CONSTRUCTION TESTING & ENGINEERING, INC.
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955 | FAX 760.746.9806

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED LUSARDI RESIDENCE
8466 EL PASEO GRANDE
LA JOLLA, CALIFORNIA

PREPARED FOR:

LUSARDI CONSTRUCTION
ATTENTION: MR MIKE RAMSEY
1570 LINDA VISTA DRIVE
SAN MARCOS, CALIFORNIA 92078

PREPARED BY:

CONSTRUCTION TESTING & ENGINEERING, INC.
1441 MONTIEL ROAD, SUITE 115
ESCONDIDO, CALIFORNIA 92026

CTE JOB NO. 10-8264G MARCH 24, 2006

TABLE OF CONTENTS

Section Page
1.0 INTRODUCTION AND SCOPE OF SERVICES 1
1.1 Introduction 1
1.2 Scope of Services 1
2.0 SITE DESCRIPTION 1
3.0 FIELD AND LABORATORY INVESTIGATIONS 2
3.1 Field Investigations 2
3.2 Laboratory Investigation 2
4.0 GEOLOGY 3
4.1 General Setting 3
4.2 Site Geologic Conditions 3
4.2.1 Slopewash 3
4.2.3 Bay Point Formation 4
4.3 Groundwater Conditions 4
4.4 Geologic Hazards 4
4.4.1 General Geologic Hazards Observation 4
4.4.2 Local and Regional Faulting 5
4.4.3 Site Near Source Factors and Seismic Coefficients 5
4.4.4 Liquefaction and Seismic Settlement Evaluation 6
4.4.5 Tsunamis and Seiche Evaluation 6
4.4.6 Landsliding or Rocksliding 7
4.4.7 Compressible and Expansive Soils 7
4.4.8 Corrosive Soils 7
5.0 CONCLUSIONS AND RECOMMENDATIONS 8
5.1 General 8
5.2 Grading and Earthwork 8
5.3 Site Preparation 8
5.4 Site Excavations 9
5.5 Fill Placement and Compaction 9
5.6 Fill Materials 10
5.7 Temporary Construction Slopes 10
5.8 Foundations and Slab Recommendations 11
5.8.1 Foundations 12
5.8.2 Foundation Settlement 12
5.8.3 Foundation Setback 13
5.8.4 Interior Concrete Slabs 13
5.9 Lateral Resistance and Earth Pressures 13
5.10 Exterior Flatwork 15
5.11 Drainage 15
5.12 Slopes 16
5.13 Construction Observation 17

5.14 Plan Review 17
6.0 LIMITATIONS OF INVESTIGATION.....17

FIGURES

FIGURE 1 INDEX MAP
FIGURE 2 EXPLORATION LOCATION MAP

APPENDICES

APPENDIX A REFERENCES CITED
APPENDIX B FIELD METHODS AND EXPLORATION LOGS
APPENDIX C LABORATORY METHODS AND RESULTS
APPENDIX D STANDARD GRADING SPECIFICATIONS

1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

Construction Testing & Engineering, Inc. (CTE) has completed this preliminary geotechnical investigation for the proposed Lusardi residence, located at 8466 El Paseo Grande, in La Jolla, California. Figure 1 is an index map showing the approximate location of the site.

Our investigation included field exploration, laboratory testing, geologic hazard evaluation, and engineering analysis. Specific recommendations for site grading and structure design for the proposed improvements are presented in this report. Cited references are presented in Appendix A.

1.2 Scope of Services

The scope of services provided included:

- A review of available geologic and soils reports pertinent to the site and adjacent areas.
- An exploration of subsurface conditions to the depths influenced by the proposed construction.
- Laboratory testing of representative soil samples to provide data to evaluate the geotechnical design characteristics of the soils.
- Definition of the general geology and evaluation of potential geologic hazards at the site.
- Soil engineering design criteria for the proposed improvements.
- Preparation of this summary report of the investigations performed including geotechnical construction recommendations.

2.0 SITE DESCRIPTION

Based upon available site plans, proposed improvements for the currently developed residential site include razing of the existing structure in order to construct a new two-story, single-family residence and associated improvements. The residential structure is expected to be supported by

conventional shallow spread foundations with slabs-on-grade construction. Grading is expected to be limited to the elevation of the proposed structure. However, overexcavation and recompaction will be required. Figure 2 shows the general location and limits of the subject site.

3.0 FIELD AND LABORATORY INVESTIGATIONS

3.1 Field Investigations

Field explorations, conducted on February 9, 2006 included site reconnaissance and the excavation of two subsurface exploratory borings using a limited access portable drill-rig to a maximum depth of just less than twenty feet below grade (fbg). A geologist visually classified and logged soils in the field using the Unified Soil Classification system.

The field descriptions have been modified, where appropriate, to reflect laboratory test results. Exploration logs, including descriptions of the soil, are included in Appendix B. Approximate exploration locations are shown on Figure 2.

Bulk and ring soil samples were collected from the borings for geotechnical laboratory analysis. Samples collected in this manner were placed in sealed plastic bags and containers and transported to the CTE geotechnical laboratory for analysis.

3.2 Laboratory Investigation

Laboratory tests were conducted on representative soil samples for classification purposes and to evaluate physical properties and engineering characteristics. Laboratory tests performed on the soil samples included In-Place Moisture and Density, Particle-Size Analysis, Chemical Analysis,

Atterberg Limits, Consolidation, Modified Proctor and Expansion Index Testing. Test method descriptions and laboratory results are included in Appendix C.

4.0 GEOLOGY

4.1 General Setting

San Diego is located with the Peninsular Ranges physiographic province that is characterized by its northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending active regional faults. The San Diego Region can be further subdivided into the coastal plain area, a central mountain–valley area and the eastern mountain valley area. The project site is located in the coastal plain area, and is characterized by Quaternary and Tertiary-aged sedimentary deposits. The site is situated at an approximate elevation of 15 feet above mean sea level, with the general topography of the area sloping moderately towards the west.

4.2 Site Geologic Conditions

According to mapping by Tan and Kennedy (1996), soils at the site consist of units of Quaternary-aged slopewash deposits. From our investigation it appears that the soils at the site consist of slopewash deposits overlying the Quaternary Bay Point Formation.

4.2.1 Slopewash

Slopewash deposits were encountered at the surface within each of our subsurface explorations to a depth of approximately 17 fbg. These soils generally consist of stiff or medium dense, moist, medium grayish brown clayey SANDS and sandy CLAYS. Shallow, less competent slopewash material will require removal during site grading. Laboratory testing indicates that this material possess low to medium expansion potential.

4.2.3 Bay Point Formation

Quaternary-aged sedimentary deposits identified as the Bay Point Formation were encountered within our subsurface explorations beneath the slopewash. These soils generally consist of dense, saturated, medium gray and brown clayey SANDS. This material is considered adequate for support of the proposed improvements and additional engineered fill material, as recommended herein.

4.3 Groundwater Conditions

Perched groundwater was encountered within our subsurface explorations at a depth of approximately 18 fbg. Although groundwater conditions will likely vary, especially during periods of sustained precipitation, it is not expected to affect the proposed development if recommendations regarding site drainage are carried out during design and construction.

4.4 Geologic Hazards

According to the San Diego Seismic Safety Study, the project site is located within Geologic Hazard Category 52. Area 52 is characterized as level areas with favorable geologic structure, where geologic hazards are considered a low risk.

4.4.1 General Geologic Hazards Observation

From our investigation it appears that geologic hazards at the site are primarily limited to those caused by violent shaking from earthquake generated ground motion waves. The potential for damage from displacement or fault movement beneath the proposed structure should be considered low.

4.4.2 Local and Regional Faulting

The site is not located within a state of California defined Alquist-Priolo Fault Zone. However, based on our preliminary review of the city of San Diego Seismic Safety Study, it appears that a concealed segment of the Scripps Fault is mapped across the extreme northwest corner of the property. As indicated, the fault segment is mapped as concealed; therefore trenching at the site to attempt to locate the fault is not feasible. Nevertheless, based on the available information, the approximate location of the fault segment does not appear to intersect any portion of the proposed structure. Therefore, structural setbacks and/or additional design or construction restrictions due to the subject fault segment are not recommended.

The Rose Canyon Fault, approximately 0.6 kilometers to the southwest, is the closest known active fault. According to the California Division of Mines and Geology, a fault is zoned active if it displays evidence of activity in the last 11,000 years (Hart and Bryant, 1997). Other principal active regional faults include the Coronado Bank, Elsinore Fault System, Newport-Inglewood, Earthquake Valley, San Jacinto Fault System, and San Andreas Fault System.

4.4.3 Site Near Source Factors and Seismic Coefficients

In accordance with the 2001 California Building Code, Volume 2, Figure 16-2, the referenced site is located within seismic zone 4 and has a seismic zone factor of Z=0.4. The nearest active fault, the Rose Canyon Fault, is approximately 0.6 kilometers to the southwest and is considered a Type B seismic source. Based on the distance from the site

to the nearest fault, near source factors of N_V=1.6 and N_a=1.3 are appropriate. Based on the subsurface explorations and our knowledge of the area, the site has a soil profile type of S_D and seismic coefficients of C_V=1.02 and C_a=0.57.

4.4.4 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake induced shaking and behave as a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking.

The site is underlain by generally dense sedimentary materials with a relatively deep groundwater table. Therefore, it is our opinion that the potential for damage resulting at the site due to liquefaction or seismic settlement is negligible.

4.4.5 Tsunamis and Seiche Evaluation

Potential tsunami damage is not considered a significant factor at the site due to existing seawall improvements and its minimum elevation (approximately 12 feet above mean sea level). In addition, the site is not near any significant bodies of water that could induce seiche damage. However, according to McCulloch (1985) the tsunami potential in the San Diego County coastal area for one-in-100 and one-in-500 year tsunami waves are approximately four and six feet. This suggests that there is a low probability of site damage due to the elevation of the site (a minimum of approximately 12 feet above msl).

4.4.6 Landsliding or Rocksliding

The site materials are considered marginally susceptible to landsliding (Tan and Giffen, 1995). However, based upon the conditions observed during our investigation at the subject site, landsliding is not considered a significant hazard. Therefore, it is our opinion that landslides will not adversely affect the proposed improvements or adjacent properties.

4.4.7 Compressible and Expansive Soils

Based on observation and laboratory testing, it is our opinion that underlying Bay Point Formational materials are not subject to significant compressibility. Shallow slopewash deposits shall be removed and properly recompacted during site grading to eliminate compressibility.

Based on geologic observation and laboratory testing, the near surface materials at the site have low expansion characteristics (EI less than 40).

4.4.8 Corrosive Soils

We have laboratory tested soil samples for chemical composition. Based on the results, we anticipate onsite soils will have a low potential to attack Portland cement concrete improvements. In addition, resistivity testing indicates soils are moderately corrosive to buried ferrous metal improvements. Therefore, plastic piping is generally preferred, where feasible.

CTE does not practice corrosion engineering; therefore, a qualified corrosion specialist may be consulted to provide additional recommendations for protection, if deemed necessary. A summary of the laboratory chemical testing is presented in Appendix C.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

We conclude that the proposed construction on the site is feasible from a geotechnical standpoint, provided the recommendations in this report are incorporated into the design and construction of the project. Recommendations for the design and construction of the proposed improvements are included herein.

5.2 Grading and Earthwork

CTE should continuously observe any grading and earthwork operations for the project. Such observations are essential to identify field conditions that differ from those predicted by this investigation, to adjust designs to actual field conditions, and to verify that the grading is in overall accordance with the recommendations of this report. Our personnel should perform adequate observation and sufficient testing of fills during grading to support our professional opinion regarding compliance with compaction requirements and specifications.

5.3 Site Preparation

Before grading, the site should be cleared of any topsoil, existing debris, and other deleterious materials. In order to mitigate excessive potential differential settlements across the proposed building due to loose or otherwise unsuitable materials, all proposed improvement locations and

where possible five feet laterally beyond, shall be over-excavated to a depth of five feet below existing and proposed grades and a minimum two feet below the bottom of all proposed foundations. However, locally deeper removals may be necessary due to additional loose or unsuitable underlying soils.

Over-excavations should extend a minimum of five feet beyond the limits of the proposed improvements, or as far as possible. Before placing fill, exposed over-excavated areas should be observed by the geotechnical representative to verify that proper preparation has occurred. We anticipate onsite material will be suitable for use as properly placed compacted fill. However, organic materials deemed unsuitable for structural backfill should be disposed of off-site or placed in non-structural planter or landscape areas.

5.4 Site Excavations

Excavations in site materials should generally be accomplished with heavy-duty construction equipment under normal conditions. Irreducible materials greater than three inches encountered during excavations should not be used in shallow structural fills on the site. Larger oversized materials may generally be placed at depth, if proposed, in general accordance with Appendix D. Before placing fill, the exposed bottom of all excavations should be scarified, properly moisture conditioned and recompacted.

