South Shore Testing & Environmental

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August 2, 2021

Mr. Peter Kulmaticki
JD Pierce Company, Inc.
2222 Martin Street, #100
Irvine, California 92612

SUBJECT: **PRELIMINARY GEOTECHNICAL INVESTIGATION**
Proposed Single-Family Residential Development
Tentative Tract 38107
SWC of Sanderson Avenue and Ramona Boulevard (proposed)
City of San Jacinto, Riverside County, California
Work Order No. 1372101.00

Dear Mr. Dykes:

Pursuant to your authorization, a preliminary geotechnical evaluation was conducted on the subject site in accordance with the 2019 California Building Code, Section 1803.5.11. Attached as **Plate 1**, the **Geotechnical Map** is a reduced image of a 100-scale Tentative Tract Map prepared by Blaine A. Wormer Civil Engineering of Hemet, California indicating the approximate location of the exploration trenches, and pertinent geotechnical information.

Scope of Work

The scope of work performed for this study included the following:

1. Onsite observation and documentation of existing site geometry with respect to the location of the proposed development.

2. Advancement of six (6) exploratory borings and six (6) exploratory trenches to the total depth explored of 51.5-ft (B-1) below the ground surface (bgs) for in-situ and bulk sample recovery for laboratory testing and observation of subsurface conditions.

3. Engineering analysis of test results to develop specifications for grading and preliminary foundation design including liquefaction analysis.

4. Research of geologic literature to develop design specifications for hazards such as seismic shaking and related effects.

5. Preparation of report of findings, including conclusions and recommendations for grading and minimum foundation design.

Introduction

This investigation has been conducted resulting from a 2019 California Building Code Chapter 18 requirement for preliminary geotechnical investigation being conducted for all projects in Seismic Category D. This investigation will address geotechnical conditions existing on the site as they may pertain to the proposed single-family residences. It is our understanding that the cabins will be typical one-story type V structure. Contained herein also are preliminary recommendations for foundation design for the proposed construction.

Site Description

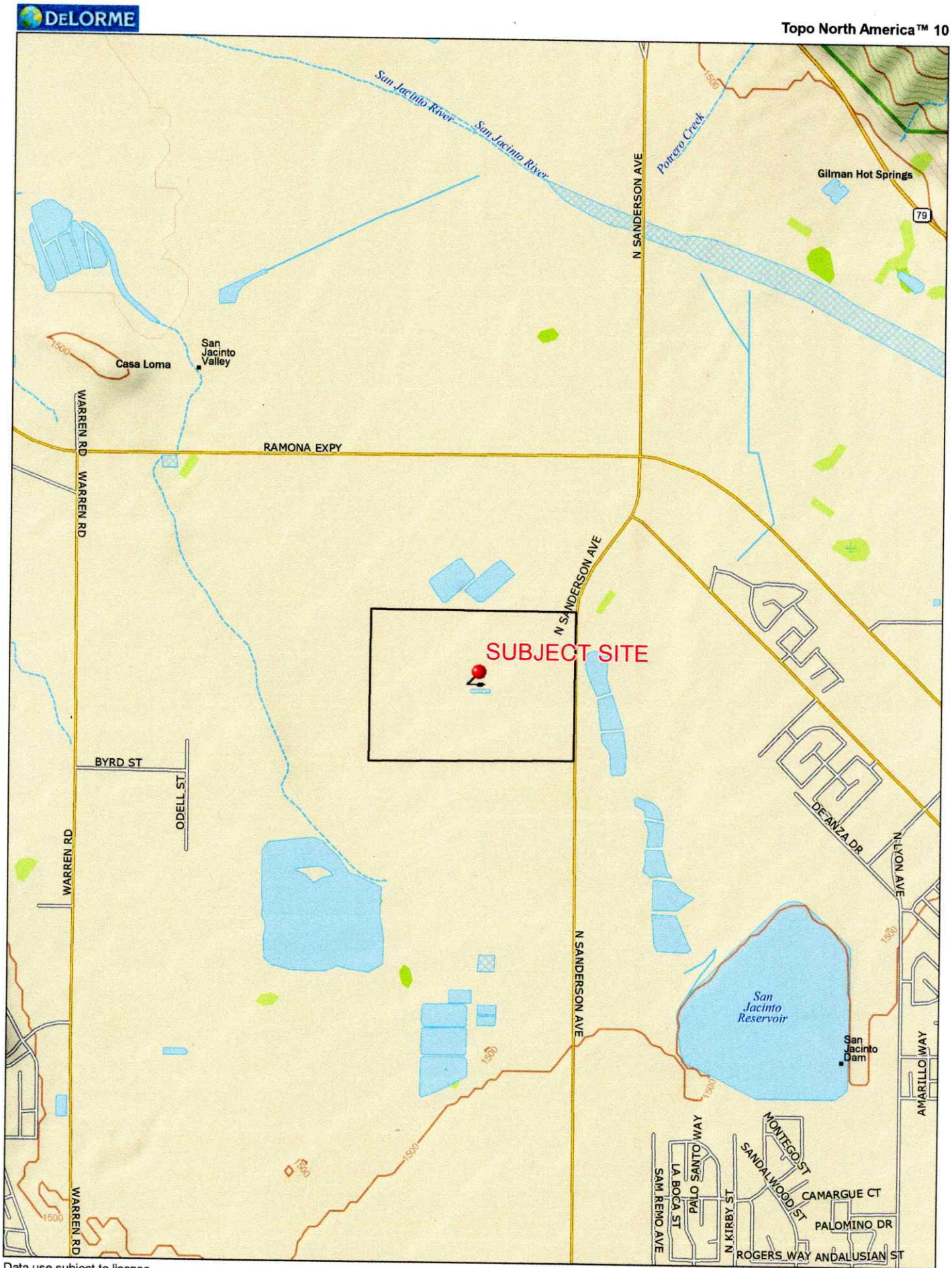
The proposed residential tract and street improvements will occupy the entire subject site (APN: 432-030-012). The subject site is an ±38.15-acre rectangular parcel of land, which is located on the west side of Sanderson Avenue in the City of San Jacinto, Riverside County, California. The geographical relationships of the site and surrounding area are depicted on our Site Location Map, **Figure 1**.

The subject site appears to be vacant and utilized for agricultural development. Man-made improvements on the subject site include dirt access roads and irrigation systems around the perimeters of the property. Vegetation onsite consisted of a stubble of recently harvested grain crop and annual weeds and grasses around the perimeters of the property. Topographically, the subject site consists of relative flat terrain that slopes to the northwest at a less than 2% gradient to the northwest toward the San Jacinto River drainage. Overall relief on the subject site is approximately 4-ft, from above mean sea elevations 1460 to 1464.

Proposed Development

A 100-scale tract map was available at the time of our investigation; it is our understanding that development includes the construction of 215 residential lots including interior streets with street improvements, the construction of Ramona Boulevard, widening of Sanderson Avenue, infiltration systems and recreation center with amenities.

Foundations are anticipated to consist of continuous spread and isolated column footings to carry structural loads, otherwise typical residential construction.



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TN

MN (11.3°E)

Scale 1 : 25,000

1" = 2,083.3 ft

FIGURE 1

Field Work

Field work on the site consisted of site mapping of the onsite earth units and observation and logging of six (6) exploratory borings advanced with a Mobile No. B-61 truck mounted drill rig equipped with 6-inch hollow stem augers. Additionally, six (6) exploratory trenches were previously advanced onsite with a Case No. 580 extenda-backhoe equipped with a 24-inch bucket (SS, 2021). Representative bulk and in-situ samples of earth materials was obtained for laboratory testing and observing the conditions of the onsite soils. Subsurface exploration of the subject site was performed on July 13, 2021, and both the current exploratory boring logs and the previous trench logs are presented in **Appendix B**. The approximate location of our exploratory borings and the previous trenches are presented on our **Geotechnical Map, Plate 1**. Observation and sampling of the exploratory borings were performed by our field personnel, who logged onsite alluvial sediments underlying the entire subject site (Dibblee, 2003), which extended to the total depth explored of 51.5-ft bgs.

Laboratory Testing

The results of laboratory testing are presented in **Appendix C**. It should be noted test results are preliminary and generally representative for the purposes of demonstrating feasibility of design for proposed construction. Additional testing recommended by this report may result in changes of minimum design requirements.

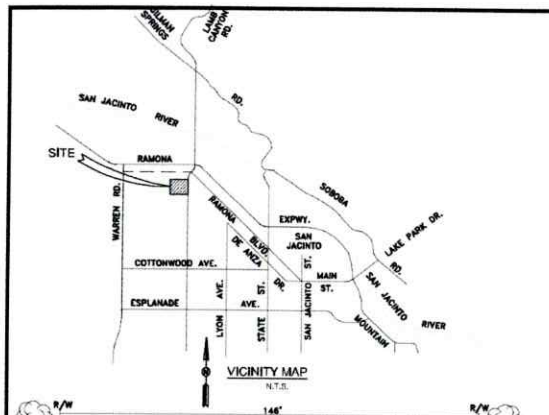
Subsurface Conditions

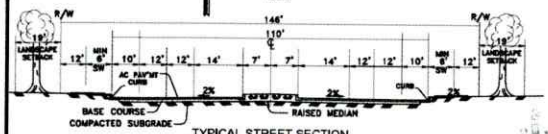
The Dibblee Center Geologic Map of the Lakeview Quadrangle (Dibblee, 2003) indicates the formational earth materials underlying the site to be Holocene-age surficial alluvial sediments (map symbol Qal). A brief description of the geologic units underlying the site that are considered pertinent to proposed development follows:

Alluvial Surficial Sediments (Map Symbol – Qal)

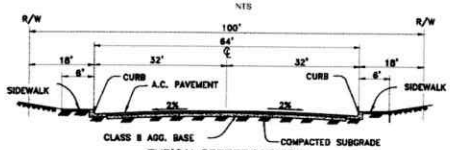
Alluvial surficial sediments underly the entire subject site and extended to a depth of 51.5-ft below the ground surface. This unit consists of inter-lensing units of medium gray fine grained silty Sand (Unified Soil Classification - SM), olive brown Silts (ML) and silty Clays (CL). Detailed descriptions of the onsite units are presented on our exploratory trench logs included in **Appendix B**.

IN THE CITY OF SAN JACINTO, CALIFORNIA
TENTATIVE TRACT MAP NO. 38107

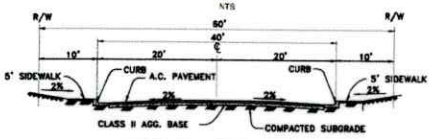


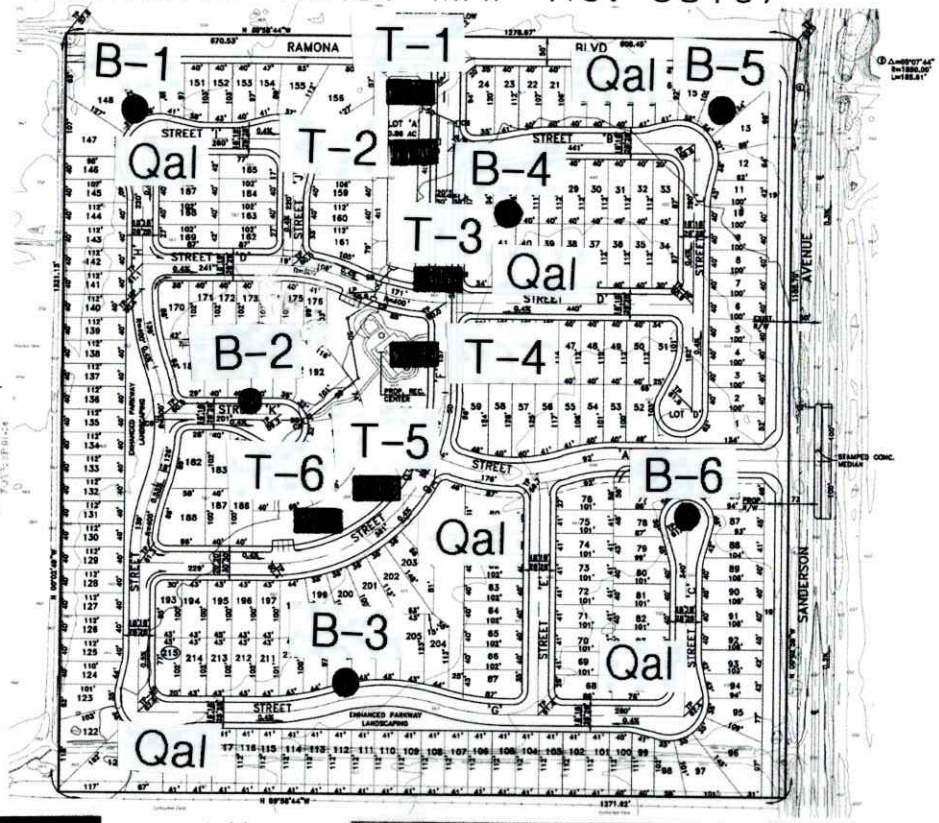


TYPICAL STREET SECTION
SANDERSON AVENUE
URBAN ARTERIAL
NTS



TYPICAL STREET SECTION
RAMONA BLVD
SECONDARY
NTS





OWNER
SRDP L.L.C.
2222 MARTIN STREET, SUITE 100
IRVINE, CA. 92612

APPLICANT
J.D. PIERCE COMPANY
2222 MARTIN STREET, SUITE 100
IRVINE, CA. 92612
(949) 428-8456

ASSESSOR'S PARCEL NO.
432-030-012

GROSS ACREAGE
38.15±

DENSITY
5.6 DU / ACRE

NUMBER OF LOTS
215 RESIDENTIAL + OPEN SPACE

EXISTING / PROPOSED ZONING
R/M

EXISTING / PROPOSED LAND USE DESIGNATION
MDR-MEDIUM DENSITY RESIDENTIAL
(5.1 TO 10 DU / AC)

ADJACENT LAND USE
NORTH - VACANT
EAST - VACANT / RESIDENTIAL
SOUTH - VACANT
WEST - VACANT

PUBLIC UTILITIES
GAS - SOUTHERN CALIFORNIA GAS CO.
ELECTRIC - SOUTHERN CALIFORNIA EDISON CO.
WATER - EASTERN MUNICIPAL WATER DISTRICT
SEWER - EASTERN MUNICIPAL WATER DISTRICT
TELEPHONE - FRONTIER
CABLE - FRONTIER

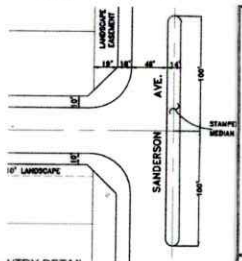
FLOOD ZONE
ZONE 'X', MAP NO. 06065C1440G, 8/28/08

DESCRIPTION
THE NORTH HALF OF THE EAST HALF OF FARM LOT 129 OF LANDS OF THE SAN JACINTO LAND ASSOCIATION, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA AS SHOWN BY MAP ON FILE IN BOOK 6 PAGE(S) 357 OF MAPS, OF OFFICIAL RECORDS OF SAN DIEGO COUNTY, CALIFORNIA.

EXCEPT THAT PORTION CONVEYED TO THE COUNTY OF RIVERSIDE BY DEED RECORDED SEPTEMBER 4, 1968 AS INSTRUMENT NO. 89042 OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

LEGEND
TP TOP OF PAVEMENT ELEVATION
CB CATCH BASIN
SD STORM DRAIN
HP HIGH POINT ELEVATION
0.4% DIRECTION OF FLOW & GRADIENT

NOTES:
1. LOT 'A' IS FOR WATER QUALITY MITIGATION AND STORM WATER RUNOFF MITIGATION. LOTS 'B', 'C' & 'D' ARE LANDSCAPED LOTS. LOT 'A' IS TO BE ANNEXED INTO THE CITY'S CFD FOR MAINTENANCE. LOTS 'B', 'C' & 'D' ARE TO BE MAINTAINED BY THE HOA/OWNERS ASSOC.
2. A SUMP PUMP WILL BE INSTALLED IN THE RETENTION BASIN TO DISCHARGE FLOWS IN EXCESS OF WQMP.
3. SEE LANDSCAPE ARCHITECT PLANS FOR DESIGN OF LOTS 'A - D' AND RECREATION CENTER.



