LAID BACK TO A SLOPE RATIO OF 2:1 OR FLATTER.

3. ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF 1/3 OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET.

4. IF THE 2:1 LAY BACK OF THE CANYON WALL IS IMPRACTICAL, THEN AS AN ALTERNATIVE THE INCREASED COMPACTION STANDARDS IN NOTE 1 SHOULD BE EXTENDED UP TO H/3 AND THE LAY BACK WILL NOT BE REQUIRED.

SETTLEMENT PLATE DETAIL



NOTES:

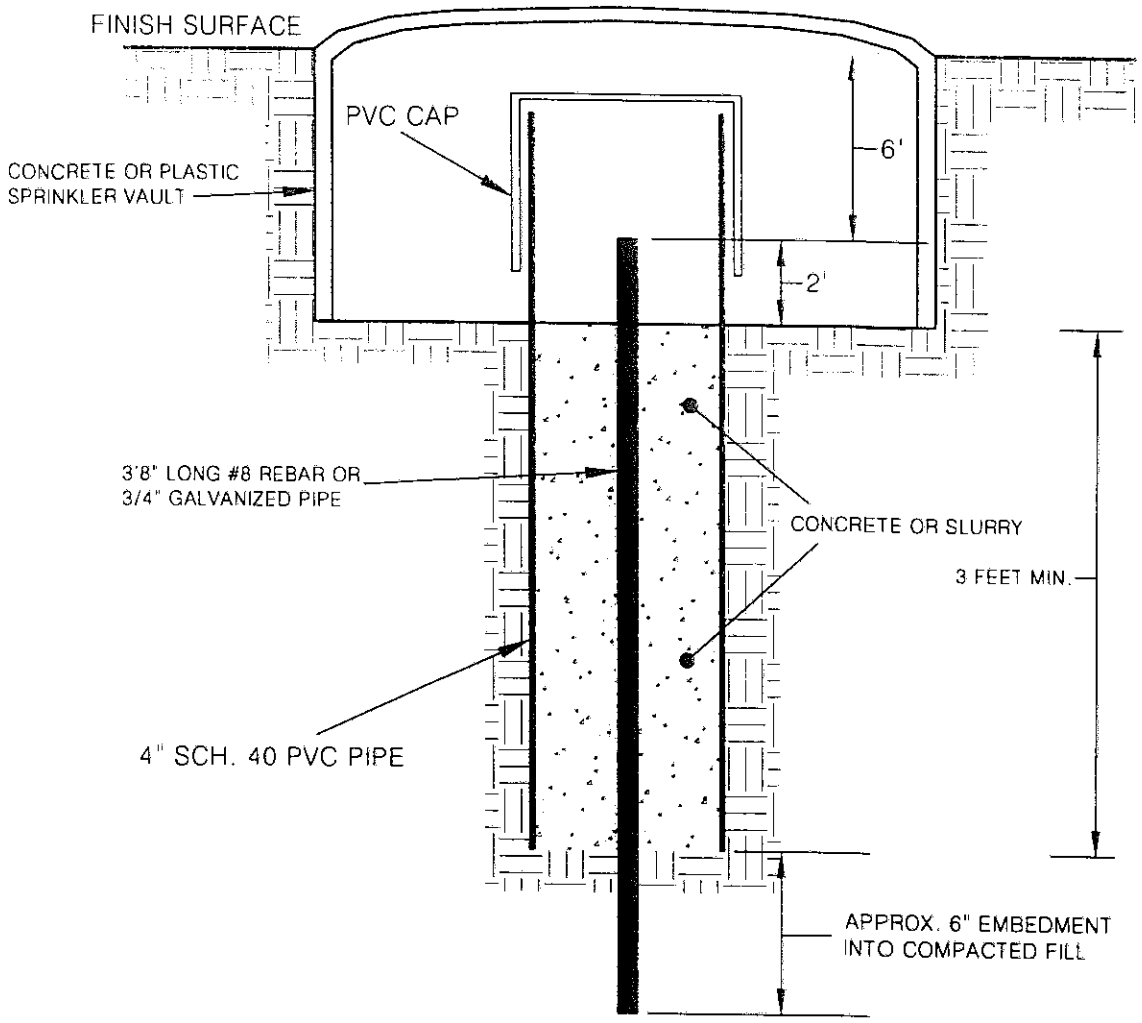
1) LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.

