Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

October 6, 2020 Project No. 20-7110

Xebec Realty
3010 Old Ranch Parkway, Suite 470
Seal Beach, CA 90740

Attention: Jake Spring, Vice President of Acquisitions

Subject: Geotechnical Investigation Report, 15825 Roxford Street, Sylmar, California.

Jake,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed development at the subject site in the City of Sylmar, California. This report presents the findings of our geotechnical investigation, including site seismicity and settlement and provides geotechnical design recommendations for the proposed improvements. The work was performed in general accordance with our proposals dated August 18, 2020 and your authorization to proceed.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

TGR GEOTECHNICAL, INC.

REGISTERED PROFESSIONAL ENGINEER
SANJAY GOVIL
No. GE2382
EXP. 6/30/2022
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
EDWARD LOUIS BURROWS
No. CEG 1750
Exp. 06/30/22
STATE OF CALIFORNIA

Sanjay Govil, PhD, PE, GE 2382
Principal Geotechnical Engineer

Edward L. Burrows, M.S, PG, CEG 1750
Principal Engineering Geologist

Distribution: (4) Addressee

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

ATTACHMENTS:

Plate 1 – Boring Location Map

Figure 1 – Site Location Map
Figure 2 – Regional Geology Map
Figure 3 – Historic High Groundwater Map
Figure 4 – Regional Fault Map
Figure 5 – Seismic Hazard Zone Map

Appendix A – References
Appendix B – Log of Borings
Appendix C – Laboratory Testing Procedures and Results
Appendix D – Site Seismic Design
Appendix E – Standard Grading Specifications

EXECUTIVE SUMMARY

Presented below are significant elements of our findings from a geotechnical viewpoint. These findings are based on our field exploration, laboratory testing, and geologic and engineering analysis.

Geotechnical/Geologic Concerns

- The site is covered with a thin (0 to 3 feet) layer of fill except at the vicinity of B-7, B-9 and B-18. 13.5 feet of fill was encountered at B-7, 22 feet of fill was encountered at B-9 and greater than 5.5 feet of fill was encountered at B-18. The fill materials generally consist of dark brown to brown sandy silt to silty sand and brown to yellowish brown of sandy and silty clay. The fill is generally medium stiff to stiff with a relative compaction of less than 90% in the upper 7 feet and greater than 90 percent below . Underlying the fill is bedrock of the Saugus Formation which consists of yellowish brown sandstone with interbedded siltstone. The bedrock is slightly weathered at the top and well indurated with depth. The lower portion of the subject site at the vicinity of B-1 is underlain by 2 feet of dark brown to brown sandy silt to silty sand. Below this is native soil consisting of silty sand which was yellowish brown and dense to very dense. Yellowish brown sandstone with interbedded siltstone was encountered at 10 feet to the maximum depth explored of 16.5 feet .
- There are no known faults passing through or adjacent to the subject site. There are no known geologic or seismic hazards that may adversely impact the subject site.
- Onsite silty/clayey soils and sandstone/siltstone bedrock have an expansion index of 45 and 47, respectively, correlating to a “low to medium” expansion potential.
- At the time of our drilling, groundwater was not encountered to a depth of 31.5 feet below ground surface, the maximum depth explored. Groundwater is not expected to impact the proposed development.
- The subject site is adjacent to but not located within an Alquist-Priolo Earthquake Fault Zone. The closest faults to the subject site is the Sierra Madre Fault mapped approximately 0.25 miles to the southwest of the site. Other faults nearby include the Mission Hill Fault located 1.25 miles southwest of the site, the Whitney Fault mapped 2.25 miles north of the site, the Northridge Hills Fault mapped approximately 2.25 miles northeast of the site and the San Gabriel Fault mapped 4.25 miles northeast of the subject site.
- The subject site is not located within an area having a potential for liquefaction. Due to the presence of shallow bedrock, the potential for liquefaction at the site is considered low.
- All depressions resulting from demolition activities shall be properly backfilled with engineered fill (minimum 90 percent) under the direction of the geotechnical consultant.

Foundations

- The proposed industrial buildings may be supported on conventional shallow pad or continuous footing foundation systems.
- An allowable bearing capacity of 2,000 psf may be utilized for foundation design for

footings supported on minimum 90 percent compacted engineered fill with an increase of 500 pounds per square foot for each additional foot of embedment, for a maximum of 2500 psf.