NTRY DETAIL
N AVENUE & STREET 'A'
NTS

LEGEND

UNITS
Qal - SURFICIAL ALLUVIAL SEDIMENTS

SYMBOLS
B-6 ● - APPROXIMATE LOCATION OF EXPLORATORY BORINGS
T-6 ▬ - APPROXIMATE LOCATION OF EXPLORATORY TRENCHES (SS, 2021)

NORTH
100 0 100 200 300
Scale: 1" = 100'

SOUTH SHORE TESTING & ENVIRONMENTAL

GEOTECHNICAL MAP
PROPOSED SINGLE-FAMILY RESIDENTIAL DEVELOPMENT
TENTATIVE TRACT 38107, APN NO. 432-030-012
SWC OF SANDERSON AVENUE
CITY OF SAN JACINTO, RIVERSIDE COUNTY, CALIFORNIA

WORK ORDER: 1372101.00 **DATE** AUG. 2021 **PLATE:** 1 OF 1

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE BY MARK APPR. DATE
ENGINEER
REVISIONS
CITY
DESIGNED BY: DRAWN BY: CHECKED BY:

SEAL

APPROVED BY: DATE
CITY ENGINEER
PREPARED BY: DATE
R.C.E. NO.

BLAINE A. WOMER
CIVIL ENGINEERING
SCALE: 1" = 100'
DATE: JULY 2021
BENCH MARK:

CITY OF SAN JACINTO
TENTATIVE TRACT NO. 38107
FOR W.O.

SHEET NO. 1 OF 1 SHEETS
FILE NO.

Groundwater

Groundwater was encountered within our exploratory boring B-1 at a depth of 33-ft bgs on the northwest corner of the subject site. Based on historic groundwater records, the depth to groundwater underlying the subject site has been recorded as approximately 60-ft bgs (DWR, 1978). The groundwater encountered at 33-ft bgs appears to be a localized perched condition. Minor fluctuations can and will likely occur in moisture or free water content of the soil owing to rainfall and irrigation over time. In addition, the depth to groundwater can fluctuate seasonally as a result of planned groundwater management.

Excavation Characteristics

We anticipate that the onsite alluvial surficial soils can be excavated with slight to moderate difficulty to the proposed depths utilizing conventional grading equipment in proper working condition.

Seismicity

There are no known active or potentially active faults transecting the site, and the site is not located within the presently defined boundaries of either an Alquist-Priolo Earthquake Fault Zone (Hart, 2000) or a County of Riverside fault hazard zone (County of Riverside GIS, 2021), see **Figure 2**. Active fault zones regional to the site include the San Jacinto fault (San Jacinto Valley segment), the San Andreas fault (Southern segment), the Pinto Mountain fault, and the Elsinore fault (Glen Ivy segment), which are located 2.4-km southwest, 21.5-km northeast, 35-km northeast, and 38-km southwest, respectively. The following table lists the known faults that would have the most significant impact on the site:

FAULT	MAXIMUM PROBABLE EARTHQUAKE (MOMENT MAGNITUDE)	SLIP RATE	FAULT TYPE
San Jacinto (San Jacinto Valley segment) (2.4-km SW)	7.2	12 mm/year	A
San Andreas (Southern Segment) (21.5-km NE)	7.2	25 mm/year	A
Elsinore (Glen Ivy Segment) (38-km SW)	6.8	5 mm/year	A
Pinto Mountain (9.8-km SW)	7.2	2.5 mm/year	B

Map My County Map

TRACT 38107

Legend

Faults
- OTHER AUTHORITY
- ALQUIST-PRIOLO
- RIVERSIDE COUNTY

Fault Zones
- OTHER FAULT ZONE
- COUNTY FAULT ZONE
- ELSINORE FAULT ZONE
- SAN ANDREAS FAULT ZONE
- SAN JACINTO FAULT ZONE

Blueline Streams

City Areas

World Street Map

RCIT

0 1,505 3,009 Feet

IMPORTANT Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

REPORT PRINTED ON... 7/28/2021 10:48:39 AM

Notes

APN: 432-030-012
N SANDERSON AVE
SAN JACINTO

FIGURE 2

2019 California Building Code (CBC) -Seismic Parameters:

Based on the geologic setting and soil conditions encountered, the soils underlying the site are classified as "Site Class C, "Very Dense Soil and Soft Rock", according to the CBC. The seismic parameters according to the CBC are summarized in the USGS Design Maps Summary Report presented in **Appendix E**. The corresponding value for peak ground acceleration from the design response spectrum based on the 2019 CBC seismic parameters is 1.183g.

SEISMIC EFFECTS

Ground Accelerations

The most significant earthquake to affect the property is a 7.2 Richter magnitude earthquake on the San Jacinto fault zone (San Jacinto Valley segment). Based on Section 1803.5.12 of the 2019 California Building Code, peak ground accelerations modified for site class effects (PGA_M) of approximately **1.183g** are possible for the design earthquake. The seismic parameters according to the CBC are summarized in the USGS Design Maps Summary Report presented in **Appendix E**.

Ground Cracks

The risk of surface rupture as a result of active faulting is considered negligible based on the absence of known active faulting on the site (Dibblee, 2003 & Morton, 1972).

Ground cracks can and do appear on sites for a variety of reasons including, but not limited to, strong seismic shaking, imperfections in subsurface strata (either man-made or natural), and the expansive nature of some soils near the ground surface. Therefore, the possibility of minor cracks at the ground surface for the life of the project cannot be fully eliminated.

Landslides

The subject property is in a wide alluvial valley and a good distance away from any steep terrain capable of any landslides have been mapped in the area (Dibblee, 2003 & Morton, 1972). The risk of seismically induced landsliding to affect the proposed development is **negligible**.

Liquefaction

The County of Riverside has designated the subject site as an area of moderate liquefaction potential. Historic high groundwater has been recorded at approximately 60-ft bgs (DWR, 1978). We anticipate that the groundwater encountered within B-1 at a depth 33-ft bgs is a localized perched condition. Owing to the depth to groundwater, the medium dense and silty nature of the underlying surficial alluvial sediments it is our opinion that liquefaction is not anticipated, and further analysis appears to be unwarranted.

Seismically Induced Soil Settlement

The proposed footings are anticipated to be founded in medium dense engineered fill overlying medium dense alluvial surficial sediments (Dibblee, 2003). The settlement potential, under seismic loading conditions for these onsite materials, in our opinion, is **low**.

Seiches and Tsunami

Considering the location of the site in relation to large bodies of water, seiches and tsunamis **are not** considered potential hazards of the site.

Rockfall Potential

The subject tract is located within a large alluvial valley and a good distance away from any steep slopes, which are covered with large granitic boulders. The potential for rockfall is anticipated to be **negligible**.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

General

The development of the site as proposed is both feasible and safe from a geotechnical standpoint provided that the recommendations contained herein are implemented during design and construction.

1. It is our understanding that proposed development will encompass the entire site an include the construction of 215 single-family residential lots, interior streets, and improvement of exterior streets.

2. Observation of excavations indicates that suitable material for support of fill and/or structures is near the surface on the site. Earth materials on the site are also suitable for use as compacted structural fill.

3. Observation, classification, and testing indicate that the near surface soils have a very low expansion potential (EI = 0 & 11) consisting of low plastic silty Sand (SM) and sandy Silts (ML).

4. Based on our exploratory borings and trenches, approximately 51.5-ft of surficial alluvial sediments underly the subject site.

RECOMMENDATIONS

Site Grading

General

No grading plan was available for our investigation; however, we were provided with a tentative tract map (38107). Proposed development includes the construction of 215 single-family residential lots, interior roads, improvement of exterior roadways, infiltration systems and a proposed recreation center. We anticipate that overexcavation and recompaction will be required to achieve design grade. It is important to note that all imported soils must be observed and approved by the soil engineer prior to use as fill to verify compliance with project specifications and consistency with onsite soils with respect to expansion potential and structural contact pressure.

Site Specific Grading

A representative of this firm shall be present to observe the bottoms of all excavations and during all fill placement operations to monitor and test as the earth materials are being placed. This observation and testing is intended to assure compliance with the recommendations of this report as well as project specifications as they relate to earthwork construction, County and State ordinances and Table 1705.6 of the 2019 California Building Code.

Where structural fill is to be placed, all loose soils at the ground surface shall be removed to competent earth, i.e., medium dense surficial alluvial sediments. Owing to the loose surficial sediments in the upper 4-ft, the proposed residential lots will require overexcavation and recompaction. Overexcavation should extend a minimum of 4-ft below the existing ground surface or 2-ft below the bottom of the deepest footings, whichever is greater. The overexcavation should extend across the entire pad from property line to property line. The upper 2-ft of the proposed streets should extend a minimum of 2-ft bgs. Overexcavation bottoms should be processed prior to placement of fill including scarification a minimum of 12-inches,

moisture conditioning a minimum to near optimum moisture content, and recompaction to a minimum of 90% of the dry density as determined by ASTM D1557 test method.

No structural fill shall be placed within the building area on any ground without first being observed by a representative of the company providing this report and then providing written certification that the ground is competent and prepared to receive fill.

Onsite soils derived from excavations will be suitable for use as structural fill provided, they are free of large rock (6-inches or larger) and organic debris or construction waste. Approved fill material should be placed in 6 to 8-inch loose lifts, brought to optimum moisture content, and compacted to a minimum of 90% of the maximum laboratory dry density, as determined by the ASTM D 1557-12 test method. No rocks larger than 6-inches in diameter should be used as fill material as they inhibit the compaction process. Rocks larger than 6-inches may be removed or crushed and used as fill material. Broken concrete slab shall also be reduced in size to be less than 6-inches in the major direction. Rocks larger than 6-inches that cannot be crushed, organic materials, asphaltic concrete or oil-bearing surface aggregate should be removed from the graded area and in the case of oil-bearing materials, removed and taken to an appropriate dump site that is designed to handle such.

All earthwork should be done in accordance with the specifications contained in **Appendix D**. Additionally, it will be the responsibility of the owner and or the grading contractor to provide this firm with schedule information for grading activities that require observation and testing. It is preferred that we have a minimum of 48 hours of notice for such.

It will also be recommended that at the completion of rough grading, additional testing of engineering characteristics such as expansion potential and ancillary testing should take place to determine final design requirements for foundations, slabs and concrete used.

Slope Construction

Owing to the relatively flat nature of the subject site, no cut slopes are anticipated. No fill slopes over 3-ft in vertical height are anticipated. Fill slopes constructed at a 2:1 (h:v) slope ratio, to a maximum vertical height of approximately 3-ft, will be surficially and grossly stable if constructed in accordance with the recommendations presented in this report and in **Appendix D** of this report. Any proposed fill slopes will be constructed of earth materials generated from the onsite surficial alluvial sediments. The fill is anticipated to consist of silty Sands (SM), and Silts and clayey Silts (ML).

A keyway should be established along the toe of any proposed fill slope. The outside edge of the keyway should be founded a minimum of 2-ft into observed and competent surficial alluvial sediments and inclined into the hillside at a minimum 2% gradient for a minimum width of 12-ft. The keyway excavations should expose surficial alluvial sediments that are free of pinpoint pores

and fine roots throughout the bottom area and up a minimum of 2-ft on all sides. Any loose soils should be completely removed by benching during rough grade operation.

The importance of proper fill compaction to the face of slope cannot be overemphasized. In order to achieve proper compaction to the slope face, one or more of the four following methods should be employed by the contractor following implementation of typical slope construction guidelines; 1) track walk the slopes at grade, 2) grid roll the slopes, 3) use a combination of sheep foot roller and track walking, and/or 4) overfill the slope 3 to 5-ft laterally and cut it back to grade.

Care should be taken to avoid spillage of loose materials down the face of any slope during grading. Loose fill on the face of the slope will require complete removal prior to shaping and or track walking. Proper seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

Bearing Value and Footing Geometry

A safe allowable bearing value of 1,500 psf for foundations embedded into observed competent engineered fill. Continuous footings, for single-story or equivalent structures, should have a minimum width of 12-inches and depth of 12-inches and conform to the minimum criteria of the 2019 CBC for very low expansive soils (EI = 0 & 11). Continuous footings, for two-story or equivalent structures, should have a minimum width of 15-inches and depth of 18-inches and conform to the minimum criteria of the 2019 CBC for very low expansive soils (EI = 0 & 11). The use of isolated column footings is not discouraged, however, where utilized, should have a minimum embedment of 18-inches below lowest soil grade. The minimum distance of the bottom outside edge of all footings and any slope face shall be 5-ft. All footings should be embedded a minimum of 12-inches into observed competent native materials, regardless of depth below the adjacent ground surface.

Settlement

The bearing value recommended above reflects a total settlement of 0.5-inches and a differential settlement of 0.5-inches within a horizontal distance of 20-ft (L/480). Most of this settlement is expected to occur during construction and as the loads are being applied.

Concrete Slabs

All concrete slabs on grade should be 4-inches thick, minimum. They should be underlain by 2-inches of sand or approved non-expansive onsite materials. Imported or approved onsite materials may be utilized for this purpose. Contractors should be advised that when pouring during hot or windy weather conditions, they should provide large slabs with sufficiently deep weakened plane joints to inhibit the development of irregular or unsightly cracks. Also, 4-inch

thick slabs should be jointed in panels not exceeding 8-ft in both directions to augment proper crack direction and development.

Moisture Barrier

When the intrusion of moisture through concrete slabs is objectionable, particularly with interior slabs where flooring is moisture sensitive, a vapor barrier should be installed onto the subgrade prior to the pouring of concrete. It should consist of a minimum 10-mil visqueen, protected from puncture with 2-inches of sand above and 2-inches of sand below. This is considered a minimum recommendation as there are other devices that provide as good as or better moisture protection. The project architect and or structural engineer may recommend alternative devices for moisture protection.

Reinforcement

From a Geotechnical standpoint, continuous footings should be reinforced with a minimum of two number 4 steel bar placed at the top and bottom. In no case, should the content of steel in concrete footings be less than the recommended minimums of the appropriate sections of the A.C.I. standards. Slabs should be reinforced with a minimum of number 3 steel bars placed at the center of thickness at 18-inch centers both ways (CBC 2019). These are considered minimums and additional requirements may be imposed by other structural engineering design requirements. In addition, at the completion of grading, testing of the near surface soils may indicate that different or more stringent reinforcing schedule minimums may be appropriate. Careful consideration should be given to the recommendations that will be contained in the final report of compaction test results and foundation design requirements.

Concrete

Based on our corrosivity suite testing, Type II Portland cement concrete can be utilized for the subject site. Laboratory analysis results, which are included in **Appendix C**, indicated that the percentage by weight of soluble sulfates were reported as **Non Detect (ND)**, which equates to a **Negligible** sulfate exposure per American Concrete Institute (ACI), 318-14. Soluble sulfate content testing should be conducted within the building pad at the completion of rough grading to confirm concentration of sulfite ions within the onsite earth materials.

Corrosivity test results, which are summarized in **Appendix C,** indicated saturated resistivity of 3,400 ohms/cm for the onsite soils, which indicates the onsite soils are moderately corrosive (NACE International, 1984). Results for pH and Chlorides are included in **Appendix C**. South Shore Testing and Environmental does not practice corrosion engineering. If specific information or evaluation relating to the corrosivity of the onsite or any import soil is required, we recommend that a competent corrosion engineer be retained to interpret or provide additional corrosion analysis and mitigation.