5.5 Fill Placement and Compaction

The geotechnical consultant should verify that the proper site preparation and required over-excavation have occurred before fill placement occurs. As indicated herein, areas to receive fill

or improvements should be scarified, properly moisture conditioned and recompacted. Fill and backfill should be compacted to a minimum of 93% relative compaction as evaluated by ASTM D1557 at moisture contents a minimum two percent above optimum.

The optimum lift thickness for backfill soil will be dependent on the type of compaction equipment used. Generally, backfill should be placed in uniform lifts not exceeding eight inches in loose thickness. Backfill placement and compaction should be done in overall conformance with geotechnical recommendations and local ordinances.

5.6 Fill Materials

Existing fill soils derived from on-site sources are considered suitable for reuse on the site as compacted fill, provided they are screened of organic materials and materials greater than three inches in maximum dimension. If proposed, fill slopes should be properly keyed and benched into competent underlying materials.

Imported fill beneath structures, pavements and walks should have an expansion index less than or equal to 30 (per UBC 18-I-B) with less than 35 percent passing the no. 200 sieve. Imported fill soils for use in structural or slope areas should be evaluated by the soils engineer to determine strength characteristics before placement on the site.

5.7 Temporary Construction Slopes

Provided below are slope recommendations for unshored temporary excavations. The recommended slopes should be relatively stable against deep-seated failure, but may experience

localized sloughing. The recommended slopes are based on the assumption that excavation sidewalls will consist of non-cemented silty sands and sandy silts. Shallow onsite soils are to be considered Type C with recommended slope ratios as set forth in Table 1 below.

TABLE 1
RECOMMENDED TEMPORARY SLOPE RATIOS

SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
C (Slopewash)	1.5: 1 (MAXIMUM)	10 FEET

A "competent person" must verify actual field conditions and soil type designations while temporary excavations exist according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

5.8 Foundations and Slab Recommendations

The following recommendations are for preliminary planning purposes only. These recommendations should be reviewed after completion of earthwork to verify that conditions exposed are as anticipated. As indicated, moderately or more expansive site soils are not generally anticipated at finish grades. Post-tension foundations are well suited, but not required for this site. If post-tension foundations are preferred, our office shall be contacted for design recommendations.

5.8.1 Foundations

Continuous and isolated spread footings are suitable for use at the site. Based on the expected as-graded conditions, all building footings will bear entirely in competent engineered fill materials. Foundation dimensions and reinforcement should be based on allowable bearing values of 2,000 pounds per square foot (psf) for footings embedded a minimum of 24 inches and bearing upon at least two feet of engineered fill materials. The allowable bearing value may be increased by one third for short duration loading which includes the effects of wind or seismic forces.

For the anticipated construction, minimum footing reinforcement for continuous footings should consist of four #4 reinforcing bars, two placed near the top, and two near the bottom of the footing or as per the structural engineer. The structural engineer should design isolated footing reinforcement. All isolated footings shall be connected together and/or to adjacent continuous footings via minimum 12-inch wide by 12-inch deep tie beams containing minimal reinforcing.

5.8.2 Foundation Settlement

In general, for the anticipated loads and recommended bearing pressure, the maximum total post construction settlement is anticipated to be less than 1.5 inches. Maximum differential settlements are anticipated to be less than 0.5 inches over a distance of 50 feet. Dynamic settlement is not anticipated to affect the proposed improvements.

5.8.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of nearby slopes to the outer edge of the footing is at least 10 feet. Locally deepening foundations may be an adequate means of attaining the prescribed setback. Upon request and once project foundation plans have been developed, CTE can review affected footings on a case-by-case basis to determine if the required setbacks may be reduced.

5.8.4 Interior Concrete Slabs

Lightly loaded concrete slabs-on-grade should be designed for the anticipated loading, but should be a minimum five inches thick. To minimize the effects of concrete shrinkage cracking and differential soil movements, we recommend that concrete slabs be reinforced with #4 reinforcing bars spaced no greater than 18-inches on centers, each way. All slab reinforcement should be properly supported to ensure placement near mid-height of the concrete.

If elastic slab design is utilized, a 175-pci subgrade modulus of reaction is appropriate. If moisture sensitive floor areas are proposed, a vapor barrier consisting of a minimum ten-mil polyethylene sheeting or equivalent membrane (with all laps sealed or taped) should underlie such slabs. A maximum four-inch bed of consolidated aggregate base (SE>30) may also be placed beneath slabs-on-grade.

5.9 Lateral Resistance and Earth Pressures

Lateral loads acting against structures may be resisted by friction between the footings and the supporting soil or passive pressure acting against structures. If frictional resistance is used, we

recommend allowable coefficients of friction of 0.30 (total frictional resistance equals the coefficient of friction times the dead load) for concrete cast directly against competent materials. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 1,500 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance, provided the passive resistance does not exceed two-thirds of the total allowable resistance.

If proposed, retaining and basement walls up to ten feet high and backfilled using generally granular onsite soils may be designed using the equivalent fluid weights given in Table 2 below.

TABLE 2
EQUIVALENT FLUID UNIT WEIGHTS
(Pounds per cubic foot)

WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	38	58
RESTRAINED WALL	55	78

The above values assume non-expansive backfill and free draining conditions. Soils with an expansion index generally less than 30 should be used as retaining wall backfill material. Measures should be taken to prevent a moisture buildup behind all retaining walls. Drainage measures should include free draining backfill materials and perforated drains. Drains should discharge to an appropriate offsite location.

5.10 Exterior Flatwork

To reduce the potential for distress to exterior flatwork caused by minor settlement of foundation soils, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as designed by the project architect. The proposed driveway can either be designed with the same recommendations as the slab-on-grade for the proposed structure or should be a minimum of six inches thick if it is not reinforced. Flatwork, which should be installed with crack control joints, includes driveways, sidewalks, and architectural features. All subgrade should be prepared according to the earthwork recommendations previously given before placing concrete.

5.11 Drainage

Foundation performance depends greatly on how well the runoff waters drain from the site. This is true both during construction and over the entire life of the structure. The ground surface around structure should be graded so that water flows rapidly away from the structures without ponding. The surface gradient needed to do this depends on the landscaping type. In general, pavements and flowerbeds within five feet of the building should slope away at gradients of at least two percent. Densely vegetated areas should have minimum gradients of five percent away from buildings if doing so is practical.

Planters should be constructed so that water from them will not seep into the foundation areas or beneath slabs and pavement. In any event, the site maintenance personnel should be instructed to limit irrigation to the minimum actually necessary to sustain the landscaping plants properly. Should excessive irrigation, waterline breaks, or unusually high rainfall occur, saturated zones

and groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating the foundation or landscaped areas or cascading over slope faces. A potential source of water, such as water pipes, drains the like should be frequently examined for signs of leakage or damage. Any such leakage or damage should be repaired promptly. The project Civil Engineers should thoroughly evaluate the on-site drainage and make provisions as necessary to keep surface waters from affecting the site.

5.12 Slopes

Based on anticipated soil strength characteristics, fill slopes will be constructed at slope ratios of 2:1 (horizontal: vertical) or flatter. These fill slope inclinations will exhibit factors of safety greater than 1.5 (i.e., scopes will be grossly stable). All proposed fill slopes should be properly keyed and benched into competent underlying materials.

Although graded and existing slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion resistant vegetation should be maintained on the face of all slopes.

Typically, soils along the top portion of a fill slope face will tend to creep laterally. We do not recommend distress sensitive hardscape improvements be constructed within five feet of slope crests in fill areas.

5.13 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed construction and the subsurface conditions found in our exploratory test pit locations. The interpolated subsurface conditions should be checked in the field during construction to verify that conditions are as anticipated.

Recommendations provided in this report are based on the understanding and assumption that CTE will provide the observation and testing services for the project. All earthworks should be observed and tested to verify that grading activity has been performed according to the recommendations contained within this report.

5.14 Plan Review

CTE should review the project grading and foundation plans before commencement of earthwork to identify potential conflicts with the recommendations contained in this report.

6.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction.

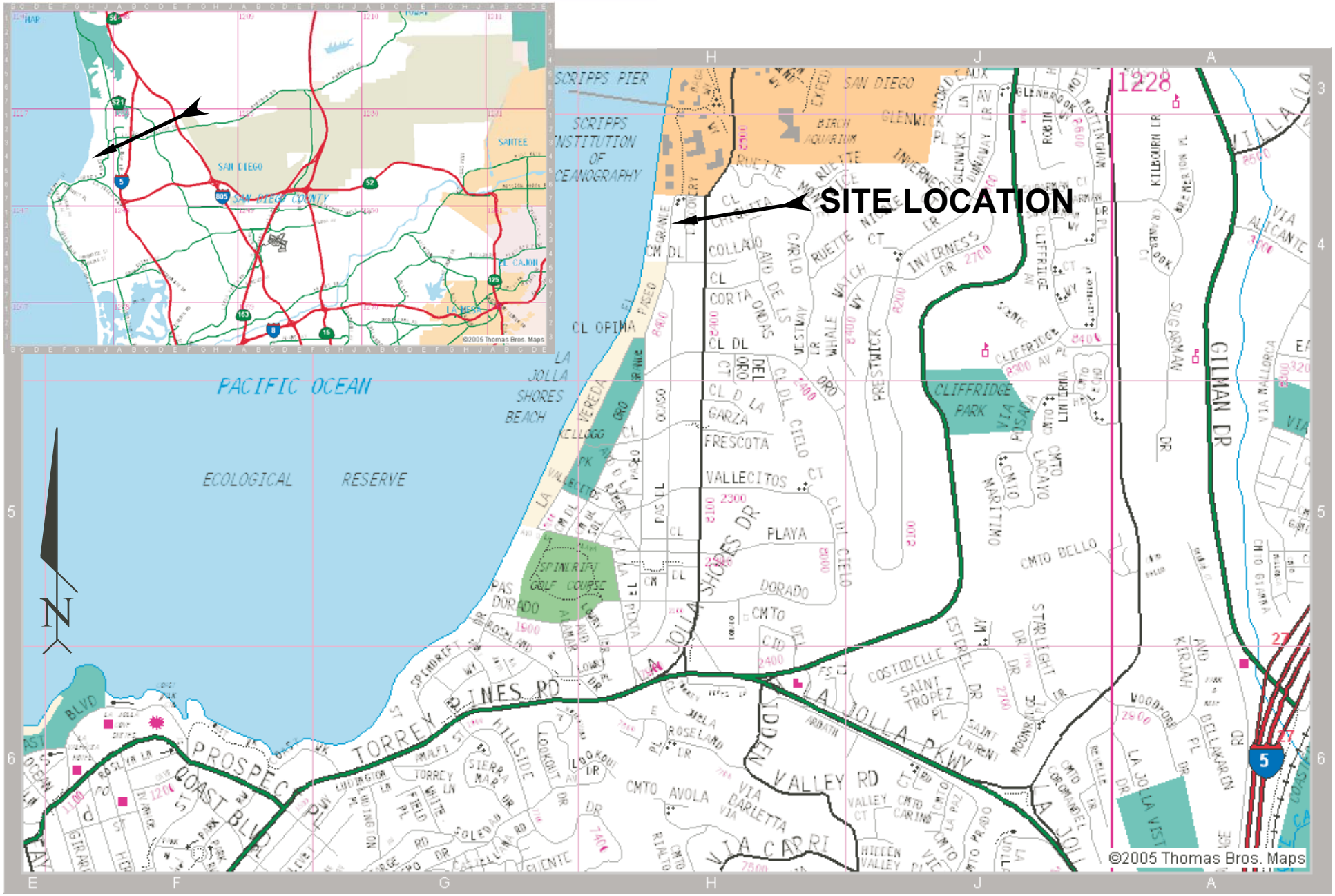
Our conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if required, will be provided upon request. We appreciate this opportunity to be of service on this project. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,
CONSTRUCTION TESTING & ENGINEERING, INC.

Dan T. Math, GE#2665
Principal Engineer

Jay F. Lynch, CEG#1890
Senior Engineering Geologist

Steve Hnat
Project Geologist



CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL AND CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, STE 115 ESCONDIDO CA. 92026 (760) 746-4955

SITE INDEX MAP
PROPOSED LUSARDI RESIDENCE
8466 EL PASEO GRANDE
LA JOLLA, CALIFORNIA

CTE JOB NO:	10-8264G
SCALE:	NO SCALE
DATE: 3/06	FIGURE: 1

APPENDIX A

REFERENCES CITED

REFERENCES CITED

1. Hart, E.W. and Bryant, E., 1997, "Fault-Rupture Hazard Zones in California, Alquist Priolo, Special Studies Zones Act of 1972," California Division of Mines and Geology, Special Publication 42, revised.