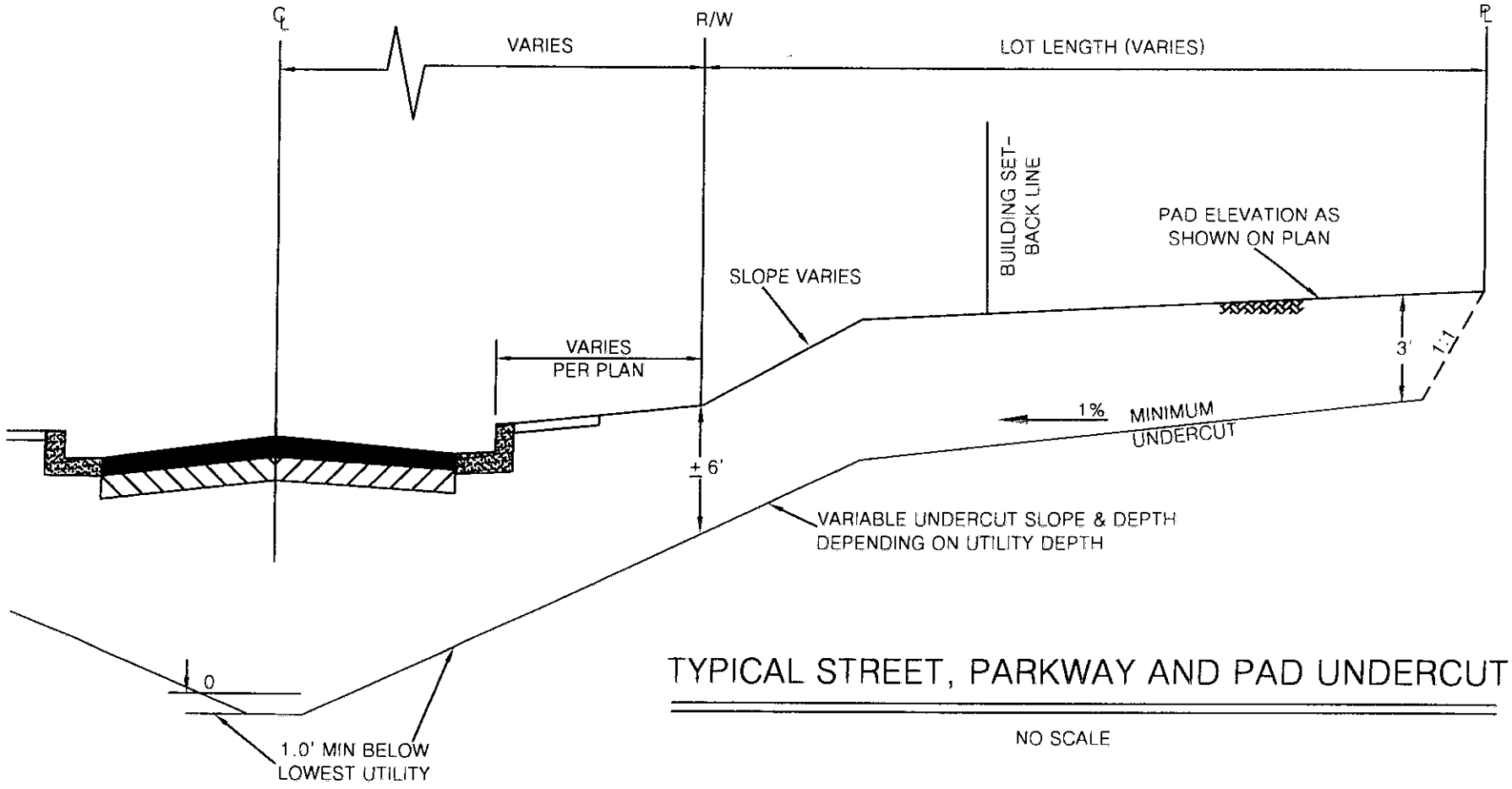
2) CONTRACTOR SHALL MAINTAIN 10' HORIZONTAL CLEARANCE FOR HEAVY EQUIPMENT WITHIN 5' (VERTICAL) OF PLATE BASE. FILL WITHIN CLEARANCE AREA SHALL BE HAND COMPACTED TO PROJECT SPECIFICATIONS OR COMPACTED BY ALTERNATIVE APPROVED BY THE GEOTECHNICAL ENGINEER.

3) AFTER 5' (VERTICAL) OF FILL IS IN PLACE, CONTRACTOR SHALL MAINTAIN 5' HORIZONTAL EQUIPMENT CLEARANCE. FILL IN CLEARANCE AREA SHALL BE HAND COMPACTED (OR APPROVED ALTERNATIVE) IN VERTICAL INCREMENTS NOT TO EXCEED 2 FEET.

4) IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION RESULTING FROM EQUIPMENT OPERATING WITHIN PRESCRIBED CLEARANCE AREA, CONTRACTOR SHALL IMMEDIATELY NOTIFY GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATE AND EXTENSION RODS TO WORKING ORDER.

SURFACE SETTLEMENT MONUMENT DETAIL





TYPICAL STREET, PARKWAY AND PAD UNDERCUT

NO SCALE

ALTA CALIFORNIA GEOTECHNICAL, INC.
VER. 3/13

PLATE G-19

PATH:C:\Users\Jinks\Desktop\Drafting\GRADING DETAILS\G-19.dwg

5261 Arlington Ave | Riverside, CA 92504

SCALE: 1" = 100'

Unit Mix	Units	%	Space per DU	Parking Spaces Req.
1BR	128	36%	1.5	192
2BR	115	32%	2	230
3BR	117	33%	2	234
Total	**360**	**100%**		**656**

LEGEND

afu - Artificial Fill-Undocumented

Qyf - Young Alluvial Fan Deposits (Bracketed where Buried)

Qof - Old Alluvial Fan Deposits (Bracketed where Buried)

B-1 - Approx. Location of Boring

P-1 - Approx. Location of Infiltration Test

- Approx. Location of Buried Geologic Contact

RETAIL TOTAL	Area
Pad 1	4,460 SF
Pad 2	11,715 SF
Total	**16,175 SF**

Parking Designation	Parking Spaces
Outdoor Walk-Up Residential	500
Tuck-under Indoor Tandem	80
Outdoor Tandem	80
Residential Parking Total	**660**
Retail Parking	**96**
Total Parking Spaces	**756**

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951)509-7090

PROJECT NUMBER:1-0312 DATE: 2-24-2020

steinberg hart | SERITAGE GROWTH PROPERTIES

RIVERSIDE | YIELD STUDY

SITEPLAN
04.10.2019