Lateral Loads

The bearing value of the soil may be increased by one third for short duration loading (wind, seismic). Lateral loads may be resisted by passive forces developed along the sides of concrete footings or by friction along the bottom of concrete footings. The value of the passive resistance for level ground may be computed using an equivalent fluid density of 250 pcf for level ground. The total force should not exceed 2,500 psf. A coefficient of friction of .35 may be used for the horizontal soil/concrete interface for resistance of lateral forces. If friction and passive forces are combined, then the passive values should be reduced by one third.

Cut/Fill Transitions

At this time, no grading plan was available for our review, however, owing to the recommended overexcavation and recompaction of the building pads presented in the Site Specific Grading section any cut/fill transitions will be eliminated within the building pads.

Oversize Rock

No oversize rock was encountered within the surficial alluvial sediments during our subsurface investigation of the subject site. If any oversize material is to be generated during site development, it should be disposed of off-site, utilized in landscaping, or placed in an approved rock fill in accordance with **Appendix D** of this report.

Preliminary Structural Section

We recommend the following preliminary structural section for interior streets and exterior. For preliminary design purposes, the following pavement sections may be considered based on a traffic indexes (T-I's) of 5, 7, and 9 and an assumed R-value of 20. R-value testing should be conducted at the completion of precise grading, or after bringing in import soils, to verify soils exposed at subgrade, and a final structural section design should be recommended at that time. The project civil engineer should confirm the traffic indexes.

AREA	TI	PAVEMENT SECTION
Interior Streets	5.0	0.25' (3.0") AC over 0.66' (8.0") ABII
Ramona Boulevard	7.0	0.32' (3.8") AC over 1.0' (12.0") ABII
N Sanderson Ave	9.0	0.44' (5.3") AC over 1.34' (16.0") ABII

It is recommended that the subgrade materials be compacted to a depth of 1 foot below subgrade elevation and that both the subgrade materials and the ABII be compacted to 95% relative to the maximum density of the respective materials, as determined by ASTM D1557 laboratory tests. R-Value testing should be conducted on imported soils prior to their approval as structural fill material.

Utility Trench Backfill

All trench excavations should be conducted in accordance with Cal-OSHA standards as a minimum. The soils encountered within our exploratory trenches are generally classified as Type "C" soil in accordance with current CAL/OSHA excavation standards. Based upon a soil classification of Type "C", the temporary excavations should not be inclined steeper than 1.5:1 (h: v) for a maximum depth of 20-ft. For temporary excavations, deeper than 20-ft or for conditions that differ from those described for Type "C" in the CAL/OSHA excavation standards, the project geotechnical engineer should be contacted.

Utility trench backfill should be compacted to a minimum of 90 percent of the maximum dry density determined in laboratory testing by the ASTM D 1557-12 test method. It is our opinion that utility trench backfills consisting of onsite or approved sandy soils can best be placed by mechanical compaction to a minimum of 90 percent of the maximum dry density. The upper 1-ft of utility trench excavations located within pavement areas should be compacted to a minimum of 95 percent of the maximum dry density.

Fine Grading and Site Drainage

Fine grading of areas outside of the residence should be accomplished such that positive drainage exists away from all footings in accordance with 2019 CBC and local governing agency requirements. Run-off should be conducted in a non-erosive manner toward approved drainage devices per approved plans. No run-off should be allowed to concentrate and flow over the tops of slopes.

Construction

South Shore Testing & Environmental, or a duly designated representative, should be present during all earthwork construction in accordance with the standard specifications contained at the back of this report, to test and or confirm the conditions encountered during this study. In addition, post earthwork construction monitoring should be conducted at the following stages:

- At the completion of final grading of building pads so that finished surface compaction tests may be obtained. Moisture content near optimum will necessarily need to be maintained, both to maintain proper compaction and to prevent wind erosion of the pad.

- At the completion of foundation excavations, but prior to the placement of steel and or other construction materials in them. As a requirement of this report, the undersigned must, in writing, certify that the foundations meet the minimum requirements of this report and the building plans for depth and width along with the earth materials being the appropriate moisture content and compaction. Backfilling of over deepened footings with earth materials will not be allowed and must be poured with concrete. Consequential changes and differences may exist throughout the earth materials on the site. It may be possible that certain excavations may have to be deepened slightly if earth materials are found to be loose or weak during these observations.

- Any other pertinent post construction activity where soils are excavated or manipulated or relied upon in any way for the performance of buildings or hardscape features.

Supplemental Recommendations

If at any time during grading or construction on this site, conditions are found to be different than those indicated in this report, it is essential that the soil engineer be notified. The soil engineer reserves the right to modify in any appropriate way the recommendations of this report if site conditions are found to be different than those indicated in this report.

- The earth units exposed at the surface is observed to be surficial alluvial sediments. They are moderately to very erosive. It is medium dense at shallow depths, on the order of 5-ft and water percolates moderately well into the onsite surficial alluvial sediments.

- Cuts to 5-ft, or slightly more will stand vertical for normal time periods associated with construction of backcuts for fill slopes or retaining walls. Time periods for unsupported cuts 5-ft or greater vertical should be limited to 30 days in the non-rainy season and 10 days in the rainy season.

Grading and Foundation Plan Reviews

Once grading and foundation plans are finalized, Grading and Foundation Plan Reviews should be performed to review plans and confirm that the plans are in general conformance with recommendations presented in this report.

Construction Monitoring

Observation and testing by South Shore Testing & Environmental is necessary to verify compliance with recommendations contained in this report and to confirm that the geotechnical conditions encountered are consistent with those encountered. South Shore Testing & Environmental should conduct construction monitoring during any fill placement and subgrade preparation prior to placement of fill or construction materials.

LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers and Geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The report is issued with the understanding that it is used only by the owner and it is the sole responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the architect, engineer, and appropriate jurisdictional agency for the project and incorporated into the plans; and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations contained herein during construction and in the field.

The samples taken and used for testing and the observations made are believed representative; however, soil and geologic conditions can vary significantly between test locations. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by **South Shore Testing & Environmental**, or its assigns.

The findings of this report are valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The firm that performed the geotechnical investigation for this project should be retained to provide testing observation services during construction to maintain continuity of geotechnical interpretation and to check that the recommendations presented herein are implemented during site grading, excavation of foundations and construction of improvements.

If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. Selection of another firm to perform any of the recommended activities or failure to retain the undersigned to perform the recommended activities wholly absolves **South Shore Testing & Environmental**, the undersigned, and its assigns from all liability arising directly or indirectly from any aspects of this project.

We appreciate the opportunity to be of service. Limitations and conditions contained in reference documents are considered in full force and applicable. If you have any questions, please do not hesitate to call our office.

Respectfully submitted,

South Shore Testing & Environmental

John P. Frey
Project Geologist

William C. Hobbs, RCE 42265
Civil Engineer

ATTACHMENTS

Figure 1 - Site Location Map (2,000-scale)
Figure 2 – County Fault Zone Map (505-scale)
Plate 1 - Geotechnical Map (not-to-scale)
Appendix A - References
Appendix B - Exploratory Boring & Trench Logs
Appendix C - Laboratory Test Results
Appendix D – Standards of Grading
Appendix E - USGS Design Maps Summary Report

APPENDIX A

References

REFERENCES

California Building Standards Commission (CBSC), 2019, "2019 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2".

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APPENDIX B

Exploratory Boring & Trench Logs

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ± 1460	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._1____ DESCRIPTION	SOIL TEST
5				V	3.0	93.0	**SURFICAL ALLUVIAL SEDIMENT** FINE SILTY SAND (SM): MEDIUM GRAY BROWN, FINE TO COARSE GRAINED, UNCONSOLIDATED WEAKLY CEMENTED, MINOR INTERBEDS OF DARK GRAY MICACOUS SILT, MOIST	MAXIMUM DENSITY/OPTIMUM MOISTURE CONTENT, SIEVE ANALYSIS, EXPANSION INDEX, CORROSIVITY SUITE
		12					SILT (ML): DARK GRAY, MOIST, MICACOUS	MOISTURE DENSITY
10		18			5.2	95.0	SILTY SAND (SM): DARK GRAY, FINE GRAINED GRADING IN POCKET TO SILT	MOISTURE DENSITY
15		18			13.6		SILTY SAND (SM): MEDIUM GRAY, FINE TO MEDIUM GRAINED, SLIGHTLY MOIST, NON COHESIVE, MODERATELY GRADED	200 WASH (47% PASSING) MOISTURE CONTENT
20		18			14.9		CLAYEY SILT (ML): OLIVE BROWN, MOIST, STIFF, LOOSE	200 WASH (55% PASSING) MOISTURE CONTENT
25		11			25.0		FINE SILTY SAND W/CLAY (SM-SC): OLIVE BROWN, MOIST, MEDIUM DENSE, FINE	200 WASH (36%PASSING) MOISTURE CONTENT
30					28.2		CLAYEY SILT (ML): OLIVE BROWN, MOIST, MEDIUM DENSE	200 WASH (56% PASSING) MOISTURE CONTENT
35		14			26.5		SILTY SAND (SM): OLIVE BROWN, FINE TO MEDIUM , MOIST, MEDIUM DENSE, CLAYEY IN PART	200 WASH (35% PASSING) MOISTURE CONTENT
40		10						

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-1

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ± 1460	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._1____ DESCRIPTION	SOIL TEST
					29.8		CLAYEY SILT (ML): OLIVE BROWN, MOIST, MEDIUM DENSE	200 WASH (60% PASSING) MOISTURE CONTENT
		17						
45					20.4		SANDY SILT (ML): MEDIUM GRAY, SANDY IN PART, MOIST, MEDIUM DENSE	200 WASH (64% PASSING) MOISTURE CONTENT
		19						
50							CLAYEY SILT (ML-CL): DARK GRAY, VERY MOIST, STIFF MINOR CLAY	
					23.4			200 WASH (59% PASSING) MOISTURE CONTENT
		10					**TOTAL DEPTH 51.5'**	
							GROUNDWATER @33'	
55								
60								
65								
70								
75								
80								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-1

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ± 1461	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._2____ DESCRIPTION	SOIL TEST
							SURFICIAL ALLUVIAL SEDIMENT SILTY SAND (SM): LIGHT GRAY, FINE TO MEDIUM GRAINED, SLIGHTLY MOIST, NON COHESIVE	MOISTURE DENSITY
5		8 11					SANDY SILT (ML): DARK DRAY, MOIST, MICACOUS, SANDY IN PART	MOISTURE DENSITY
10		17					SILTY SAND (SM): MEDIUM GRAY, FINE TO MEDIUM GRAINED, MEDIUM DENSE	MOISTURE DENSITY
15							SILTY SANDSM: MEDIUM GRAY, FINE TO MEDIUM GRAINED, NON COHESIVE, SLIGHTLY MOIST, MODERATELY GRADED	200 WASH (18% PASSING) MOISTURE CONTENT
		10					SILT (ML): OLIVE BROWN, MOIST, STIFF **TOTAL DEPTH = 15.5 FT** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-2

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ±	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._3____ DESCRIPTION	SOIL TEST
							SURFICIAL ALLUVIAL SEDIMENT	
							SANDY SILT (ML): DARK GRAY, SLIGHTLY MOIST, MINOR SAND, LOOSE	
5							SANDY SILT (ML): DARK GRAY, SLIGHTLY MOIST, SANDY IN PART, LOOSE,	MOISTURE DENSITY
		9			11.1	97.0		
					14.9	102.0		
10								MOISTURE DENSITY
		12					SILTY SAND(SM): MEDIUM GRAY FINE GRAINED, MINOR MEDIUM DENSE, SLIGHTLY MOIST	
					4.1	97		MOISTURE DENSITY
		18						
15							SILTY SAND(SM): DARK GRAY, BROWN, MOIST, MEDIUM DENSE, MICACEOUS, FINE GRAINED	200 WASH (34% PASSING) MOISTURE CONTENT
					23.4		POORLY GRAINED	
		10						
20								
		10		#			SANDY SILT (SM): GRAY, SANDY IN PART, MEDIUM DENSE, MOIST, MICACEOUS, FINE GRAINED, AS ABOVE	200 WASH (32% PASSING) MOISTURE CONTENT
							TOTAL DEPTH = 21.5 FT	
25							**NO GROUNDWATER**	
30								
35								
40								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-3

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ±	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._4____ DESCRIPTION	SOIL TEST
							SURFICIAL ALLUVIAL SEDIMENT	
							SANDY SILT (ML): MEDIUM GRAY,DRY, LOOSE TO MEDIUM DENSE	
5							FINE SANDY SILT (ML): GRAY BROWN, TRACE SAND, MOIST	
					13.6	97.0		MOISTURE DENSITY
		10						
10							CLAYEY SILT (ML-CL): OLIVE BROWN, MOIST, MICACEOUS, CLAYEY IN PART	
		7			16.2	93.0		MOISTURE DENSITY
		18						
15							SILTY SAND(SM): MEDIUM GRAY BOWN, IN PART, MICACOUS, MOIST, FINE GRAINED, POORLY GRADED	200 WASH (33% PASSING) MOISTURE CONTENT
					11.1			
		11					**TOTAL DEPTH = 16.5 FT** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-4

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ±	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._5___ DESCRIPTION	SOIL TEST
5		12		V | | | Λ	13.6	97.0	**SURFICIAL ALLUVIAL SEDIMENT** FINE SANDY SILT (ML): DARK GRAY BROWN, TRACE FINE SAND, SLIGHTLY MOIST, NON COHESIVE, POORLY GRADED, MICACEOUS	MOISTURE DENSITY
10		8			25.0	88.0	CLAYEY SILT (ML-CL): OLIVE BROWN, MOIST, MICEOUS, MINOR CLAY	MOISTURE DENSITY
15		10					FINE SILTY SAND(SM): MEDIUM GRAY, FINE GRAINED, TRACE MEDIUM, POORLY GRADED, SLIGHTLY DENSE	200 WASH (15% PASSING) MOISTURE CONTENT
20							**TOTAL DEPTH = 16.5 FT** **NO GROUNDWATER**	
25								
30								
35								
40								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-5

LOGGED BY: KMC	METHOD OF EXCAVATION: MOBILE # B61 TRUCK MOUNTED DRILL RIG EQUIPPED W/6" HOLLOW STEM AUGERS ELEVATION: ± 1464	DATE OBSERVED:7/13/21 LOCATION: SEE PLATE 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	BORING LOG NO._6____ DESCRIPTION	SOIL TEST
							SURFICIAL ALLUVIAL SEDIMENT	
							SILT (ML): DARK GRAY BROWN, MOIST, MICACEOUS, TRACE OF SAND	
5					9.8			200 WASH (33% PASSING) MOISTURE CONTENT
		6					SILT (ML): OLIVE BROWN, MOIST, MICACEOUS	
10					28.2			200 WASH (33% PASSING) MOISTURE CONTENT
		10						
15							**TOTAL DEPTH = 11.5 FT** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO:1372101.00	LOG OF BORING	FIGURE: B-6

APPENDIX C

Laboratory Test Results

LABORATORY TESTING

A. Classification

Soils were visually classified according to the Unified Soil Classification System. Classification was supplemented by index tests such as maximum density and optimum moisture content.

B. Expansion Index

Expansion index tests were performed on representative samples of the onsite soils remolded and tested under a surcharge of 144 lb/ft^2, in accordance with ASTM D-4829-11. The test results are presented on **Figure C-1, Table I.**

C. Maximum Density/Optimum Moisture Content

Maximum density/optimum moisture content relationships were determined for typical samples of the onsite soils. The laboratory standards used were ASTM 1557-Method A. The test results are summarized on **Figure C-1, Table II** and laboratory results are presented on **Figures C-2 & C-3.**

D. Particle Size Determination

Particle size determinations, consisting of mechanical analyses (sieve) was performed on representative samples of the onsite soils in accordance with ASTM D 422-63 and CAL TEST 202. The test results are shown on **Figures C-4 & C-5.**

E. Corrosivity Suite

Corrosivity suite testing including resistivity, soluble sulfate content, pH and chloride content were performed on a representative sample of the onsite soils. The laboratory standards used were CTM 643, CTM 417 & CTM 422. The test results are presented on **Figure C-1, Table III**.