2. Martin, Ross, 2000, "Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region," California Division of Mines and Geology, CD 2000-003.

3. Tan, S.S. and Giffen, D.G., 1995, "Landslide Hazards in the Southern Part of the San Diego Metropolitan Area, San Diego County, California," California Division of Mines and Geology, Landslide Hazard Identification Map No. 33.

4. Tan, S. S. and M. P. Kennedy, 1975, "Geology of the San Diego Metropolitan Area, California", La Jolla Quadrangle, California Division of Mines and Geology, DMG Bulletin 200.

APPENDIX B

EXPLORATION LOGS

CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

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

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

FIGURE: BL1

CONSTRUCTION TESTING & ENGINEERING, INC.

GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION

1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

BORING LEGEND

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									
								Block or Chunk Sample	
								Bulk Sample	
5									
								Standard Penetration Test	
10									
								Modified Split-Barrel Drive Sampler (Cal Sampler)	
								Thin Walled Army Corp. of Engineers Sample	
15									
								Groundwater Table	
								Soil Type or Classification Change	
20								? — ? — ? — ? — ? — ? — ?	
								Formation Change [(Approximate boundaries queried (?)]	
						"SM"		Quotes are placed around classifications where the soils exist in situ as bedrock	
25									

FIGURE: BL2

CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

PROJECT:	LUSARDI RESIDENCE	DRILLER:	PACIFIC DRILLING	SHEET:	1 of 1
CTE JOB NO:	10-8264G	DRILL METHOD:	TRIPOD DRILL RIG	DRILLING DATE:	2/9/2006
LOGGED BY:	STEVE H.	SAMPLE METHOD:	BULK AND RING	ELEVATION:	~

BORING: B-1

Depth (Feet)	Sample: Bulk	Sample: Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC	Qsw	SLOPEWASH (Qsw): Medium dense, very moist, medium to dark grayish brown clayey SAND (SC).	WA MAX
	X	X	3 4 5			CL		Stiff, moist, medium grayish brown sandy CLAY (CL).	WA, MD AL
5	X								
		X	6 8 12			SC		Dense, moist, medium to dark brown, fine to medium-grained clayey SAND (SC).	WA
10									
15									
							Qbp	BAY POINT FORMATION (Qbp): Dense, saturated, medium gray and brown, fine to medium-grained clayey SAND (SC).	WA
		X	8 11 15						
20								Total Depth 20' Perched Groundwater at 17'	
25									

CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

PROJECT:	LUSARDI RESIDENCE	DRILLER:	PACIFIC DRILLING	SHEET:	1 of 1
CTE JOB NO:	10-8264G	DRILL METHOD:	TRIPOD DRILL RIG	DRILLING DATE:	2/9/2006
LOGGED BY:	STEVE H.	SAMPLE METHOD:	BULK AND RING	ELEVATION:	~

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC	Qsw	SLOPEWASH (Qsw): Medium dense, moist, medium yellowish brown fine to medium-grained clayey SAND (SC).	
						CL		Stiff, moist, medium brown sandy CLAY (CL).	
			3 4 6						EI CHEM
5									MD
			5 5 7						
10									
						SC		Medium dense, moist, medium to dark brown fine to medium-grained clayey SAND (SC).	
			6 9 13						
15									
							Qbp	BAY POINT FORMATION (Qbp): Dense, saturated, medium grayish brown, fine to medium-grained clayey SAND (SC).	
			8 10 17						
20								Total Depth 19'	
25									

APPENDIX C

LABORATORY METHODS AND RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used. Laboratory results are presented in the following section of this Appendix.

Classification
Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487.

Particle-Size Analysis
Particle-size analyses were performed on selected representative samples according to ASTM D422.

Expansion Index
Expansion testing was performed on selected samples of the matrix of the onsite soils according to Building Code Standard No. 29-2.

In-Place Moisture/Density
The in-place moisture content and dry unit weight of selected samples were determined using relatively undisturbed chunk soil samples.

Modified Proctor
Laboratory maximum dry density and optimum moisture content were performed according to ASTM D1557, Method A. A mechanically operated rammer was used during the compaction process.

Sand Equivalent
Laboratory determinations of the sand equivalent for soils were performed according to ASTM D 2419.

Atterberg Limits

The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Chemical Analysis

Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

200 WASH ANALYSIS

LOCATION	DEPTH (feet)	PERCENT PASSING	CLASSIFICATION
B-1	0-3	47.7	SC-CL
B-1	5	59.2	CL
B-1	10	56.7	CL
B-1	20	44.5	SC

EXPANSION INDEX TEST

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-2	2-6	26	LOW

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-1	5	24.1	98.9
B-2	10	20.3	108.6

SULFATE

LOCATION	DEPTH (feet)	RESULTS ppm
B-2	2-6	49

CHLORIDE

LOCATION	DEPTH (feet)	RESULTS ppm
B-2	2-6	6

p.H.

LOCATION	DEPTH (feet)	RESULTS
B-2	2-6	10.60

CONDUCTIVITY

LOCATION	DEPTH (feet)	RESULTS uS/cm
B-2	2-6	112

RESISTIVITY

LOCATION	DEPTH (feet)	RESULTS ohms/cm
B-2	2-6	7550

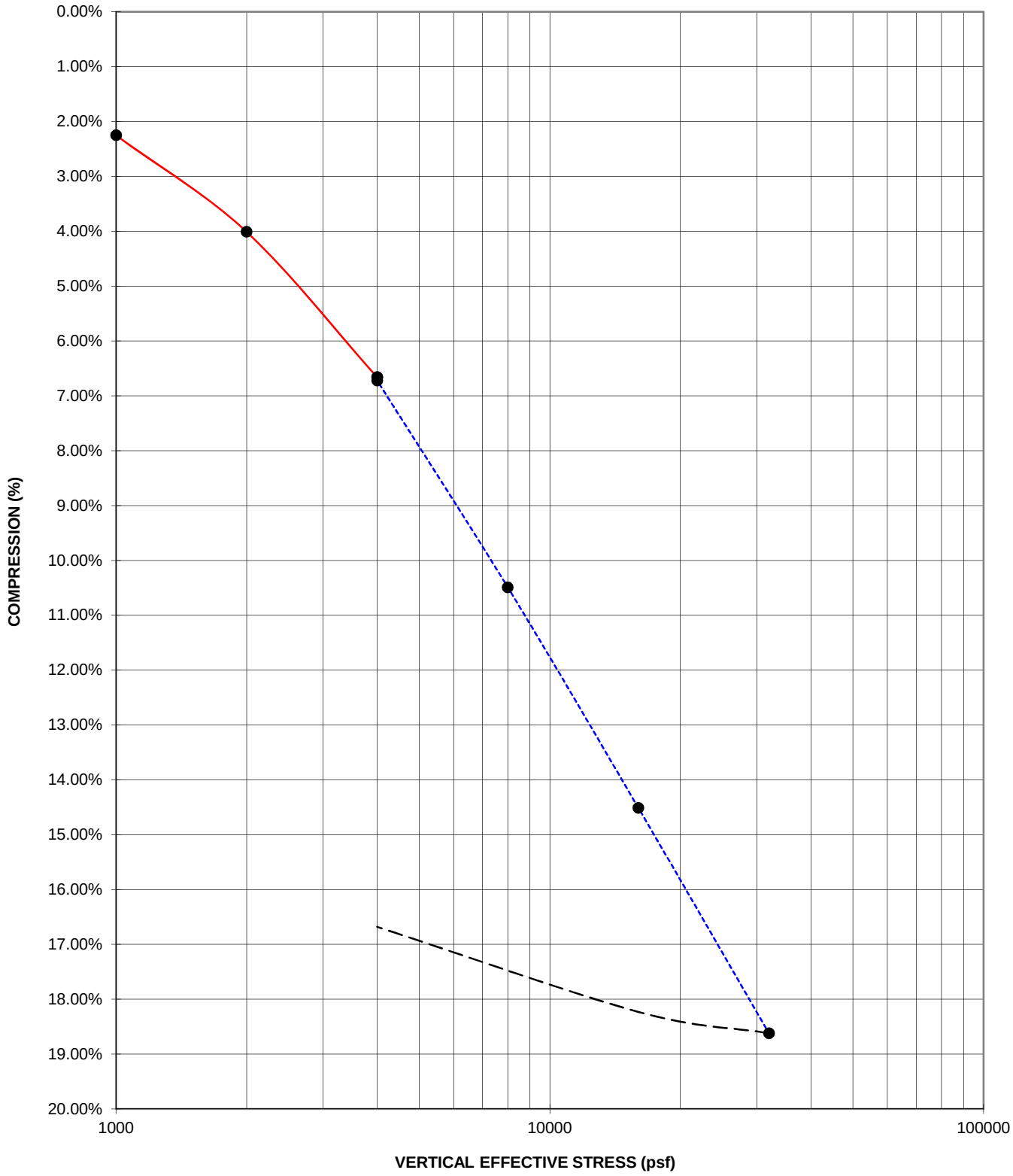
CONSTRUCTION TESTING & ENGINEERING, INC.
GEOTECHNICAL | CONSTRUCTION ENGINEERING TESTING AND INSPECTION
1441 MONTIEL ROAD, SUITE 115 | ESCONDIDO, CA 92026 | 760.746.4955

ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-1	4-7	37	24	CL

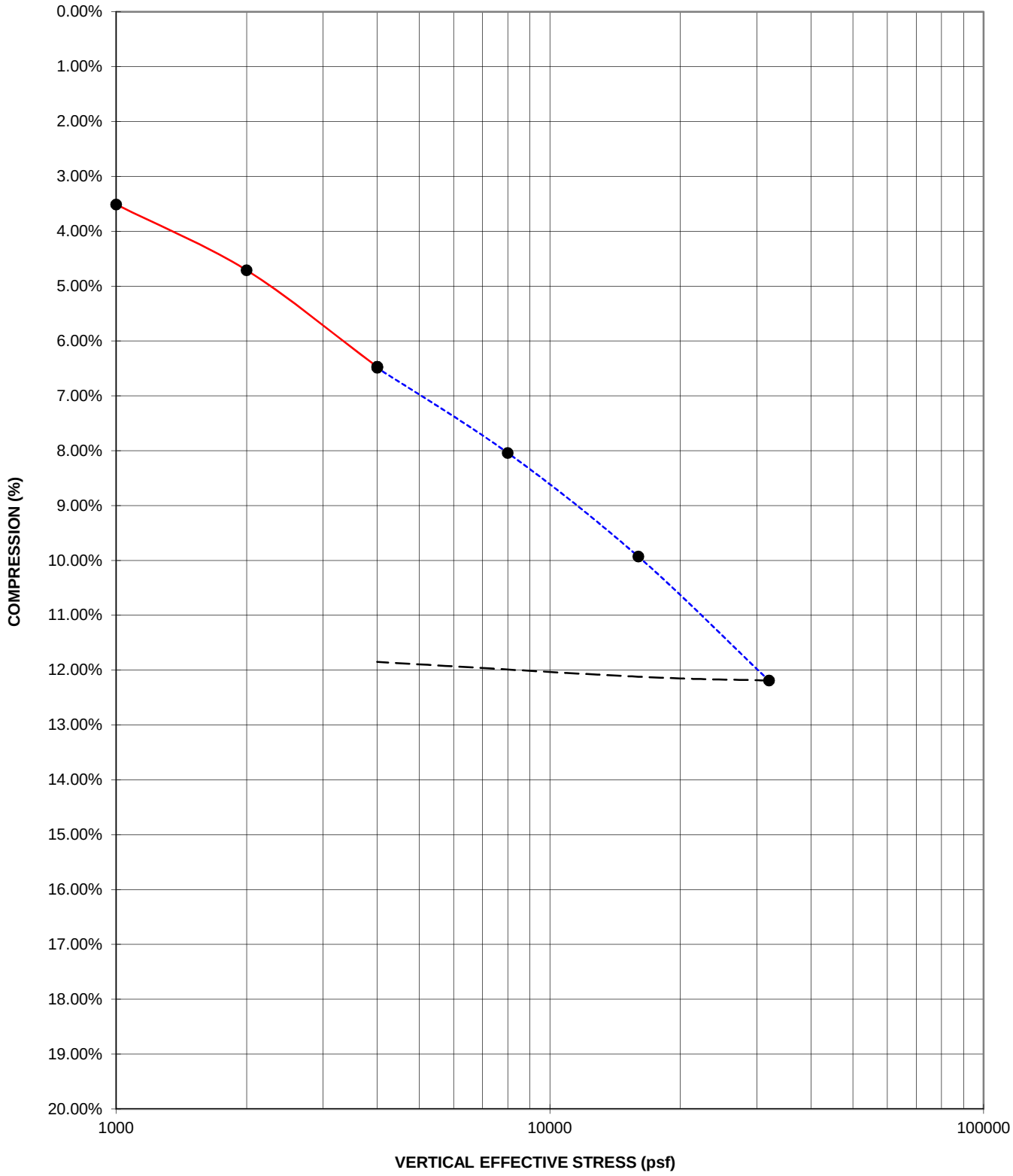
MODIFIED PROCTOR

LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PSF)	OPTIMUM MOISTURE (%)
B-1	0-3	127.3	10.4



SWELL/COMPRESSION TEST			
Sample Designation	Depth (ft)	Symbol	Legend
B1	5'	●	FIELD MOISTURE SAMPLE SATURATED REBOUND

Initial Moisture (%):		Initial Dry Density (pcf)	CTE JOB NO: 10-8264G
Final Moisture (%):	19.00%	Final Dry Denstiy (pcf)	FIGURE NO: C-1



SWELL/COMPRESSION TEST			
Sample Designation	Depth (ft)	Symbol	Legend
B2	10'	●	FIELD MOISTURE SAMPLE SATURATED REBOUND

Initial Moisture (%):		Initial Dry Density (pcf)	CTE JOB NO: 10-8264G
Final Moisture (%):	13.60%	Final Dry Denstiy (pcf)	FIGURE NO: C-2

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

The guidelines contained herein and the standard details attached hereto represent Construction Testing & Engineering's standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to assure that geotechnical construction is performed in general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor should be responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting shall be arranged by the owner and/or client and shall include the grading contractor, the design engineer, the geotechnical consultant, owner’s representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be

graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable.