TABLE I EXPANSION INDEX		
TEST LOCATION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 0-5 ft	0	Non-Expansive
T-1 @ 0-5 ft	11	Non-Expansive

TABLE II MAXIMUM DENSITY/OPTIMUM MOISTURE RELATIONSHIP ASTM D 1557		
TEST LOCATION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)
B-1 @ 0-5 ft	126.4	11.5
T-1 @ 0-5 ft	124.0	11.2

TABLE III CORROSIVITY SUITE				
TEST LOCATION	SATURATED RESISTIVITY	pH	CHLORIDE CONTENT	SULFATE CONTENT
B-1 @ 0-5 ft	3,400	7.5	43 ppm	ND % by wt.

Figure C-1

COMPACTION TEST REPORT

Curve No.: 2.60

Project No.: 1372101.00
Project: JD PIERCE CO.

Date: 07/19/21

Location: B–1
Elev./Depth: 0–5'
Sample No.
Remarks:

MATERIAL DESCRIPTION

Description: MEDIUM GRAY SILTY SAND

Classifications - USCS: SM AASHTO:
Nat. Moist. = Sp.G. = 2.65
Liquid Limit = Plasticity Index =
% > No.4 = % % < No.200 =

TEST RESULTS	
Maximum dry density =	126.4 pcf
Optimum moisture =	11.5%

Test specification:
ASTM D 1557-91 Procedure A Modified

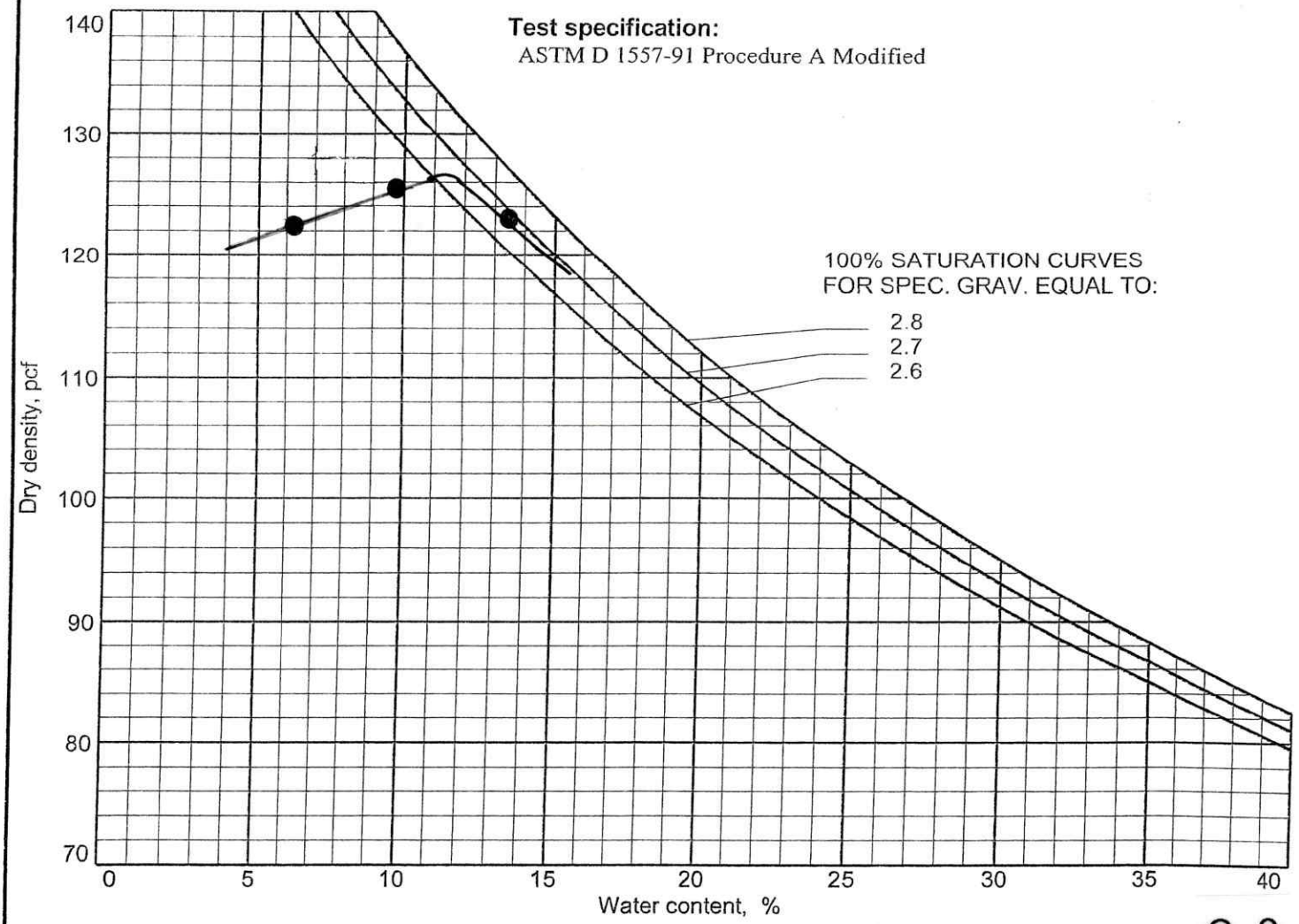


Figure C–2

COMPACTION TEST REPORT

Curve No.: 2.60

Project No.: 1372101.00
Project: JD PIERCE CO.

Date: 06/04/21

Location: T-1
Elev./Depth: 0-5'
Sample No.
Remarks:

MATERIAL DESCRIPTION

Description: DARK GRAY FINE SANDY SILT

Classifications - USCS: ML AASHTO:
Nat. Moist. =
Liquid Limit =
% > No.4 = %

Sp.G. = 2.65
Plasticity Index =
% < No.200 =

TEST RESULTS	
Maximum dry density =	124.0 pcf
Optimum moisture =	11.2%

Test specification:
ASTM D 1557-91 Procedure A Modified

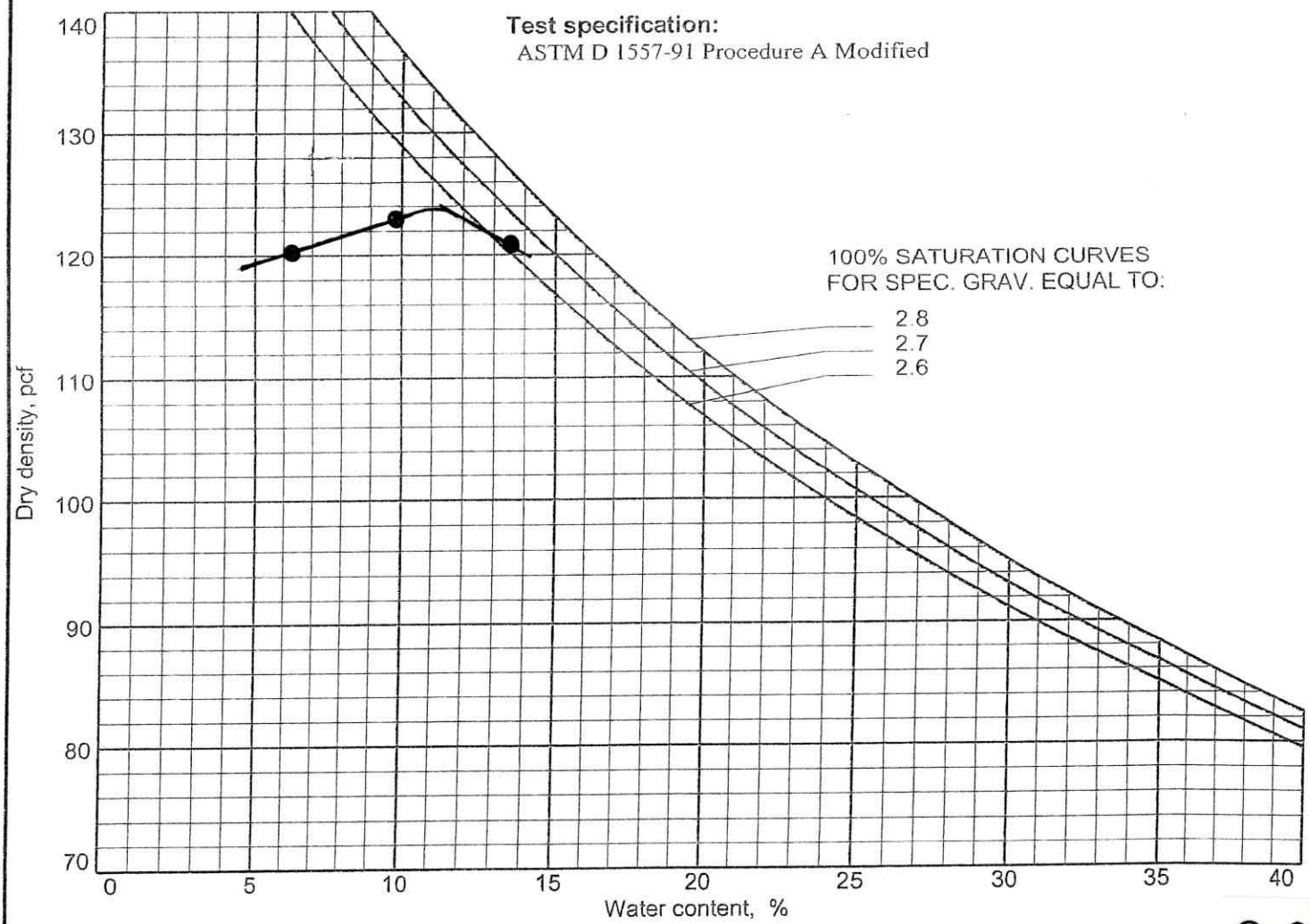


Figure C-3

Project Number: 1372101.00	ASTM C131/D1140	Depth: 0-5
Project Name: JD Pierce	Gradation & 200 Wash	Date: 7/20/21
Boring: B-1		Tested By: MG

Wash Data				Moisture Content		
Before Wash (g)	After Wash (g)	% Retained	% Passing	Tare:	Wet+Tare:	Dry+Tare:
0.0	1000.0	#DIV/0!	#DIV/0!			

Total Dry Weight:	1000.0	Moisture Content:	#DIV/0!

Sieve Data

Categories	Sieve No.	Accumulated Weight	% Retained	% Passing
Coarse Gravel	2 1/2"		0%	100.0%
	2"		0.0%	100.0%
	1 1/2"		0.0%	100.0%
	1"		0.0%	100.0%
Fine Gravel	3/4"	0.0	0.0%	100.0%
	1/2"	0.0	0.0%	100.0%
	3/8"	0.0	0.0%	100.0%
Coarse Sand	No. 4	8.0	0.8%	99.2%
Medium Sand	No. 10	47.0	0.8%	99.2%
	No. 30	263.0	26.3%	73.7%
Fine Sand	No. 50	413.0	41.3%	58.7%
	No. 100	578.0	57.8%	42.2%
Silt/Clay	No. 200	612.0	61.2%	38.8%
	Pan			

Project Number: 1372101.00	ASTM C131/D1140	Depth: 0-5
Project Name: JD Pierce		Date: 6/4/21
Boring: T-1	Gradation & 200 Wash	Tested By: MG

Wash Data				Moisture Content		
Before Wash (g)	After Wash (g)	% Retained	% Passing	Tare:	Wet+Tare:	Dry+Tare:
0.0	1000.0	#DIV/0!	#DIV/0!			

Total Dry Weight:	1000.0	Moisture Content:	#DIV/0!

Sieve Data

Categories	Sieve No.	Accumulated Weight	% Retained	% Passing
Coarse Gravel	2 1/2"		0%	100.0%
	2"		0.0%	100.0%
	1 1/2"		0.0%	100.0%
	1"		0.0%	100.0%
Fine Gravel	3/4"	0.0	0.0%	100.0%
	1/2"	0.0	0.0%	100.0%
	3/8"	0.0	0.0%	100.0%
Coarse Sand	No. 4	4.0	0.4%	99.6%
Medium Sand	No. 10	95.0	0.4%	99.6%
	No. 30	153.0	15.3%	84.7%
Fine Sand	No. 50	225.0	22.5%	77.5%
	No. 100	268.0	26.8%	73.2%
Silt/Clay	No. 200	300.0	30.0%	70.0%
	Pan			

APPENDIX D

Standards of Grading

STANDARD GRADING AND EARTHWORK SPECIFICATIONS

These specifications present **South Shore Testing & Environmental,** standard recommendations for grading and earthwork.

No deviation from these specifications should be permitted unless specifically superseded in the geotechnical report of the project or by written communication signed by the Soils Consultant. Evaluations performed by the Soils Consultant during the course of grading may result in subsequent recommendations which could supersede these specifications or the recommendations of the geotechnical report.

1.0 GENERAL

1.1 The Soils Consultant is the Owner's or Developer's representative on the project. For the purpose of these specifications, observations by the Soils Consultant include observations by the Soils Engineer, Soils Engineer, Engineering Geologist, and others employed by and responsible to the Soils Consultant.

1.2 All clearing, site preparation, or earthwork performed on the project shall be conducted and directed by the Contractor under the allowance or the supervision of the Soils Consultant.

1.3 The Contractor should be responsible for the safety of the project and satisfactory completion of all grading. During grading, the Contractor shall remain accessible.

1.4 Prior to the commencement of grading, the Soils Consultant shall be employed for the purpose of providing field, laboratory, and office services for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the Soils Consultant provide adequate testing and observations so that he may provide an opinion as to determine that the work was accomplished as specified. It shall be the responsibility of the Contractor to assist the Soils Consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

1.5 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes, agency ordinances, these specifications, and the approved grading plans. If, in the opinion of the Soils Consultant, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc, are resulting in a quality of work less then required in these specifications, the Soils Consultant will be empowered to reject the work and recommend that construction be stopped until the conditions are rectified.

1.6 It is the Contractor's responsibility to provides safe access to the Soils Consultant for testing and/or grading observation purposes. This may require the excavation of the test pits and/or the relocation of grading equipment.

1.7 A final report shall be issued by the Soils Consultant attesting to the Contractor's conformance with these specifications.

2.0 SITE PREPARTION

2.1 All vegetation and deleterious material shall be disposed of off-site. This removal shall be observed by the Soils Consultant and concluded prior to fill placement.

2.2 Soil, Alluvium or bedrock materials determined by the Soils Consultant as being unsuitable for placement in compacted fills shall be removed from the site or used in open areas as determined by the Soils Consultant. Any material incorporated as a part of a compacted fill must be approved by the Soils Consultant prior to fill placement.

2.3 After the ground surface to receive fill has been cleared, it shall be scarified, disced and/or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks, or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than twelve inches in depth, the excess shall be removed and placed in lifts not to exceed six inches or less.

Prior to placing fill, the ground surface to receive fill shall be observed, tested, and approved by the soils consultant.

2.4 Any underground structures or cavities such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines, or others are to be removed or treated in a manner prescribed by the Soils Consultant.

2.5 In cut-fill transitions lots and where cut lots are partially in soil, colluvium or unweathered bedrock materials, in order to provide uniform bearing conditions, the bedrock portion of the lot extending a minimum of 5 feet outside of building lines shall be over excavated a minimum of 3 feet and replaced with compacted fill. Greater over excavation could be required as determined by Soils Consultant. Typical details are attached.

3.0 COMPACTED FILLS

3.1 Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the Soils Consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by Soils Consultant or shall be mixed with other soils to serve as satisfactory fill material, as directed by the Soils Consultant.

3.2 Rock fragments less than six inches in diameter may be utilized in the fill, provided

- They are not placed or nested in concentrated pockets
- There is sufficient amount of approved soil to surround the rocks
- The distribution of rocks is supervised by the Soils Consultant

3.3 Rocks greater than twelve inches in diameter shall be taken off-site, or placed in accordance with the recommendations of the Soils Consultant, areas designated as suitable for rock disposal (A typical detail for Rock Disposal is attached.)

3.4 Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fil.

3.5 Representative samples of materials to be utilized as compacted fill shall be analyzed by the laboratory of the Soils Consultant to determine the physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Soils Consultant before being approved as fill material.

3.6 Material used in the compacting process shall be evenly spread, watered, processed, and compacted in thin lifts not to exceed six inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Soils Consultant.

3.7 If the moisture content or relative compaction varies from that required by the Soils Consultant, the Contractor shall rework the fill until it has been approved by the Soils Consultant.

3.8 Each layer shall be compacted to at least 90 percent of the maximum density in compliance with the testing method specified by the controlling government agency or ASTM 1557-70, whichever applies.

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soil conditions the area to receive fill compacted to less than 90 percent shall either be delineated on the grading plan and/or appropriate reference made to the area in the geotechnical report.

3.9 All fills shall be keyed and benched through all topsoil, colluvium, alluvium, or creep material, into sound bedrock, or firm material where the slope receiving fill exceeds a ratio of five horizontal to one vertical or in accordance with the recommendations of the Soils Consultant.

3.10 The key for side hill fills shall be a minimum width of 15 feet within bedrock or firm materials, unless otherwise specified in the geotechnical report, (see detail attached.)

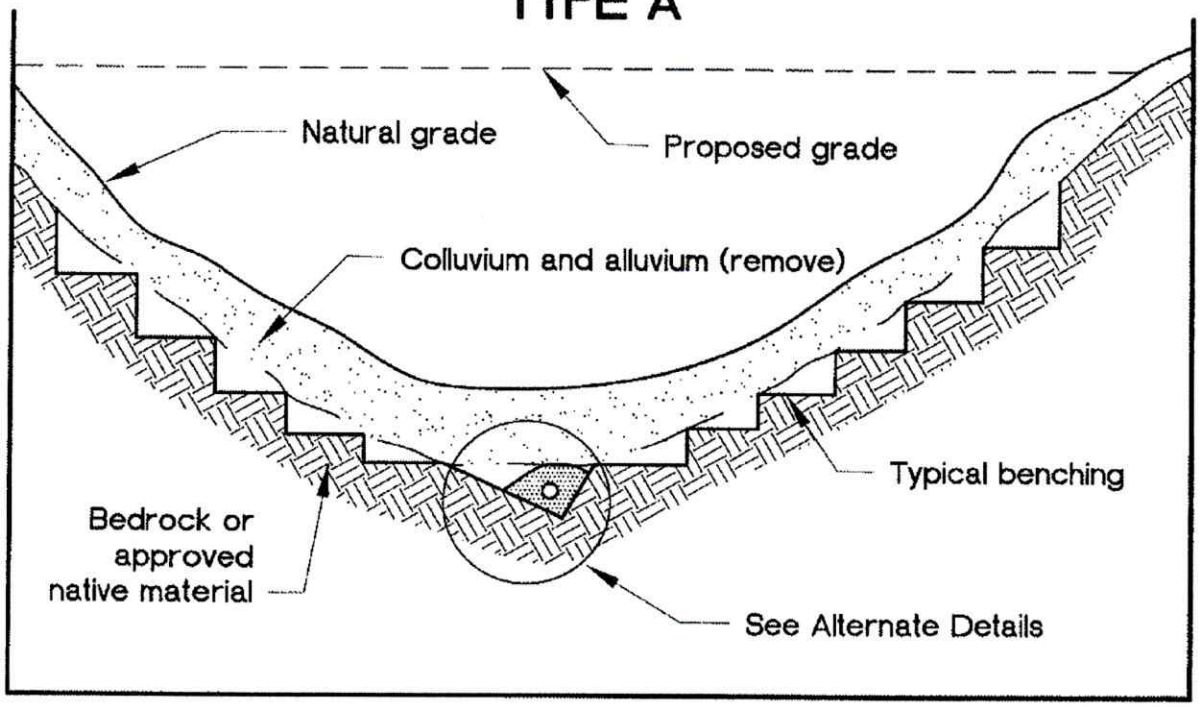
3.11 Sub drainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Consultant. (Typical Canyon Subdrain details are attached.)

3.12 The contractor will be required to obtain a minimum relative compaction of at least 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. This may be achieved by either over building the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure, which produces the required compaction approved by the Soils Consultant.

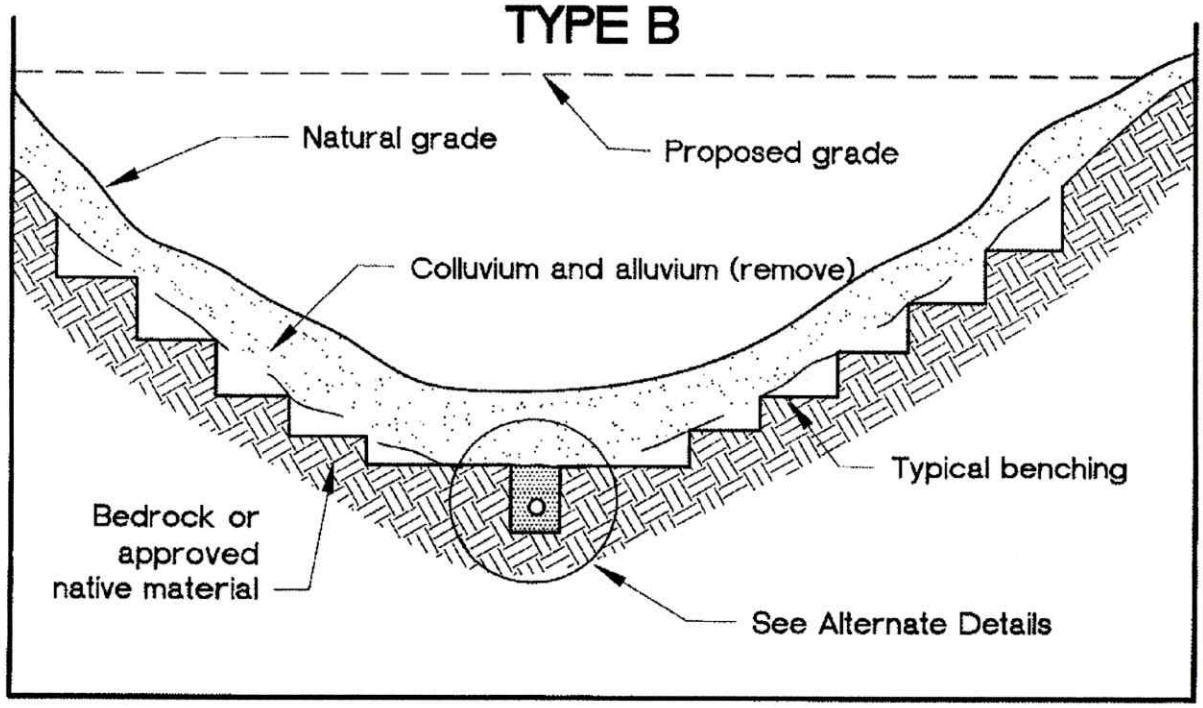
3.13 All fill slopes should be planted or protected from erosion by other methods specified in the Soils report.

3.14 Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials and the transition shall be stripped of all soils prior to placing fill (see attached detail.)

TYPE A

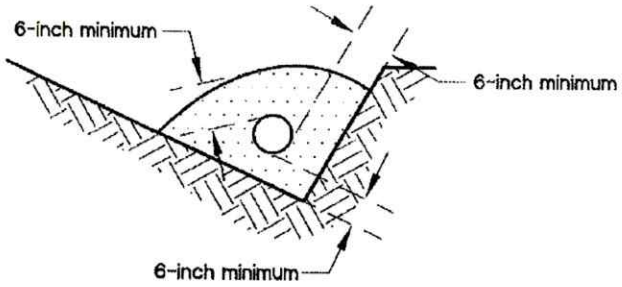


TYPE B

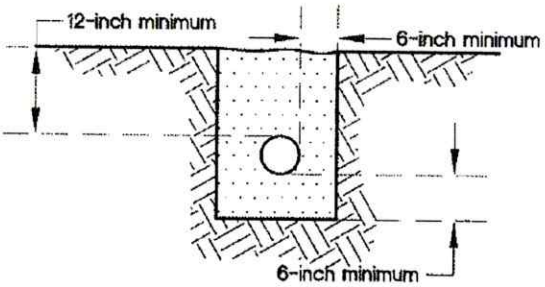


Selection of alternate subdrain details, location, and extent of subdrains should be evaluated by the geotechnical consultant during grading.

SOUTH SHORE TESTING	CANYON SUBDRAIN DETAIL	Plate 1



A-1



B-1

Filter material: Minimum volume of 9 cubic feet per lineal foot of pipe.

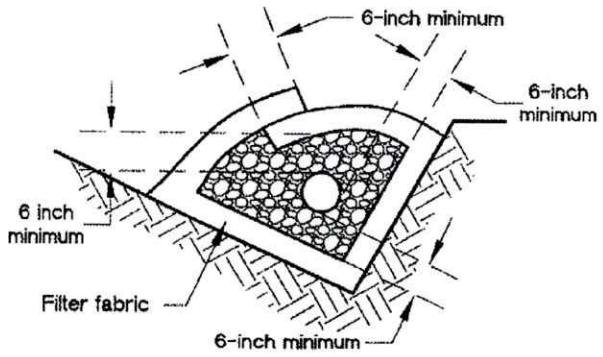
Perforated pipe: 6-inch-diameter ABS or PVC pipe or approved substitute with minimum 8 perforations (¼-inch diameter) per lineal foot in bottom half of pipe (ASTM D-2751, SDR-35, or ASTM D-1527, Schd. 40).

For continuous run in excess of 500 feet, use 8-inch-diameter pipe (ASTM D-3034, SDR-35, or ASTM D-1785, Schd. 40).