When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with attached Plates and described below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should inspect the area to receive fill. After inspection and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed,

thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 5 feet of any fill and should not be closer than 11 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean,

overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-82, D 2922-81. Tests should be conducted at a minimum of 2 vertical feet or 1,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful

to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least 2 percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications of the accompanying attached plates.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales) as shown in the attached plates.

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants

To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation

Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

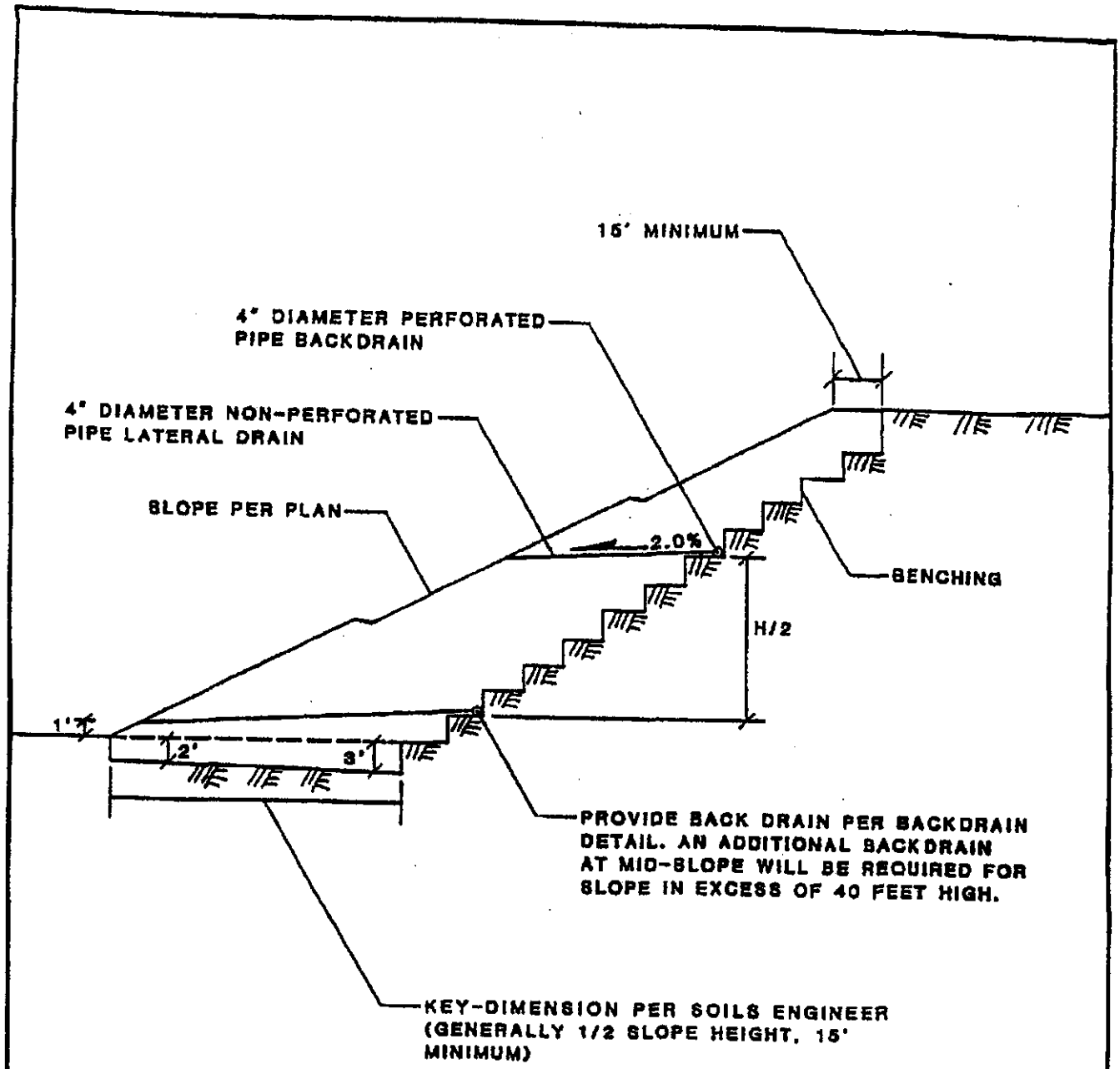
10.3 - Repair

As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

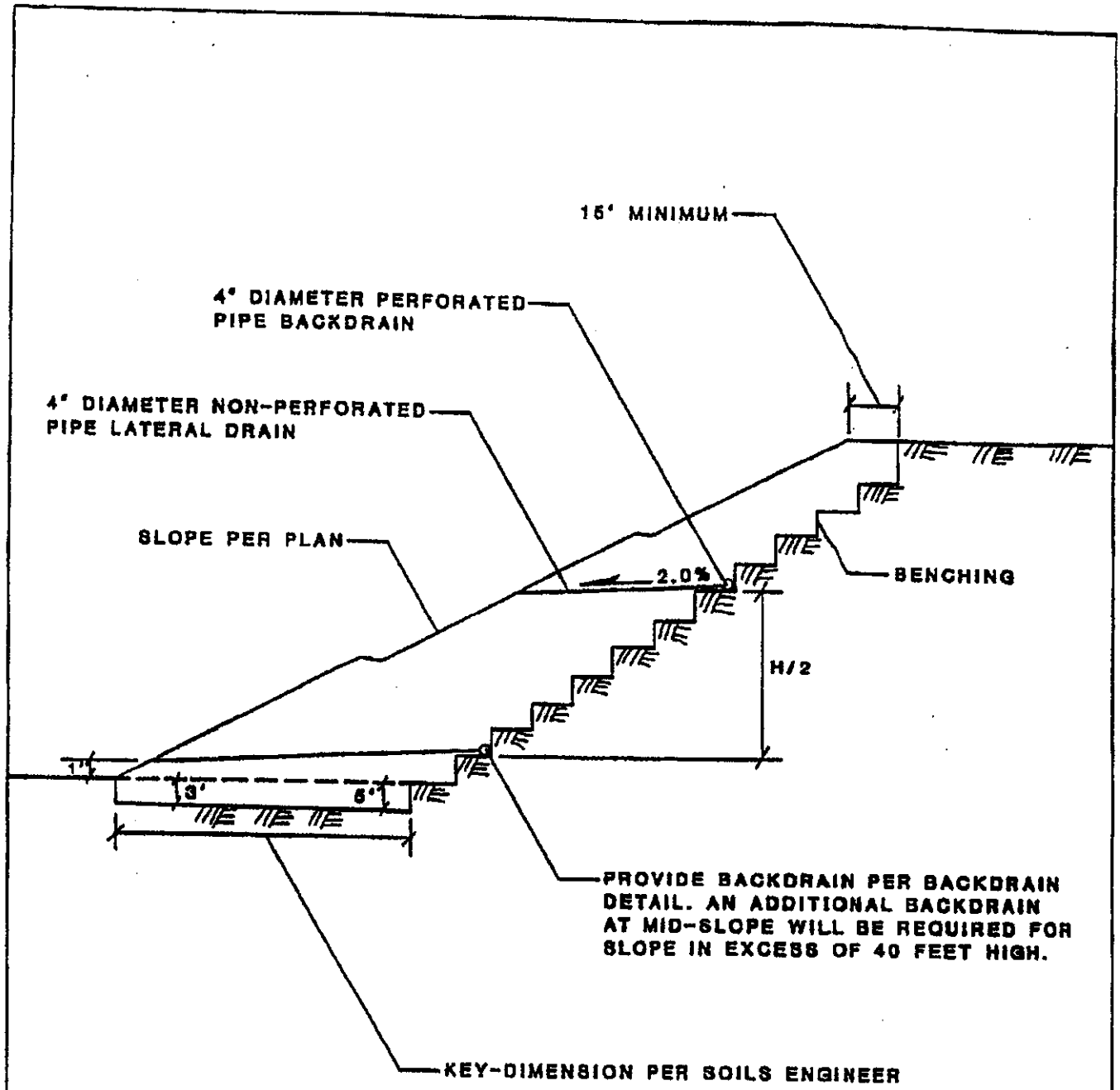
If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

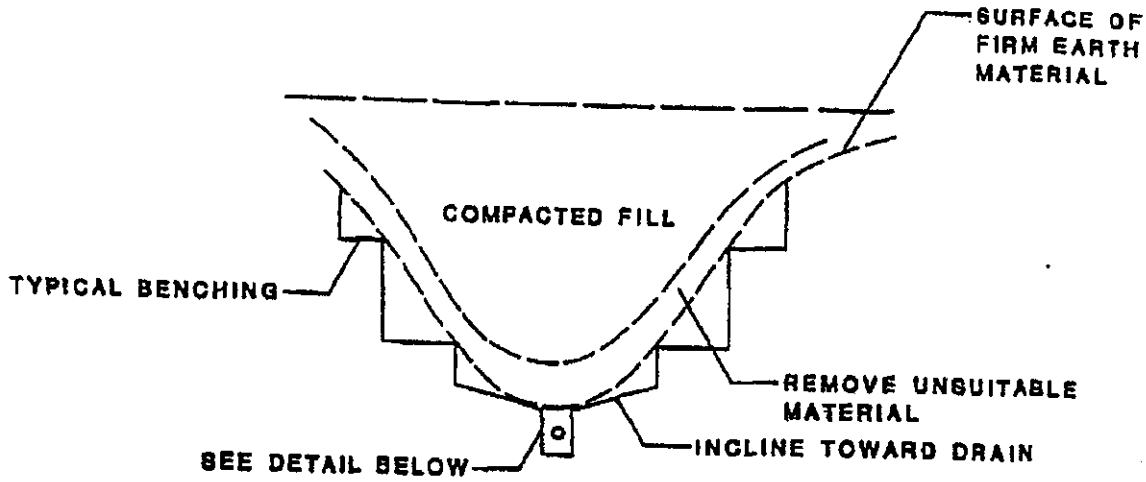
In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).