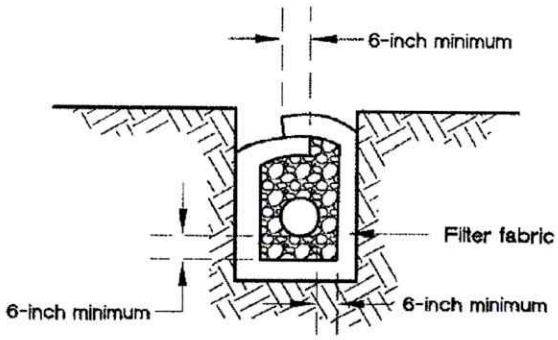
FILTER MATERIAL

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

ALTERNATE 1: PERFORATED PIPE AND FILTER MATERIAL



A-2

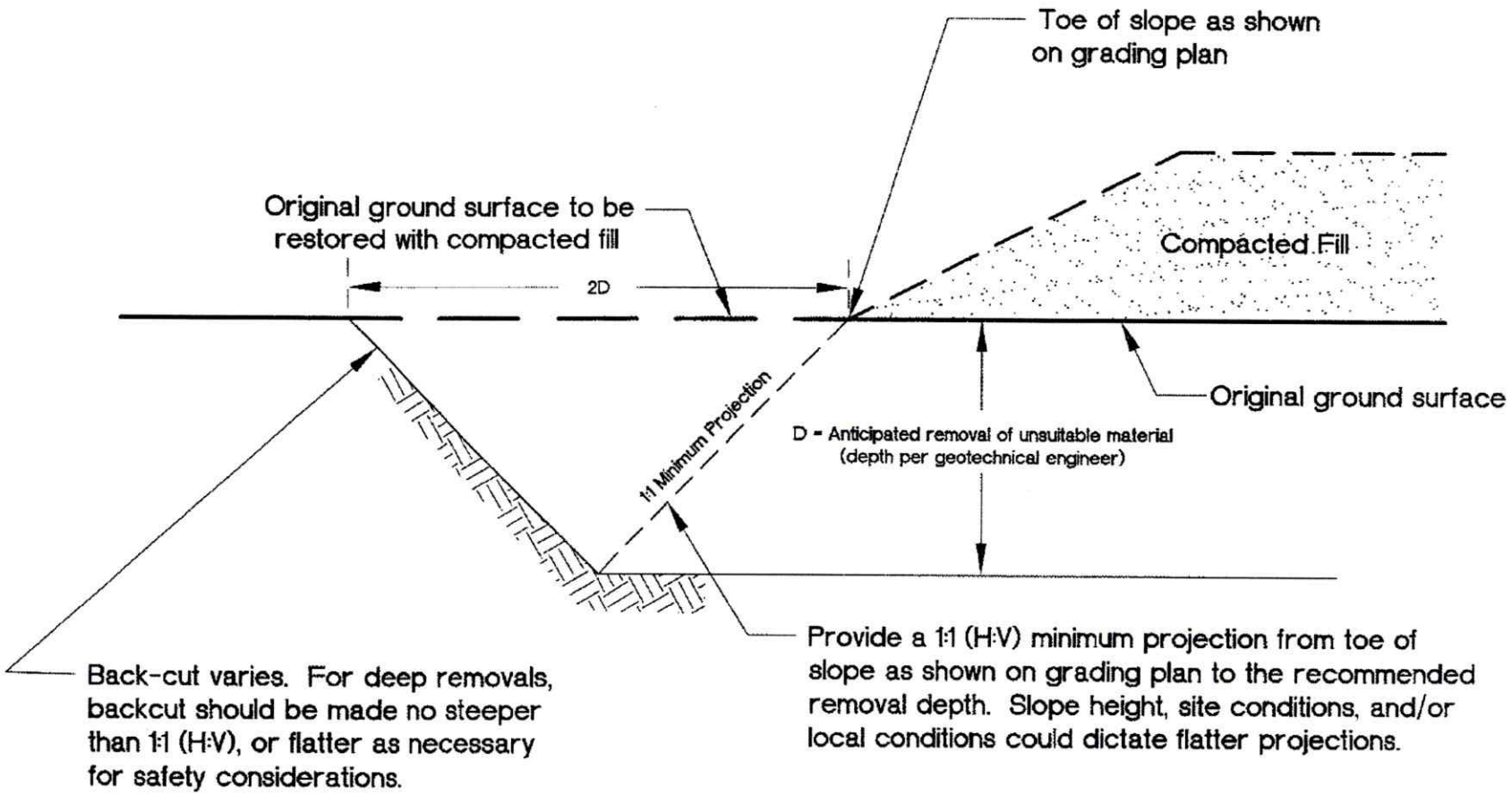


B-2

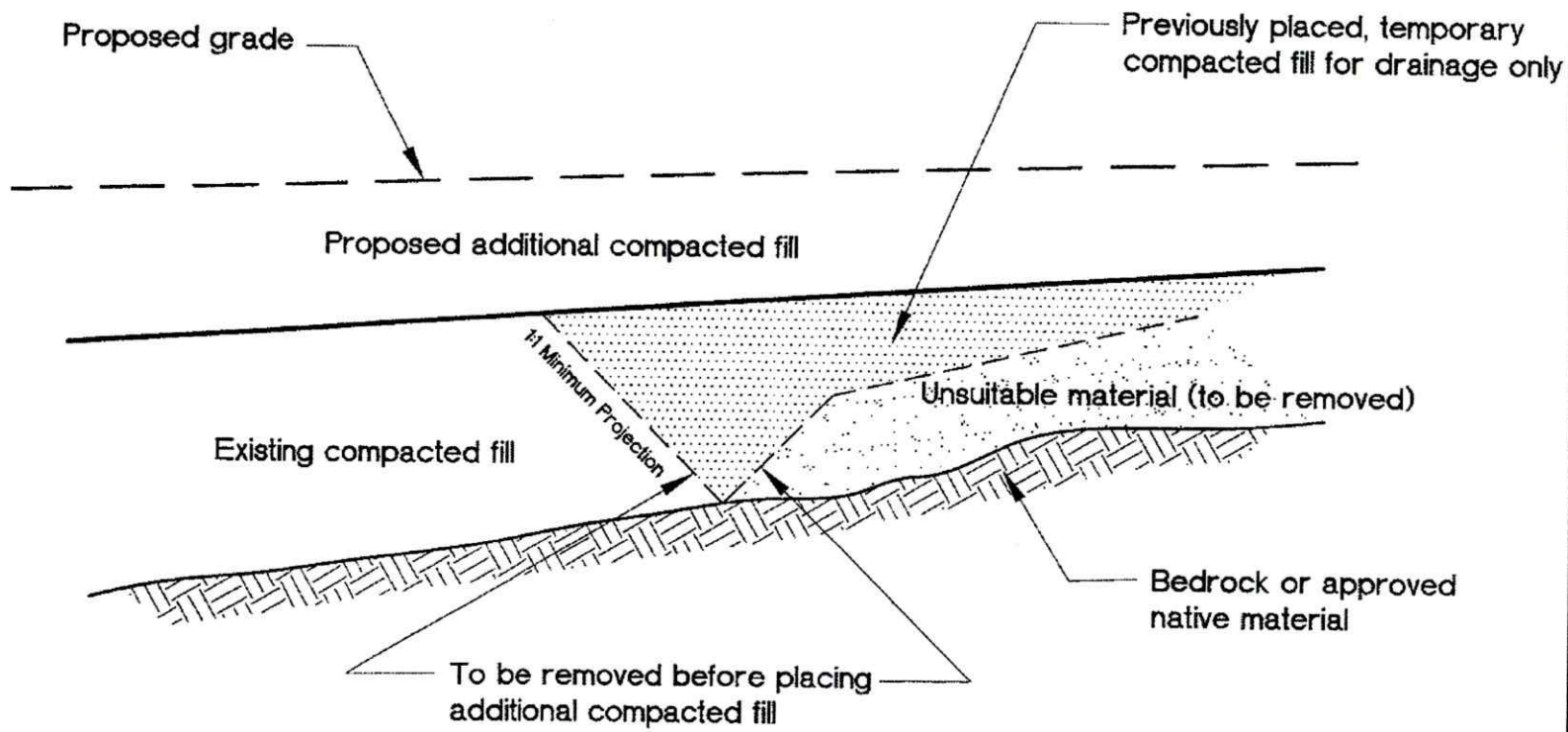
Gravel Material: 9 cubic feet per lineal foot.
Perforated Pipe: See Alternate 1
Gravel: Clean ¾-inch rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

ALTERNATE 2: PERFORATED PIPE, GRAVEL, AND FILTER FABRIC

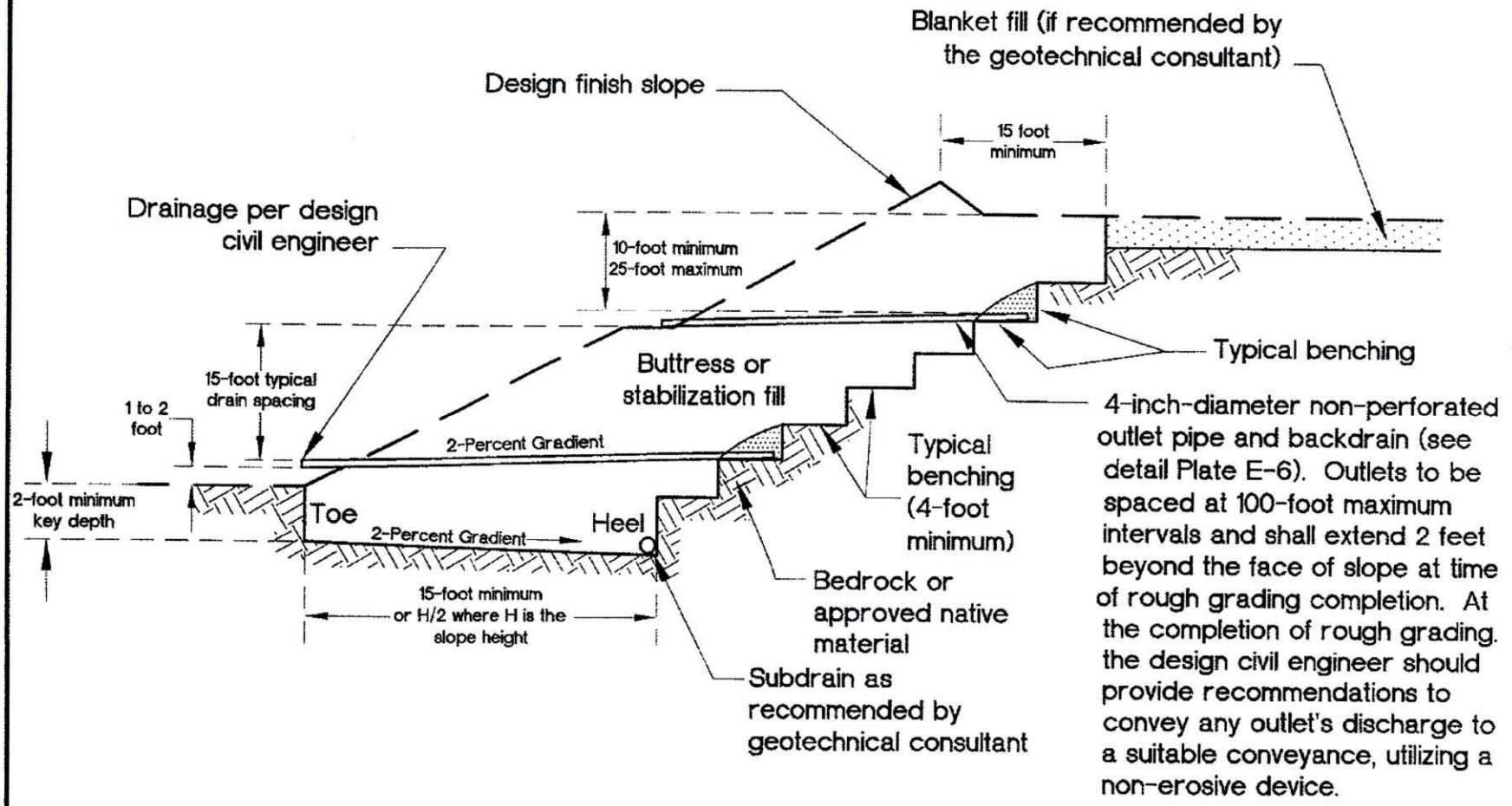
SOUTH SHORE TESTING	CANYON SUBDRAIN ALTERNATE DETAILS	Plate 2



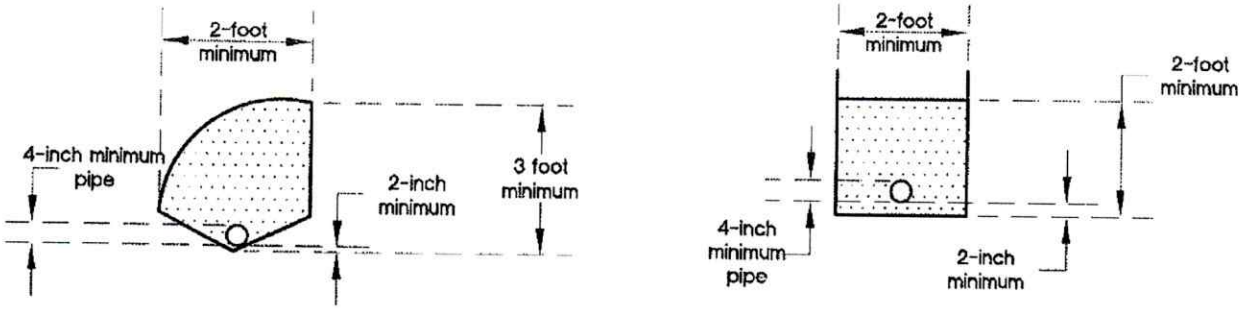
SOUTH SHORE TESTING	FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON DETAIL	PLATE 3



SOUTH SHORE TESTING	REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL DETAIL	Plate 4



SOUTH SHORE TESTING	TYPICAL STABILIZATION / BUTTRESS FILL DETAIL	Plate 5



Filter Material: Minimum of 5 cubic feet per lineal foot of pipe or 4 cubic feet per lineal feet of pipe when placed in square cut trench.

Alternative in Lieu of Filter Material: Gravel may be encased in approved filter fabric. Filter fabric shall be Mirafi 140 or equivalent. Filter fabric shall be lapped a minimum of 12 inches in all joints.

Minimum 4-Inch-Diameter Pipe: ABS-ASTM D-2751, SDR 35; or ASTM D-1527 Schedule 40, PVC-ASTM D-3034, SDR 35; or ASTM D-1785 Schedule 40 with a crushing strength of 1,000 pounds minimum, and a minimum of 8 uniformly-spaced perforations per foot of pipe. Must be installed with perforations down at bottom of pipe. Provide cap at upstream end of pipe. Slope at 2 percent to outlet pipe. Outlet pipe to be connected to subdrain pipe with tee or elbow.

Notes:
1. Trench for outlet pipes to be backfilled and compacted with onsite soil.
2. Backdrains and lateral drains shall be located at elevation of every bench drain. First drain located at elevation just above lower lot grade. Additional drains may be required at the discretion of the geotechnical consultant.

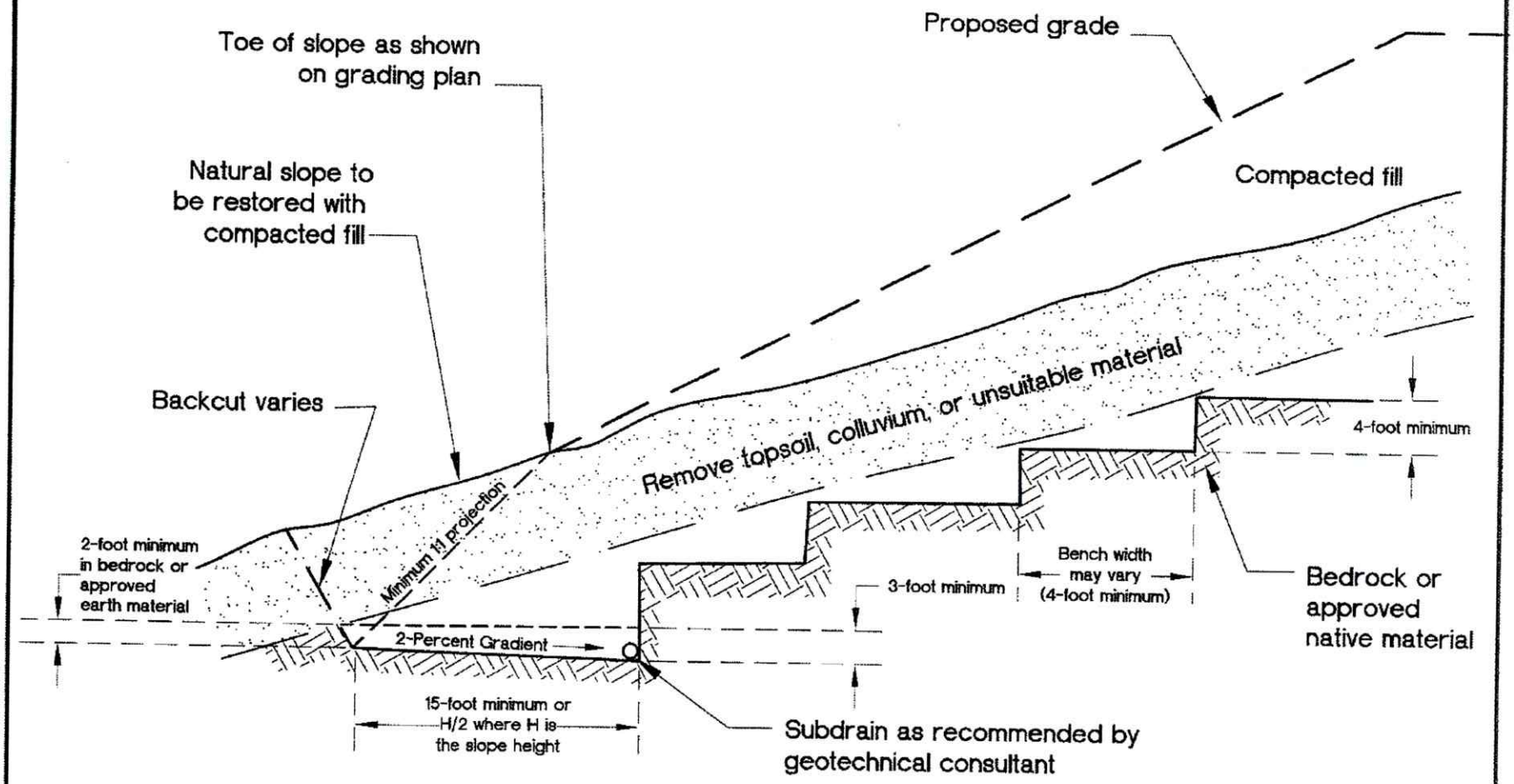
Filter Material shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Gravel shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1½ inch	100
No. 4	50
No. 200	8

SOUTH SHORE TESTING	TYPICAL BUTTRESS SUBDRAIN DETAIL	Plate 6

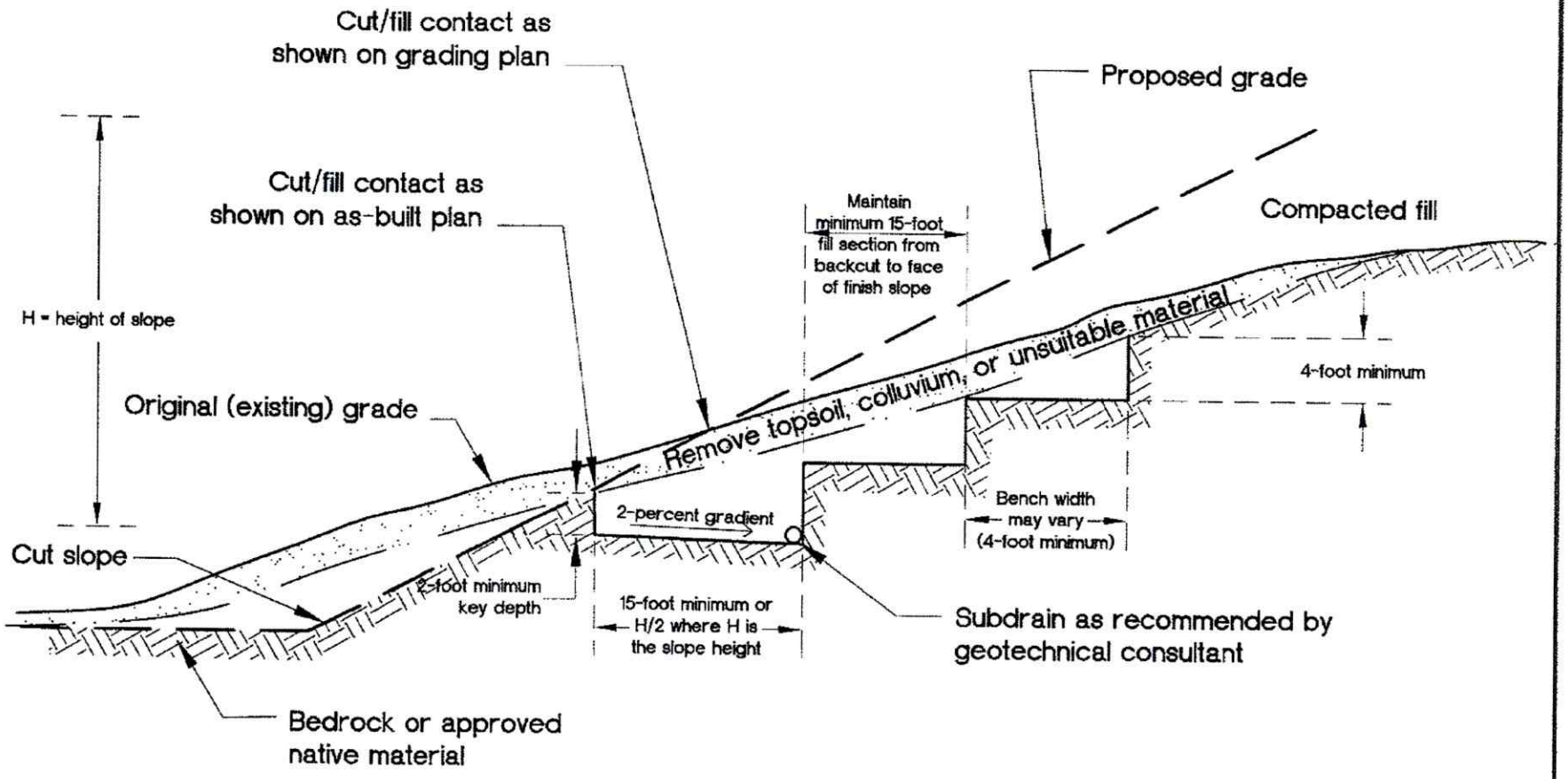


NOTES:

1. Where the natural slope approaches or exceeds the design slope ratio, special recommendations would be provided by the geotechnical consultant.