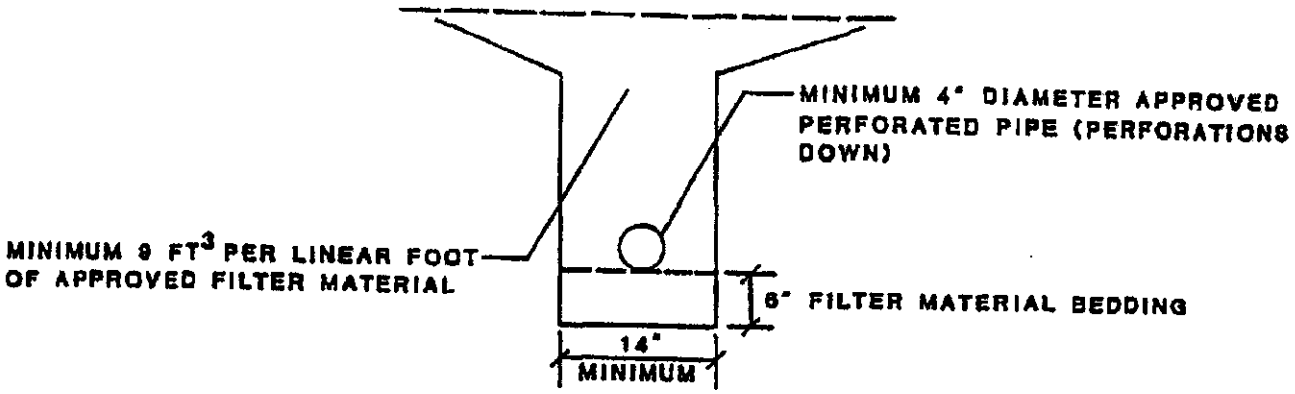
TYPICAL STABILIZATION FILL DETAIL



TYPICAL BUTTRESS FILL DETAIL



DETAIL



FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

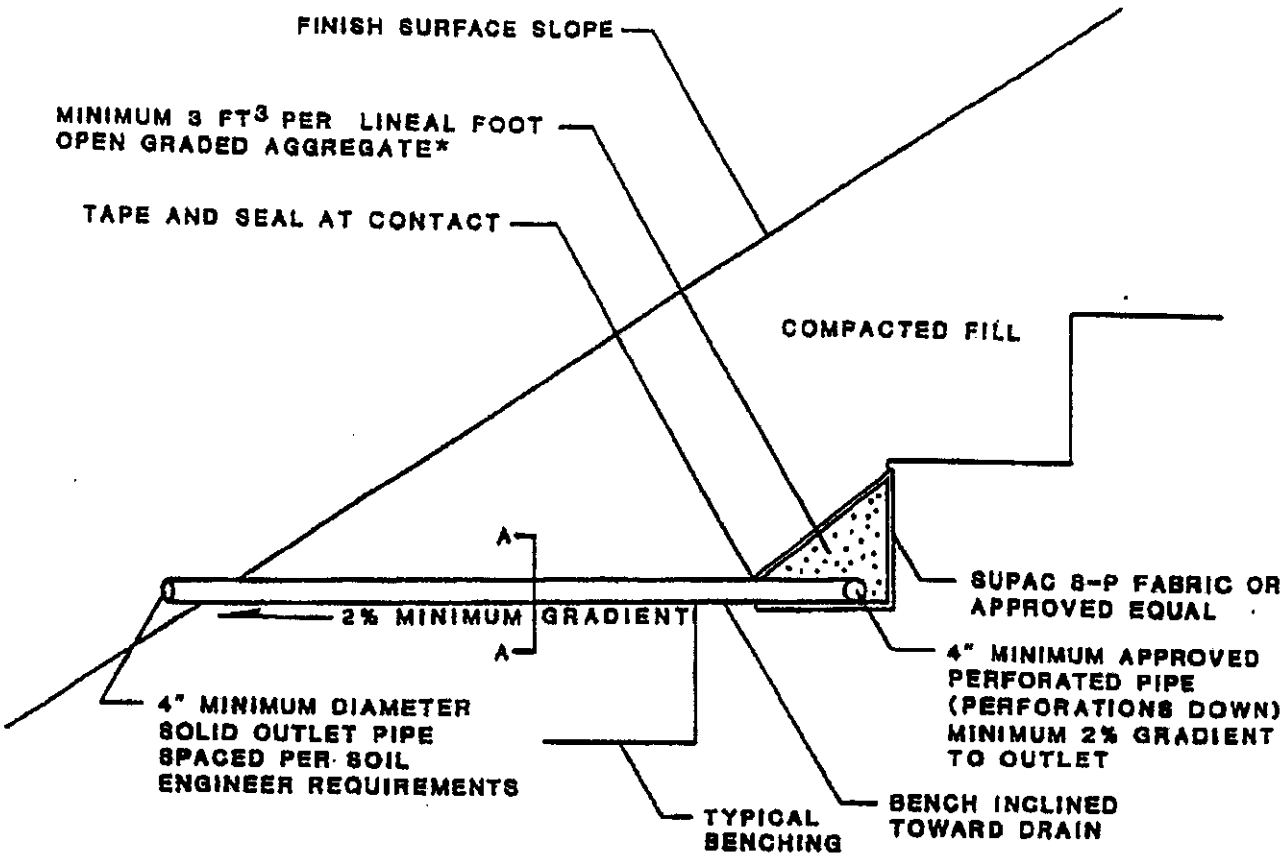
SIEVE SIZE	PERCENTAGE
1"	100
3/4"	90-100
3/8"	40-100
NO.4	25-40
NO.30	5-15
NO.50	0-7
NO.200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

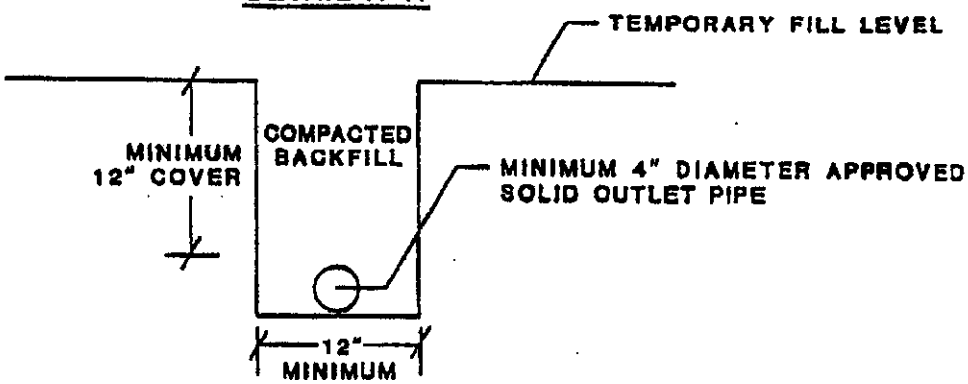
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
UPPER 500'	4"
NEXT 1000'	6"
> 1500'	8"

TYPICAL CANYON SUBDRAIN DETAIL



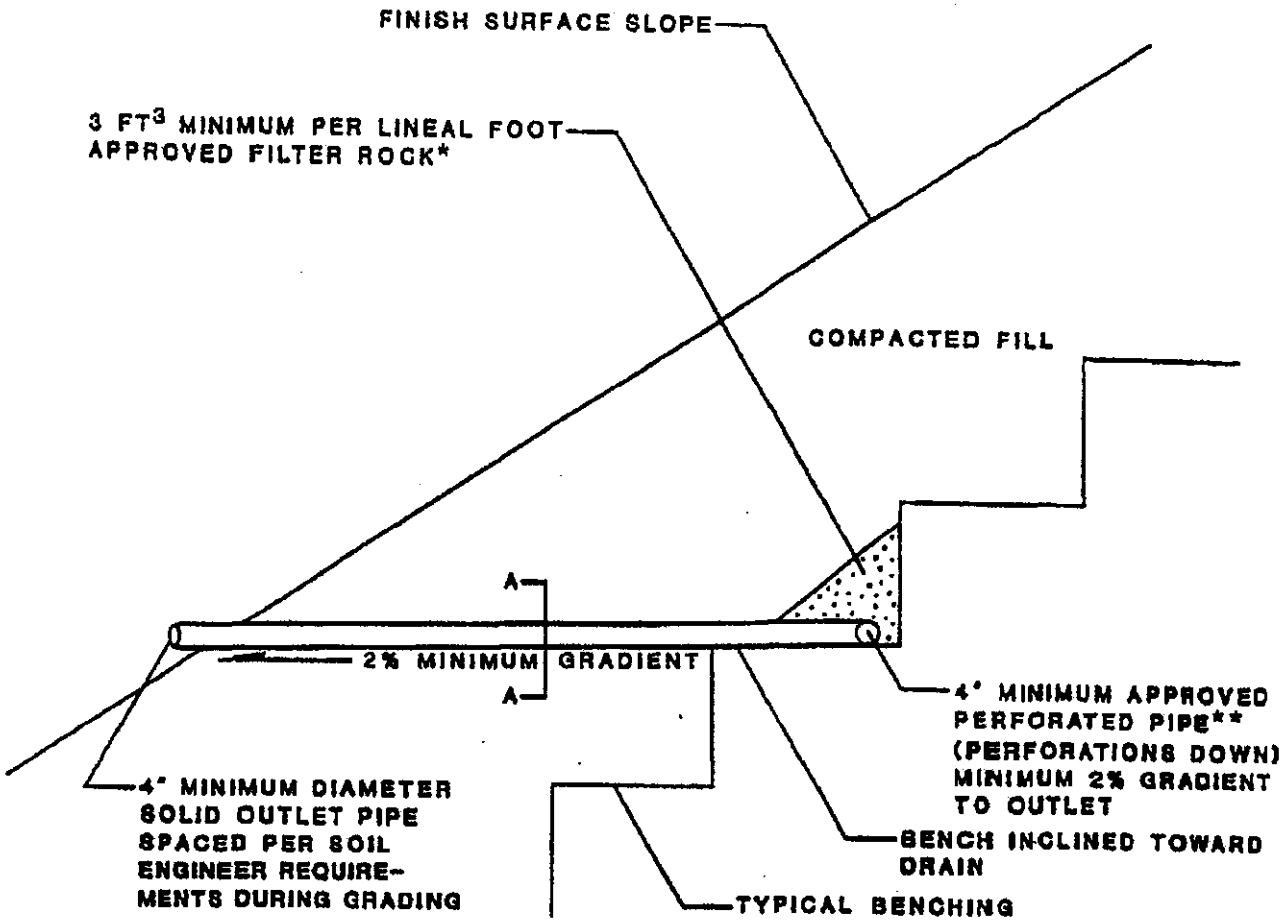
DETAIL A-A



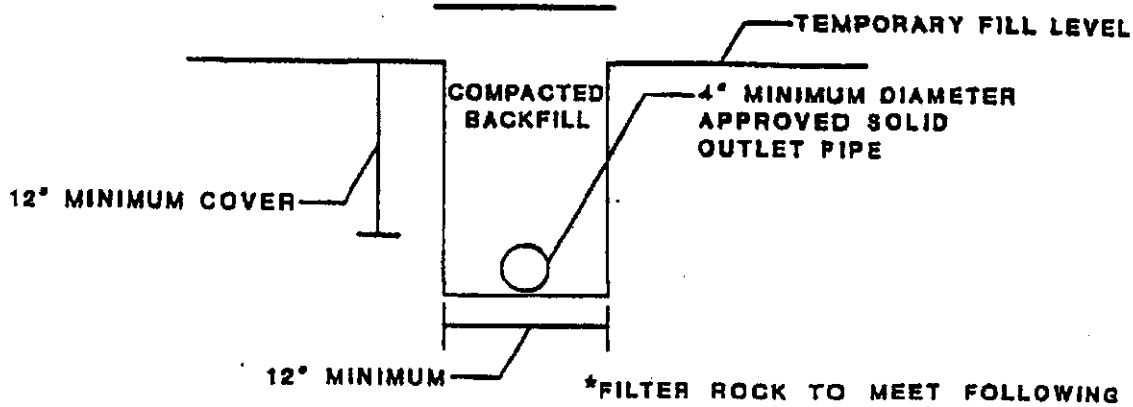
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 1/2"	100
1"	5-40
3/4"	0-17
3/8"	0-7
NO. 200	0-3

BACKDRAIN DETAIL (GEOFABRIC)



DETAIL A-A



*FILTER ROCK TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

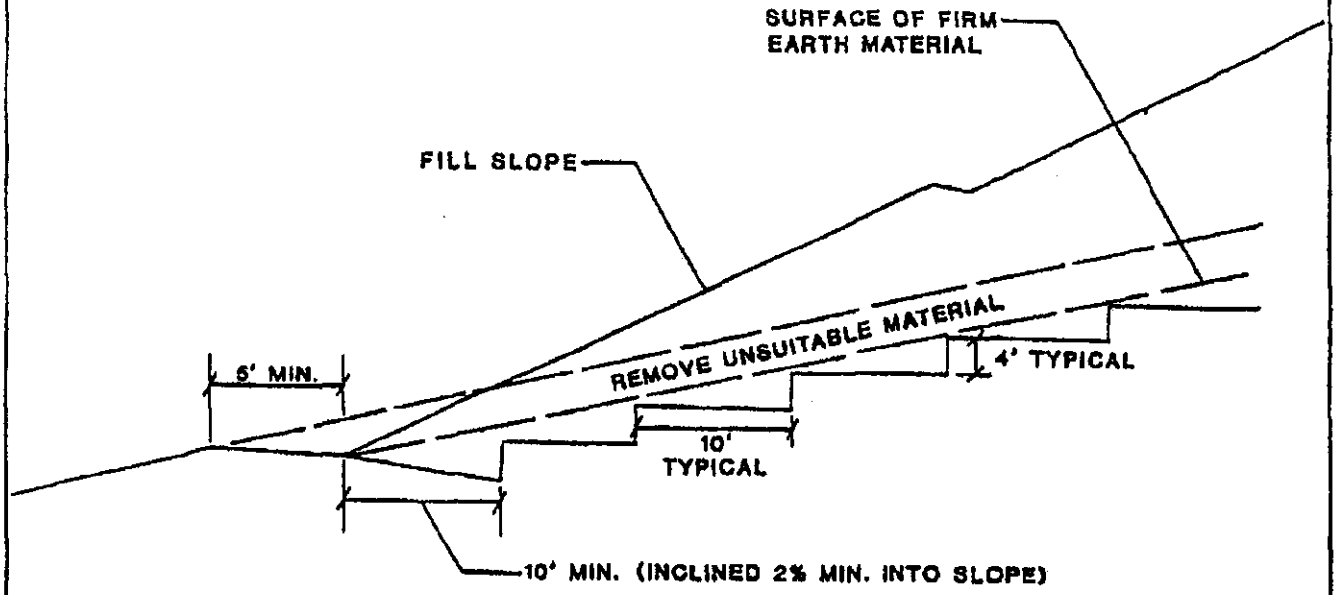
SIEVE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO.4	25-40
NO.30	5-15
NO.50	0-7
NO.200	0-3