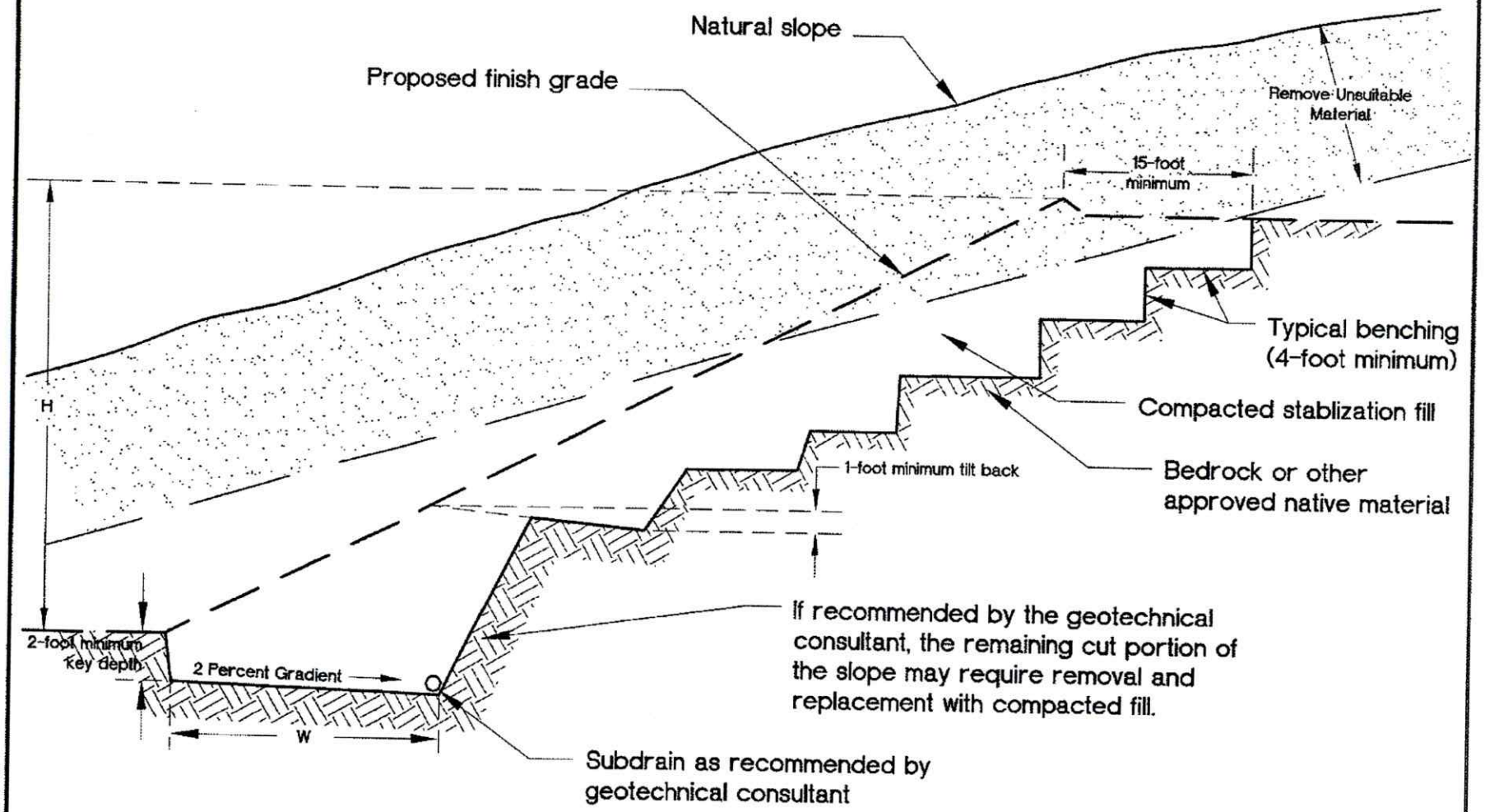
2. The need for and disposition of drains should be evaluated by the geotechnical consultant, based upon exposed conditions.

SOUTH SHORE TESTING	FILL OVER NATURAL (SIDEHILL FILL) DETAIL	Plate 7



NOTE: The cut portion of the slope should be excavated and evaluated by the geotechnical consultant prior to construction of the fill portion.

SOUTH SHORE TESTING	FILL OVER CUT DETAIL	Plate 8

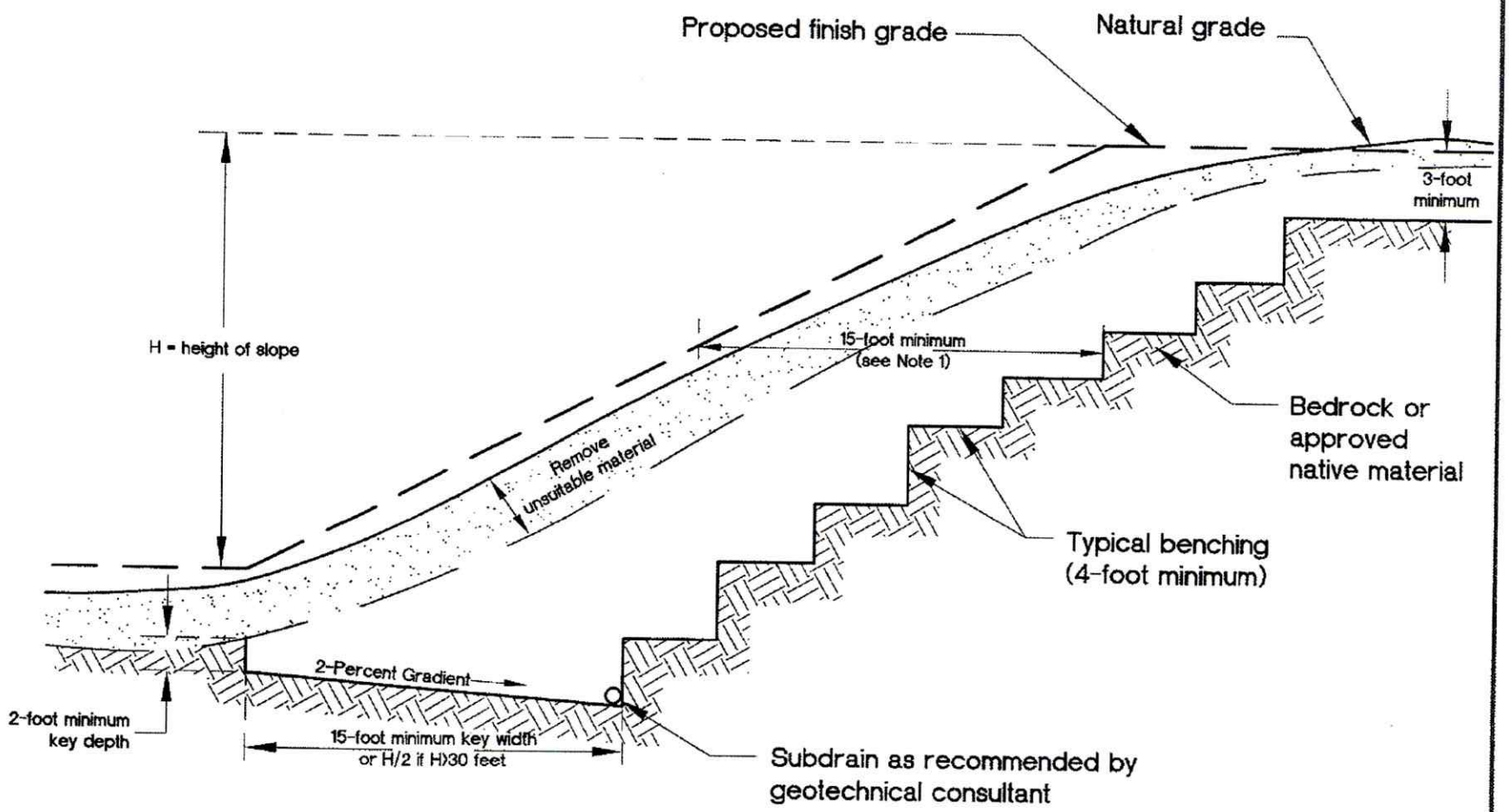


NOTES:

1. Subdrains may be required as specified by the geotechnical consultant.

2. W shall be equipment width (15 feet) for slope heights less than 25 feet. For slopes greater than 25 feet, W shall be evaluated by the geotechnical consultant. At no time, shall W be less than H/2, where H is the height of the slope.

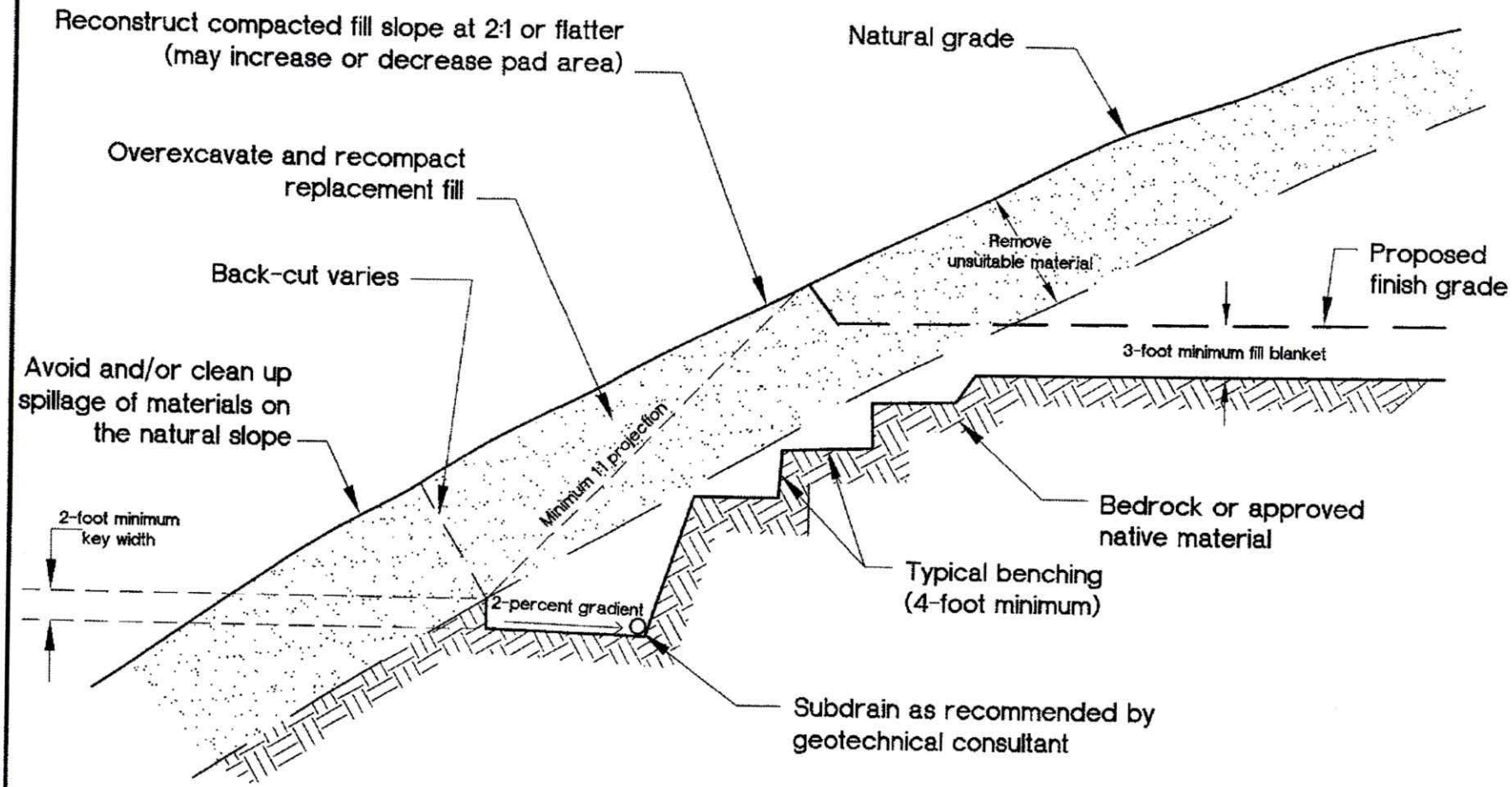
SOUTH SHORE TESTING	STABLIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN CUT SLOPE DETAIL	Plate 9



NOTES:

1. 15-foot minimum to be maintained from proposed finish slope face to backcut.
2. The need and disposition of drains will be evaluated by the geotechnical consultant based on field conditions.
3. Pad overexcavation and recompaction should be performed if evaluated to be necessary by the geotechnical consultant.