**APPROVED PIPE TYPE:

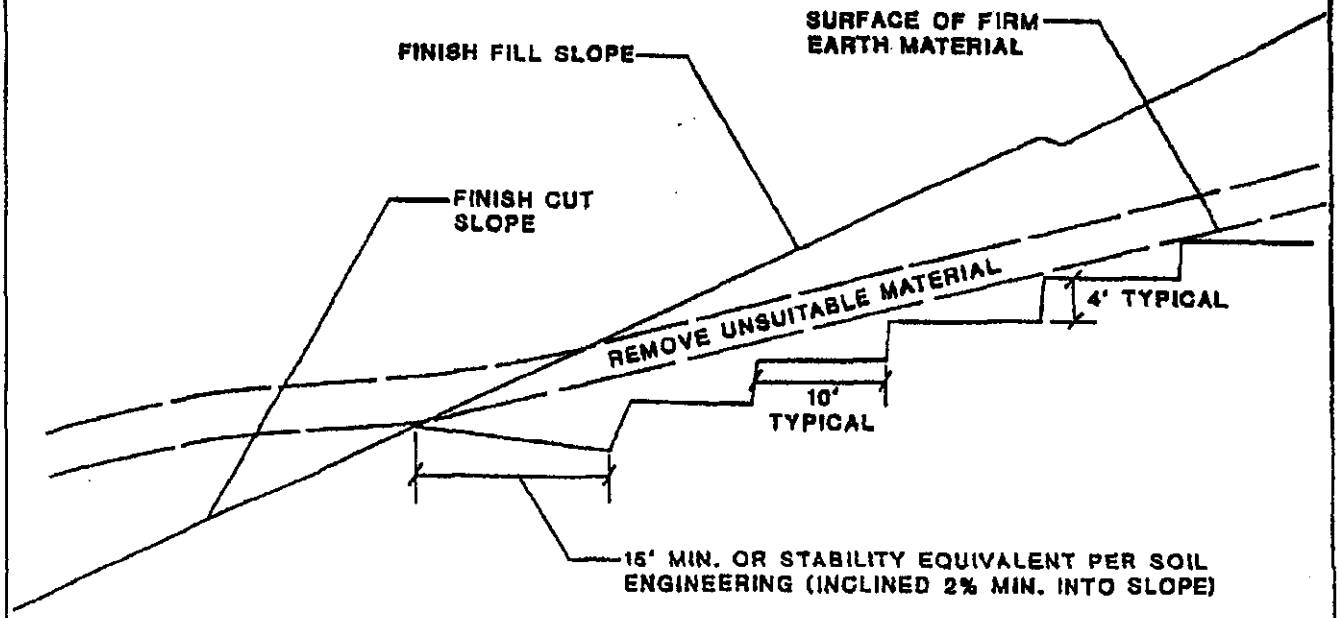
SCHEDULE 40 POLYVINYL CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

TYPICAL BACKDRAIN DETAIL

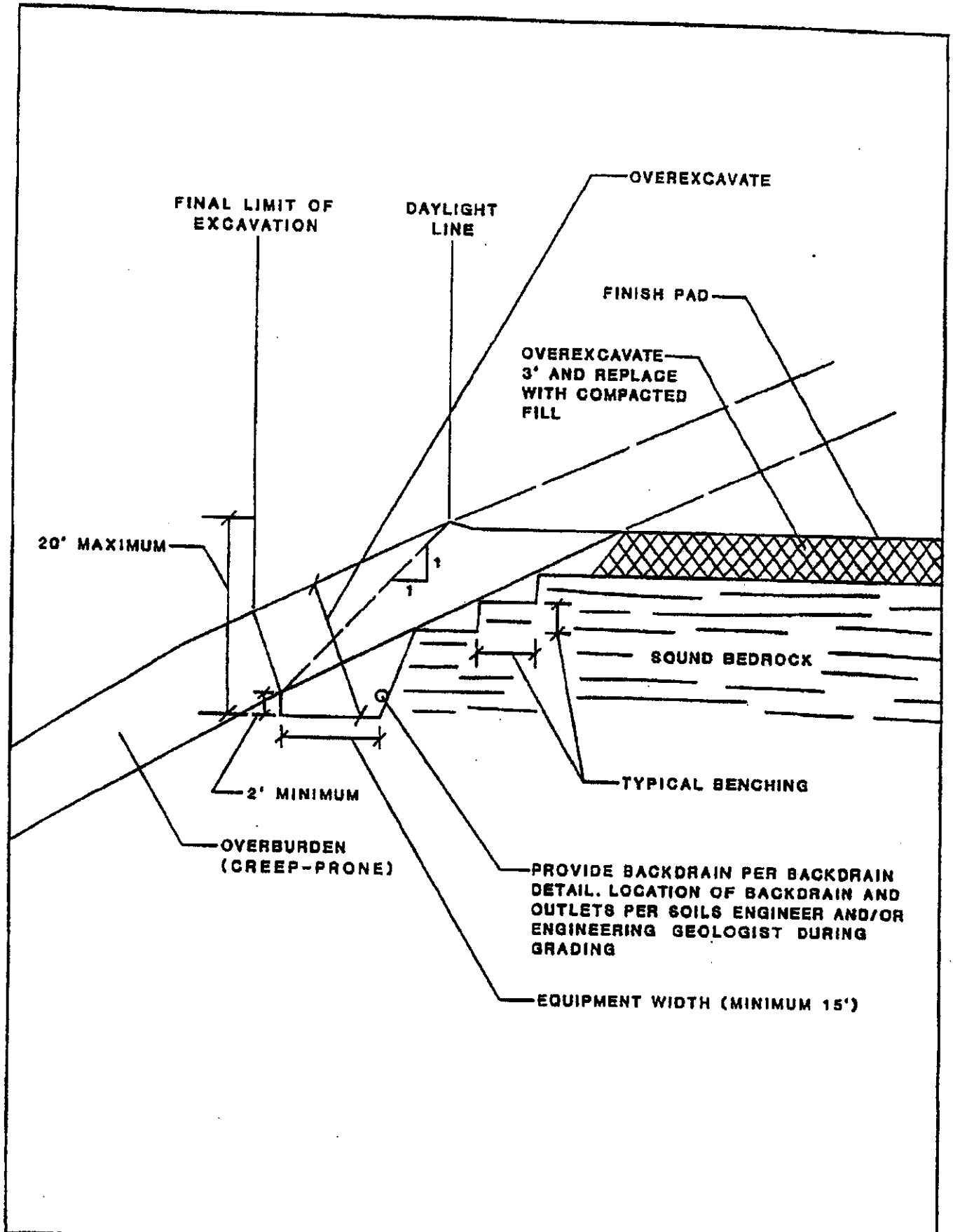
BENCHING FILL OVER NATURAL



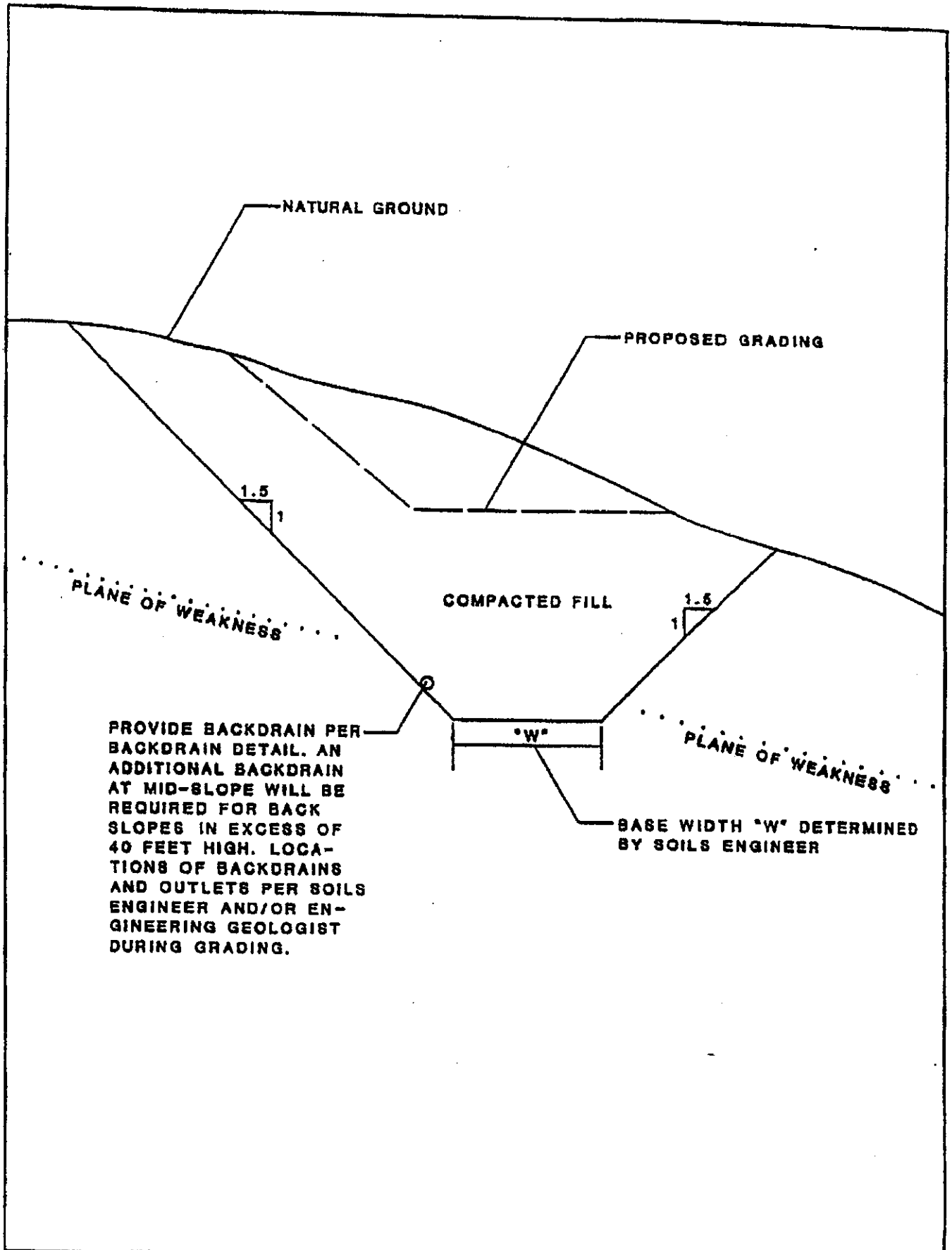
BENCHING FILL OVER CUT



BENCHING FOR COMPACTED FILL DETAIL

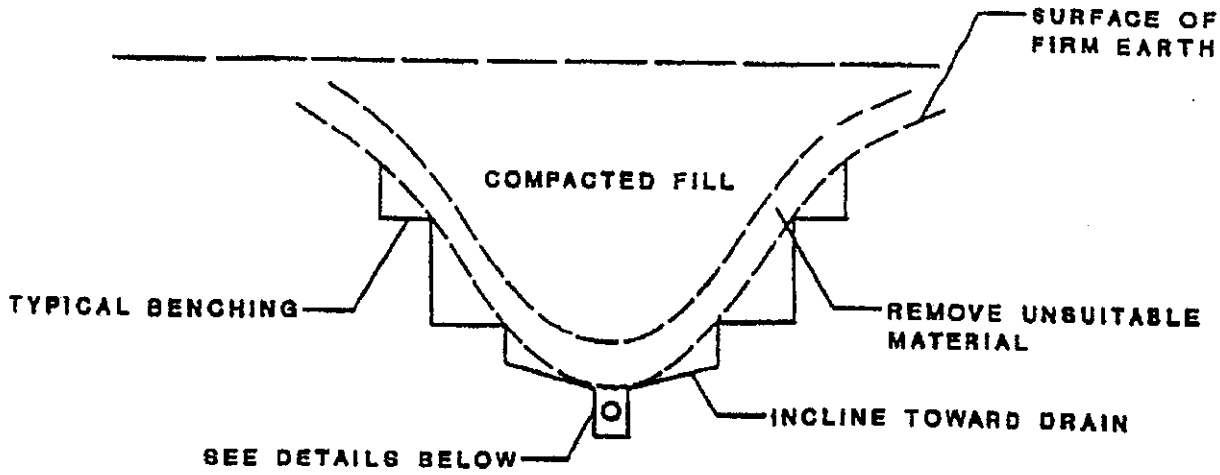


DAYLIGHT SHEAR KEY DETAIL

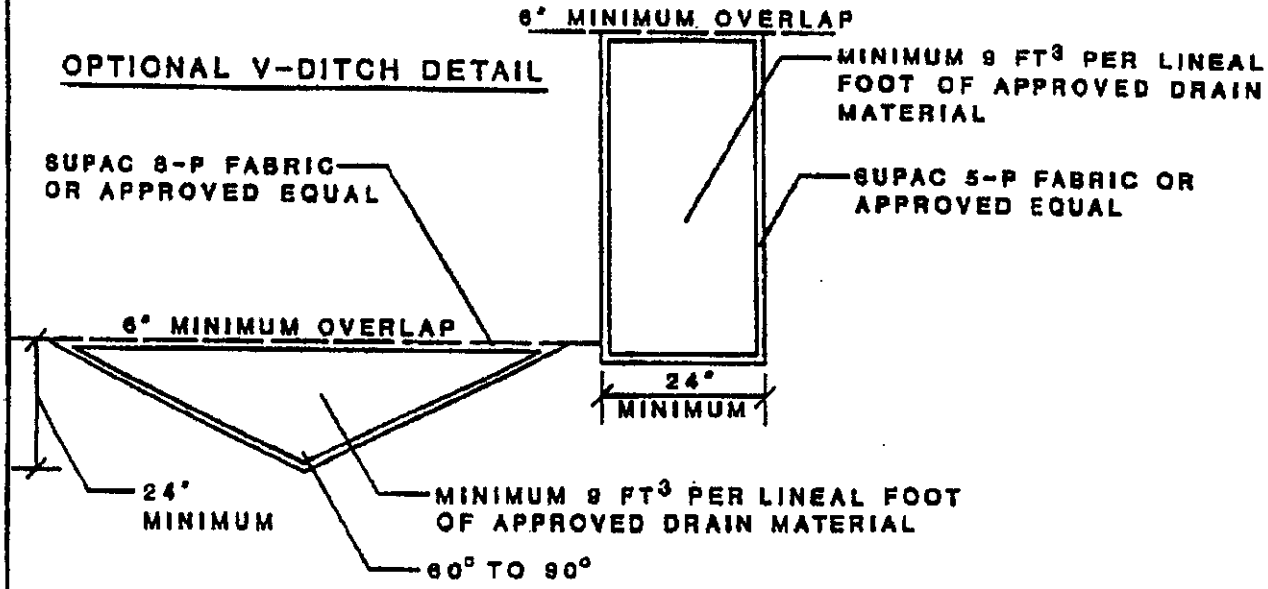


TYPICAL SHEAR KEY DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAIL



OPTIONAL V-DITCH DETAIL

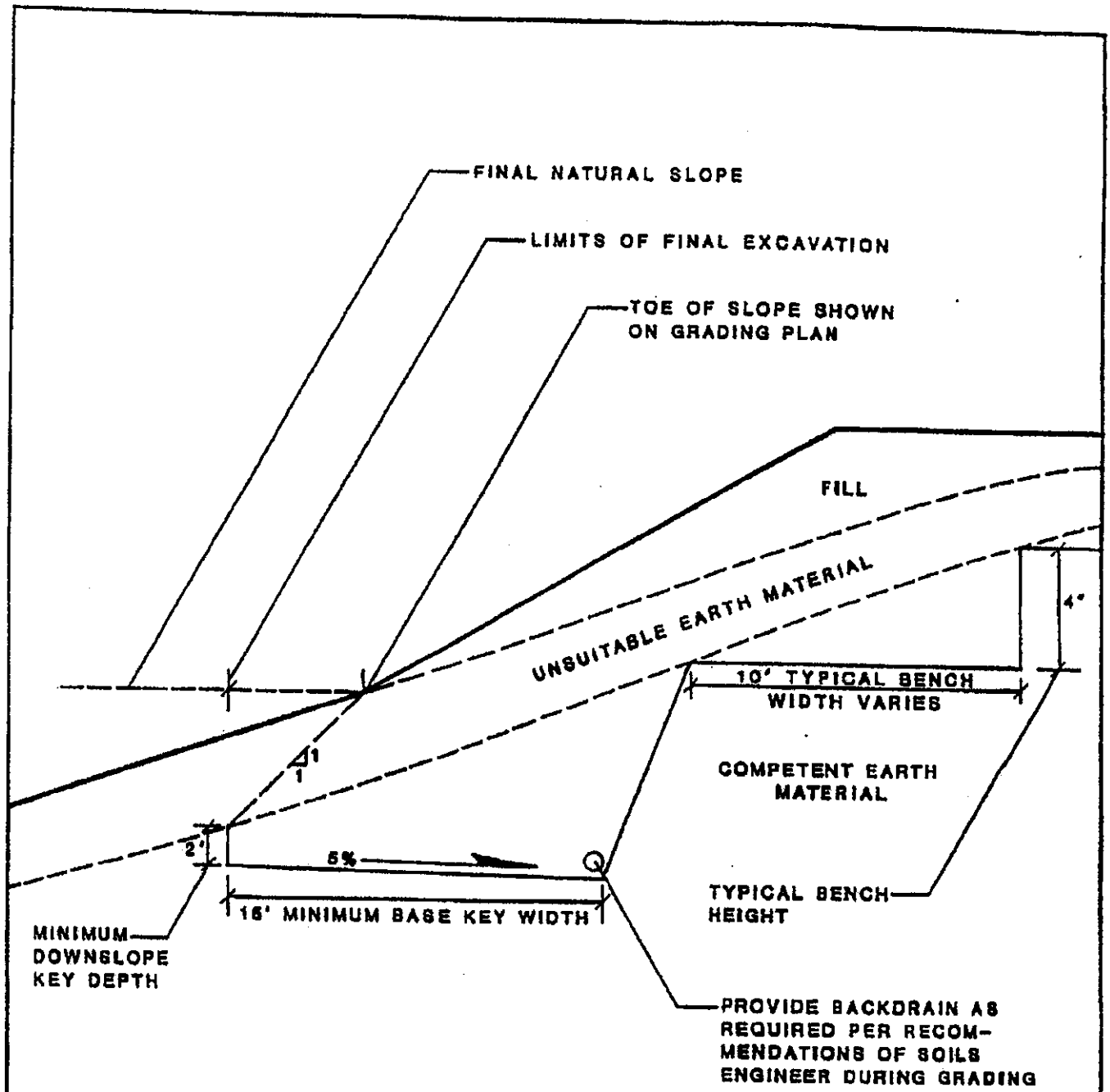
DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 1/2"	88-100
1"	5-40
3/4"	0-17
3/8"	0-7
NO.200	0-3

ADD MINIMUM 4" DIAMETER APPROVED PERFORATED PIPE WHEN GRADIENT IS LESS THAN 2%

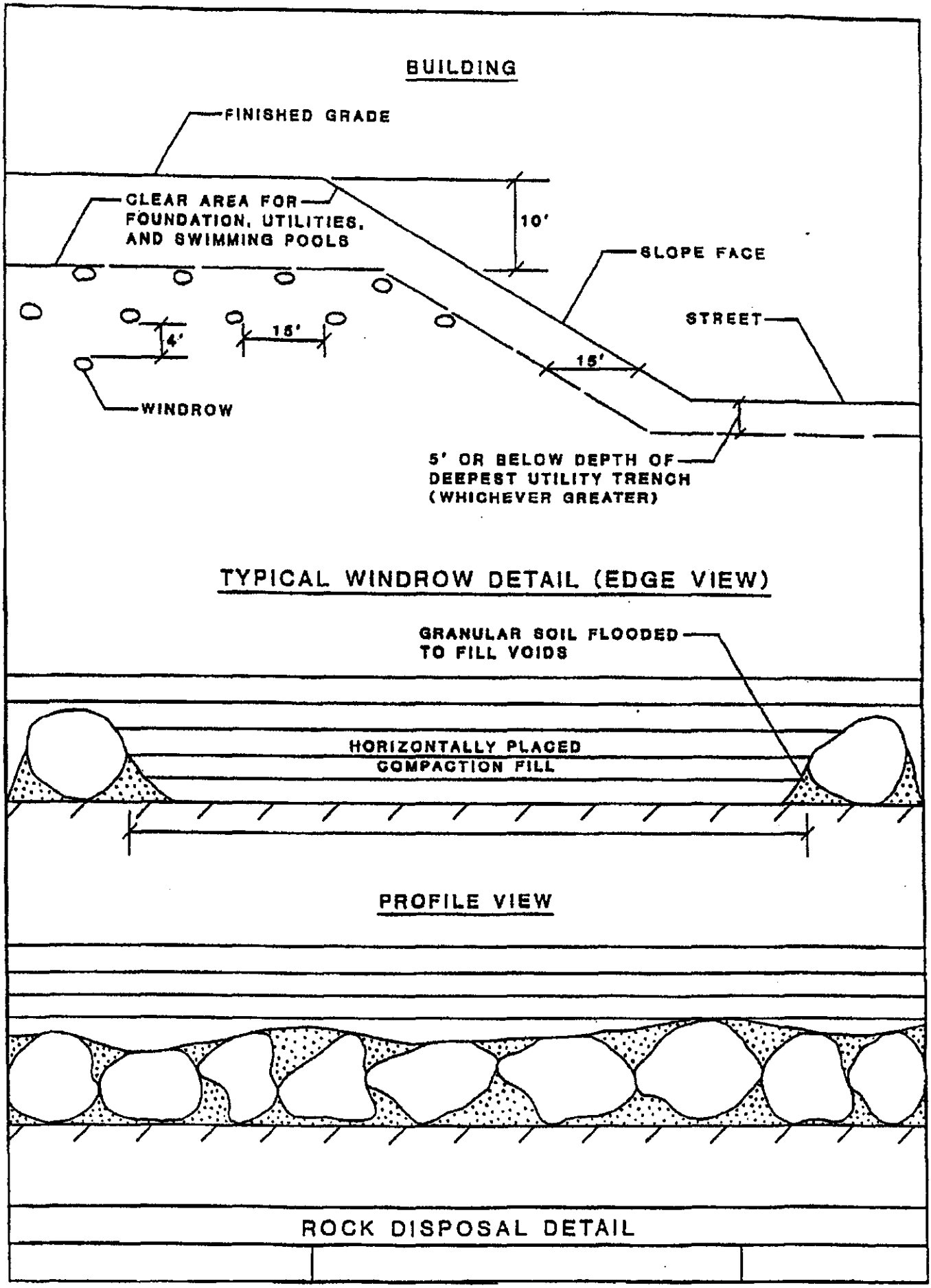
APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi.