SOUTH SHORE TESTING	SKIN FILL OF NATURAL GROUND DETAIL	Plate 10

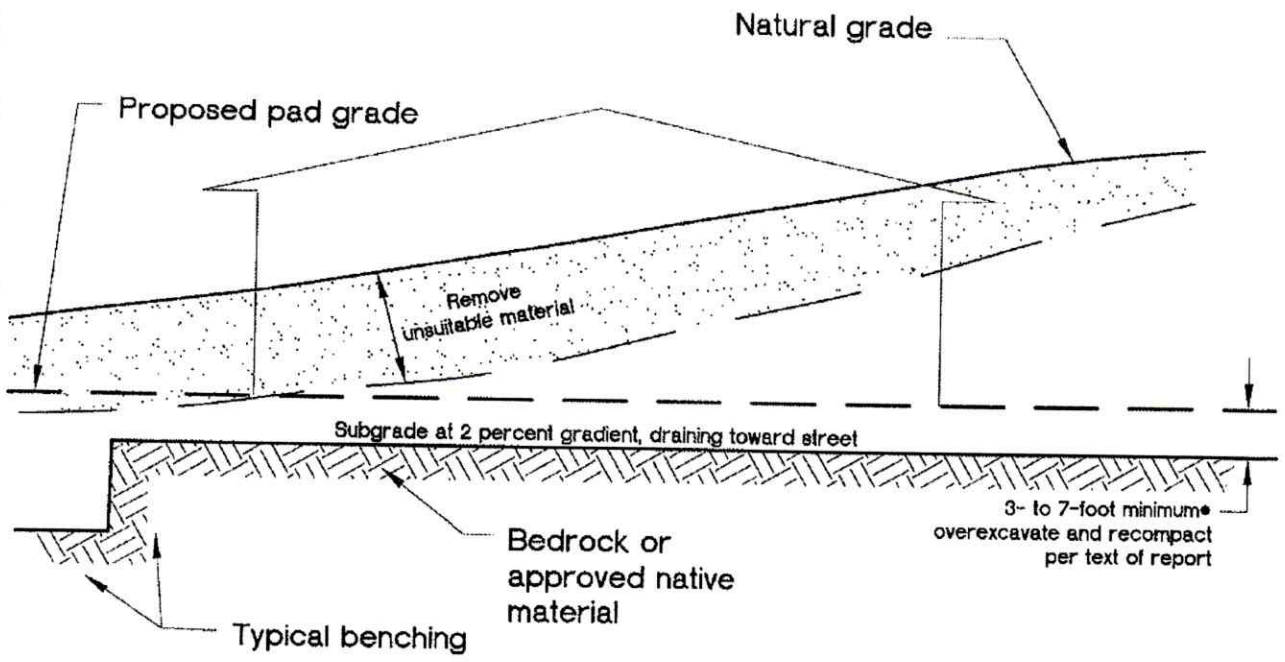


NOTES:

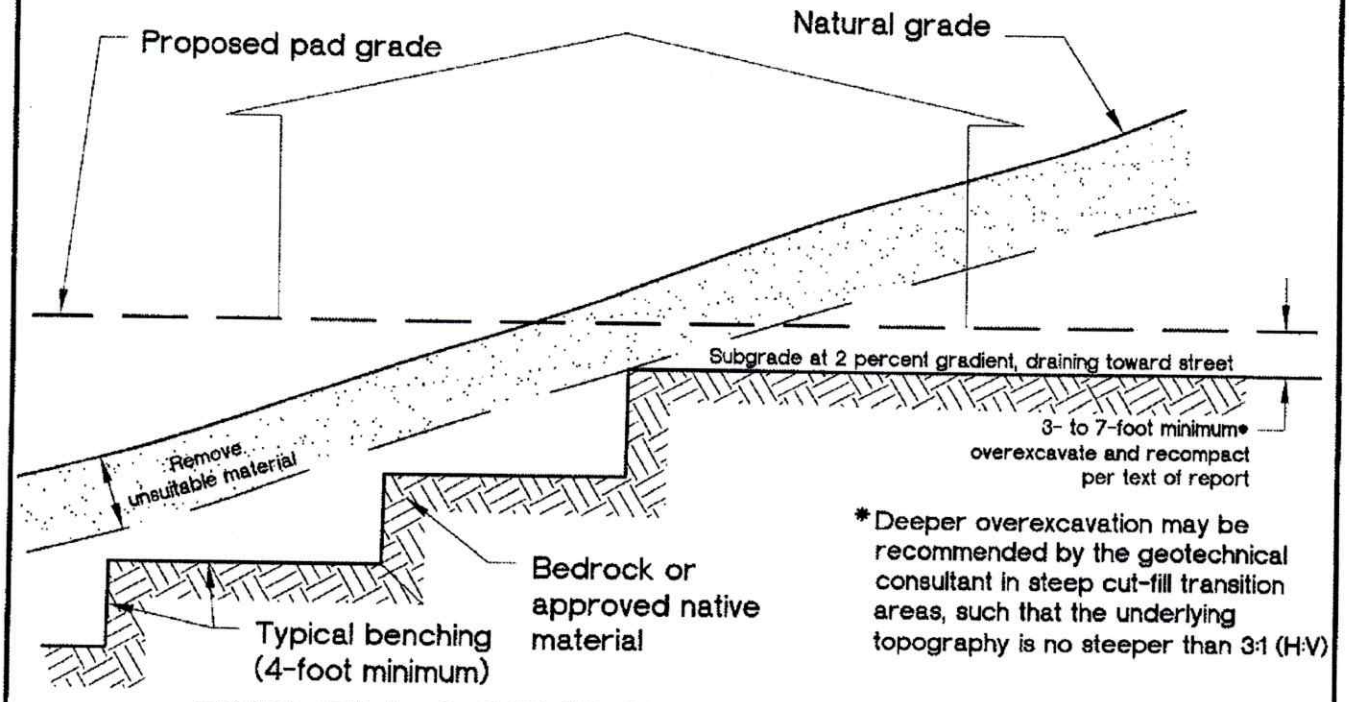
1. Subdrain and key width requirements will be evaluated based on exposed subsurface conditions and thickness of overburden.

2. Pad overexcavation and recompaction should be performed if evaluated necessary by the geotechnical consultant.

SOUTH SHORE TESTING	DAYLIGHT CUT LOT DETAIL	Plate 11



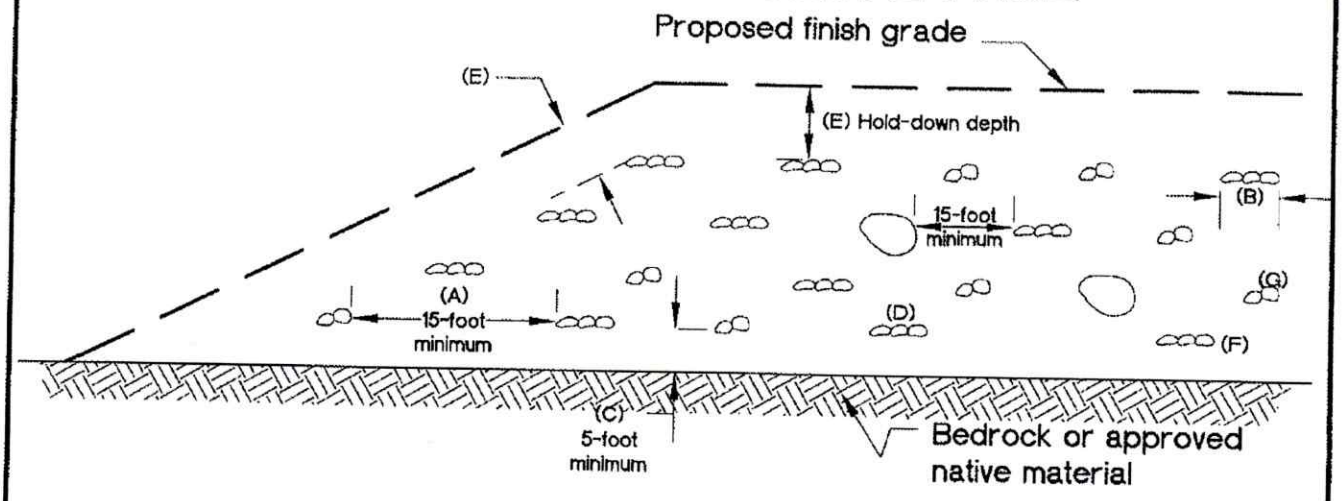
CUT LOT OR MATERIAL-TYPE TRANSITION



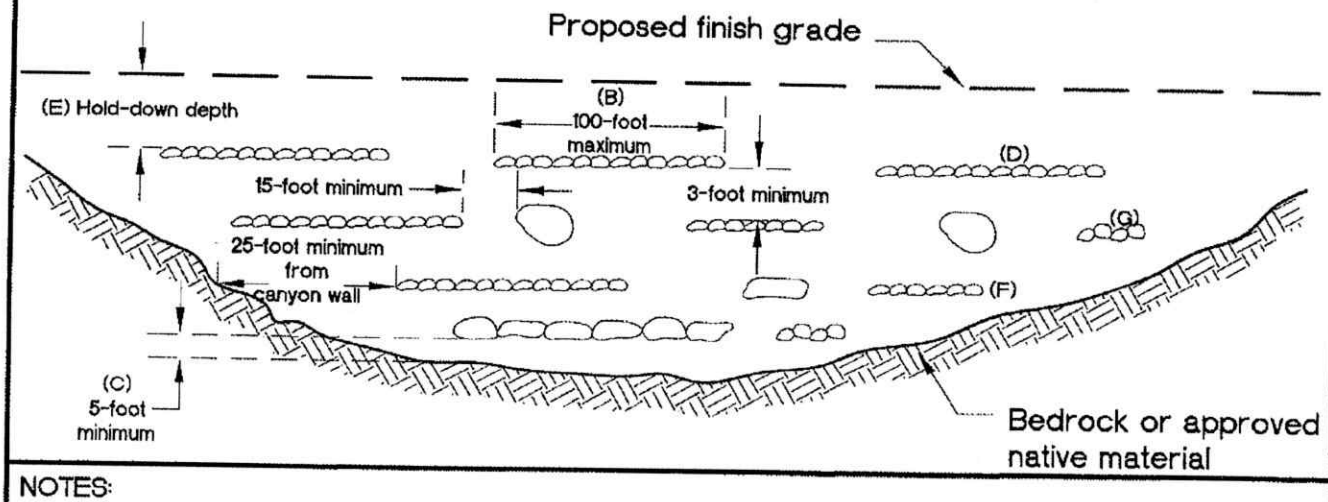
CUT-FILL LOT (DAYLIGHT TRANSITION)

SOUTH SHORE TESTING	TRANSITION LOT DETAILS	Plate 12

VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE



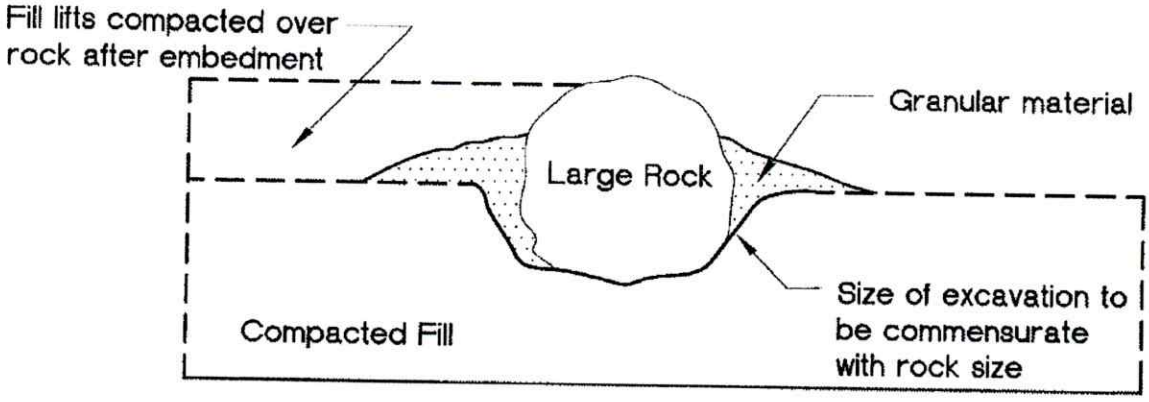
NOTES:

A. One equipment width or a minimum of 15 feet between rows (or windrows).
B. Height and width may vary depending on rock size and type of equipment. Length of windrow shall be no greater than 100 feet.
C. If approved by the geotechnical consultant, windrows may be placed directly on competent material or bedrock, provided adequate space is available for compaction.
D. Orientation of windrows may vary but should be as recommended by the geotechnical engineer and/or engineering geologist. Staggering of windrows is not necessary unless recommended.
E. Clear area for utility trenches, foundations, and swimming pools; Hold-down depth as specified in text of report, subject to governing agency approval.
F. All fill over and around rock windrow shall be compacted to at least 90 percent relative compaction or as recommended.
G. After fill between windrows is placed and compacted, with the lift of fill covering windrow, windrow should be proof rolled with a D-9 dozer or equivalent.

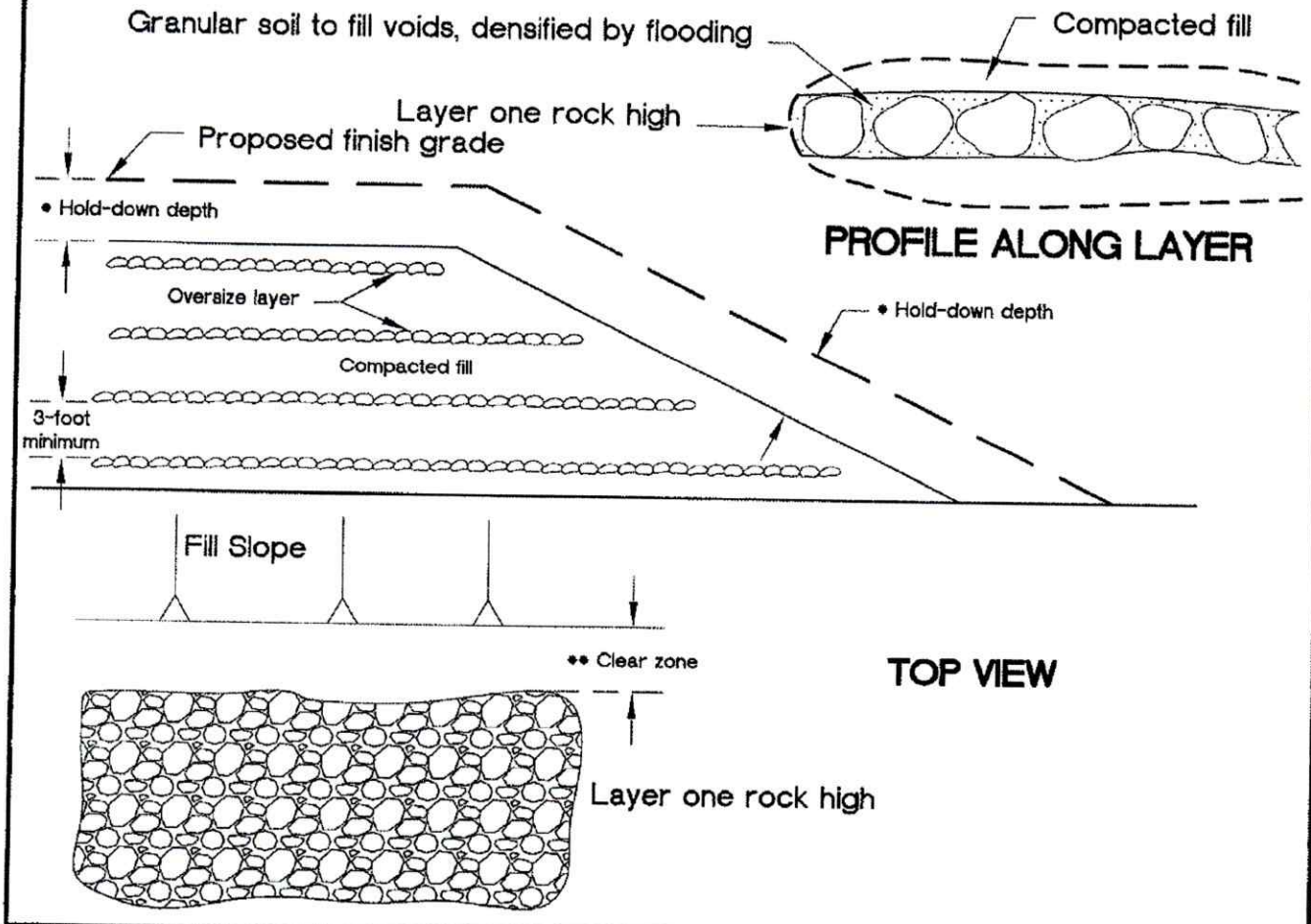
VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE
ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED

SOUTH SHORE TESTING	OVERSIZE ROCK DISPOSAL DETAIL	Plate 13

ROCK DISPOSAL PITS



ROCK DISPOSAL LAYERS



* Hold-down depth or below lowest utility as specified in text of report, subject to governing agency approval.
** Clear zone for utility trenches, foundations, and swimming pools, as specified in text of report.
VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE
ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN

SOUTH SHORE TESTING	ROCK DISPOSAL DETAIL	Plate 14

APPENDIX E

USGS Design Maps Summary Report