GEOFABRIC SUBDRAIN



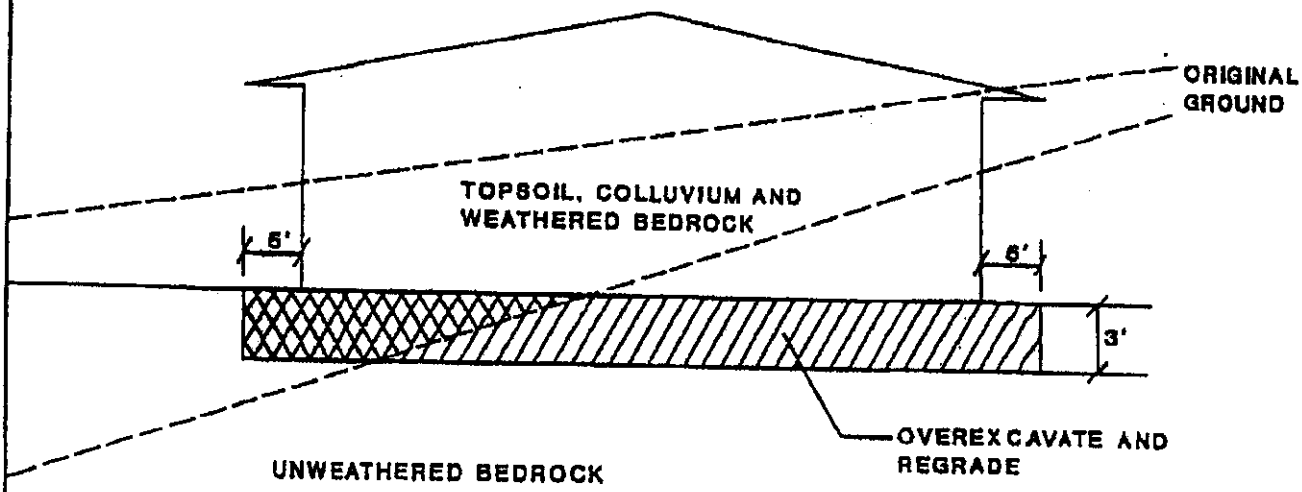
WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. HOWEVER, FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

FILL SLOPE ABOVE NATURAL GROUND DETAIL

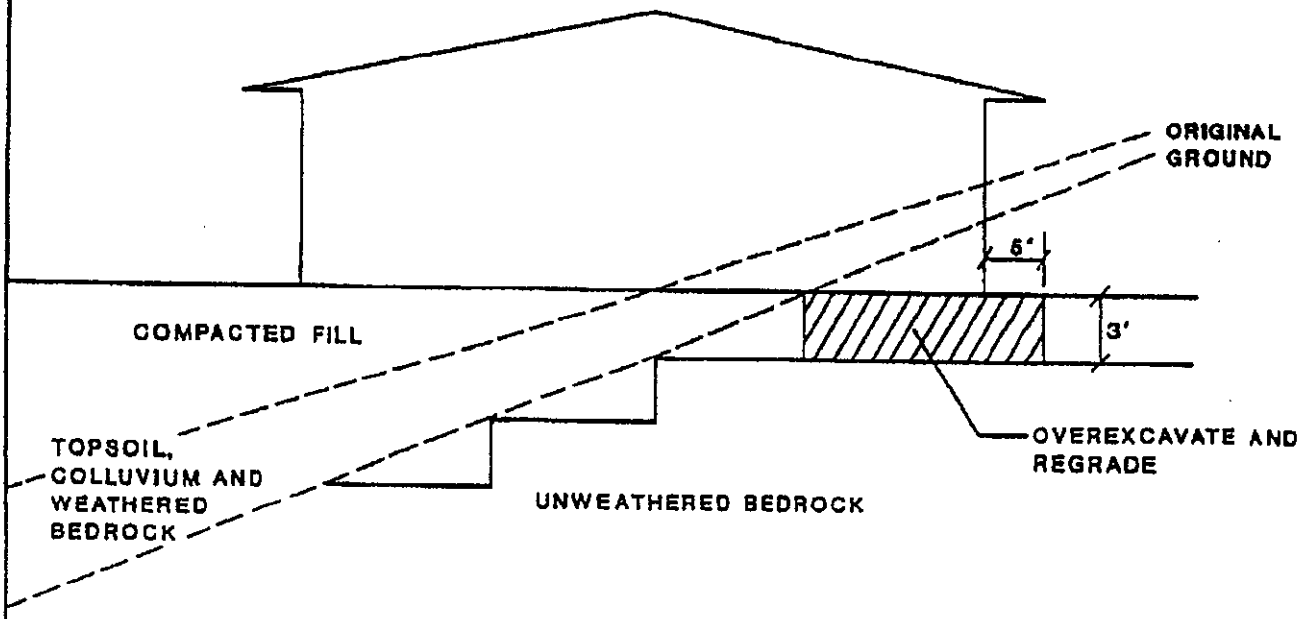

BUILDING
FINISHED GRADE
CLEAR AREA FOR FOUNDATION, UTILITIES, AND SWIMMING POOLS
10'
SLOPE FACE
STREET
4'
15'
15'
WINDROW
5' OR BELOW DEPTH OF DEEPEST UTILITY TRENCH (WHICHEVER GREATER)
TYPICAL WINDROW DETAIL (EDGE VIEW)
GRANULAR SOIL FLOODED TO FILL VOIDS
HORIZONTALLY PLACED COMPACTION FILL
PROFILE VIEW
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

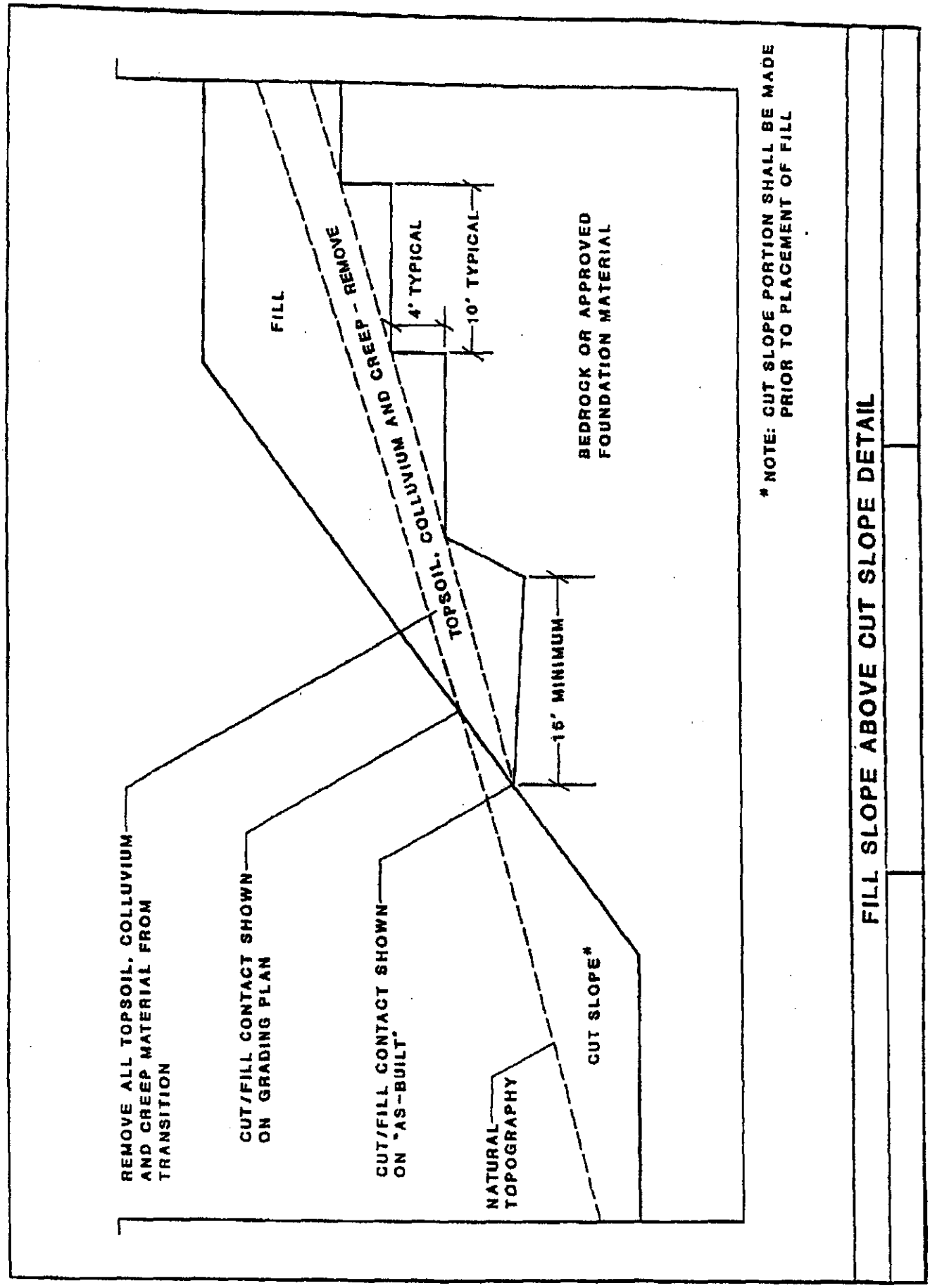
CUT LOT

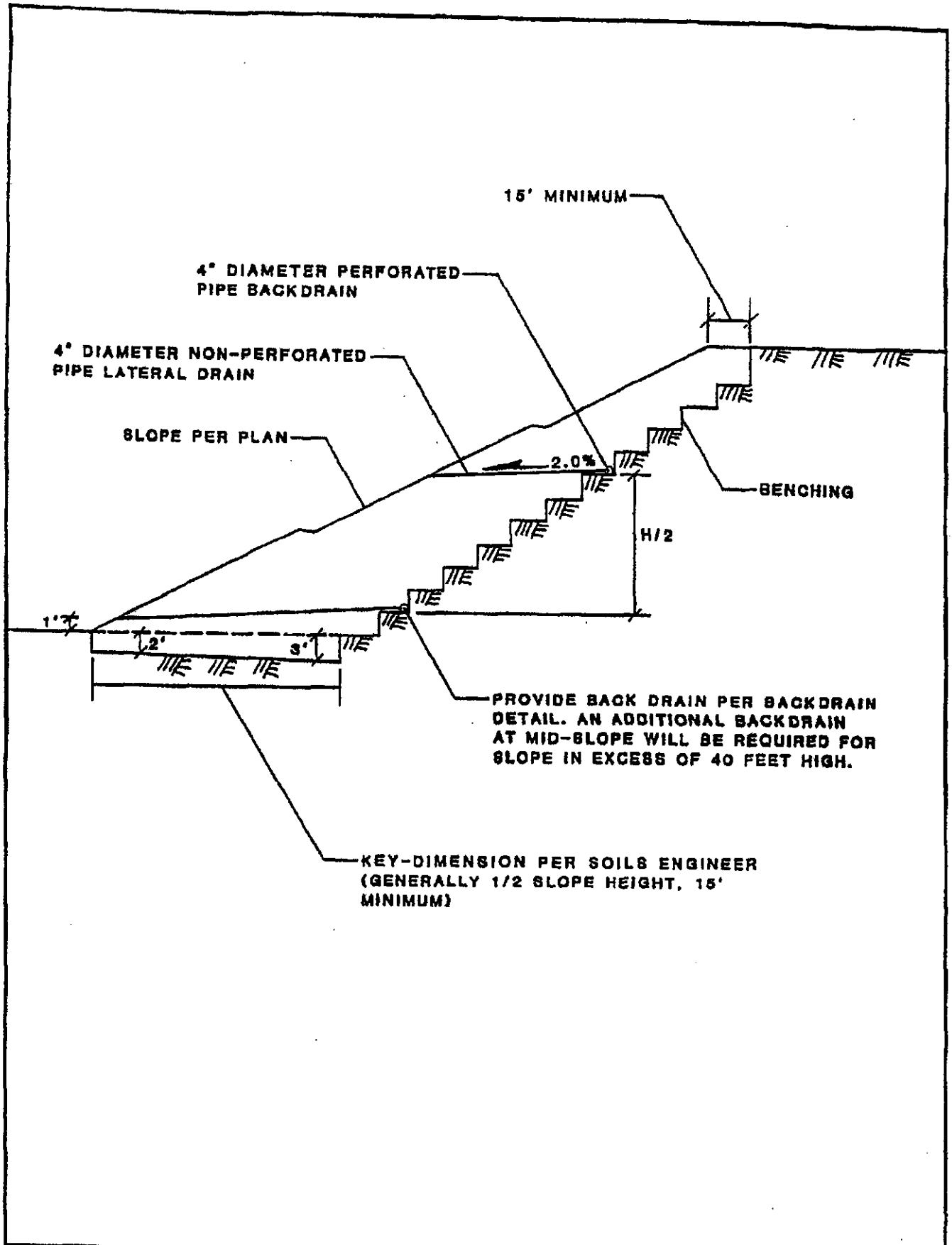


CUT/FILL LOT (TRANSITION)



TRANSITION LOT DETAIL


FILL
TOPSOIL, COLLUVIUM AND CREEP - REMOVE
4' TYPICAL
10' TYPICAL
BEDROCK OR APPROVED FOUNDATION MATERIAL
15' MINIMUM
REMOVE ALL TOPSOIL, COLLUVIUM AND CREEP MATERIAL FROM TRANSITION
CUT/FILL CONTACT SHOWN ON GRADING PLAN
CUT/FILL CONTACT SHOWN ON "AS-BUILT"
NATURAL TOPOGRAPHY
CUT SLOPE*
* NOTE: CUT SLOPE PORTION SHALL BE MADE PRIOR TO PLACEMENT OF FILL
FILL SLOPE ABOVE CUT SLOPE DETAIL



TYPICAL STABILIZATION FILL DETAIL