- The minimum recommended footing width is eighteen (18) inches for continuous footing and twenty-four (24) inches for pad footings.
- All shallow foundations should extend a minimum of twenty-four (24) inches below the lowest adjacent grade.
- All shallow foundations shall be supported on three (3) feet or half the width of the footing (whichever is greater) of engineered fill with minimum ninety (90) percent relative compaction.
- Laboratory test results indicate that concrete in contact with onsite soils should be designed for exposure class S0 (minimum 2,500 psi concrete).
- The total and differential static and seismic settlement is anticipated to be 1.0-inches and 0.5-inches over 60 feet or less.

Slab-on-Grade

- Slab-on-grade should be a minimum of 5-inches thick.
- Slab-on-grade shall be reinforced with a minimum of No. 4 reinforcing bar on 18-inch centers in two horizontally perpendicular directions.
- The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of three (3) feet.
- Areas requiring moisture sensitive flooring shall be underlain by a minimum 15-mil visqueen (Stego Wrap or equivalent).

Pavement Design

ASPHALT PAVEMENT SECTION					PCC PAVEMENT SECTION		
Pavement Utilization	Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	PCC	Aggregate Base (Inch)	Total (Inch)
Parking Stalls	4.5	3.0	7.0	10.0	--	--	--
Auto Driveways	5.0	3.5	8.0	11.5	--	--	--
Truck Aisles/ Driveways	6.0	4.0	11.0	14.0	**7	6	13
Loading Dock	7.0	5.0	12.0	17.0	**7	6	13

*Minimum concrete compressive strength of 3,500 psi.

INTRODUCTION

Site Descriptions and Proposed Project Development

The subject site is located at 15825 Roxford Street (Plate 1) in Sylmar, California. The subject site is currently occupied by an existing building with associated out buildings, truck docks, asphalt covered vehicle parking, tractor-trailer parking, storage areas, dirt covered areas, an asphalt access road and tree covered landscape areas. Based on the referenced conceptual site plan the proposed development will consist of two buildings: an industrial building (Building 1) which is approximately 422,910 sq. ft. with a 5,000 sq. ft. office/mezzanine area and associated truck docks, drive aisles and vehicle parking; an industrial building (Building 2) which is approximately 154,260 sq. ft with a 4,000 sq. ft. mezzanine area and associated truck docks, vehicle parking and drive aisles.

Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance to assess current site conditions and mark borings and review of readily available previous geotechnical reports for the subject site.
- Sampling and logging eighteen (18) hollow stem auger borings utilizing a hollow stem drill rig to approximate depths ranging from 4.5 to 31.5 feet at the subject site to evaluate subsurface soil conditions. The borings were backfilled with cuttings and asphalt capped, as appropriate. Any excess soil was disposed onsite**.**
- Laboratory testing of selected samples to include: in-situ moisture density, maximum density and optimum moisture content, corrosion, consolidation, shear, expansion and R-Value.
- Engineering analysis including site seismicity, foundation design, and settlement.
- Preparation of an appropriately illustrated report summarizing subsurface soil conditions, site seismicity, settlement and provide pertinent geotechnical/geologic information that may influence the proposed development.

Literature Review

The following referenced reports were reviewed by TGR with respect to the subject site and surrounding area.

L.T. Evans, Inc. (1960) – Foundation Investigation. This investigation consisted of 15 geotechnical borings, associated laboratory testing, and recommendations for foundation design. This investigation covered the general site area including the subject site.

L.T. Evans, Inc. (1965) – Addendum Report for 15828 Roxford Street, Sylmar. This report provided foundation recommendations for a building addition. In the report, L. T. Evans noted that portions of the subject site were underlain by compacted fill which was placed under their supervision and for which they issued a report on January 17, 1962.

LeRoy Crandall and Associates (Feb. 19, 1986) – Preliminary Foundation Investigation and Geologic Seismic Study, Proposed Sylmar Business Center. This investigation, which consisted of 24 geotechnical borings, associated laboratory testing and recommendations for foundation design. This investigation covered the general site area but did not include the subject site as it had already been graded with building(s) constructed. LeRoy Crandall encountered existing fill soils and recommended that they be excavated and replaced as properly compacted fill.

LeRoy Crandall and Associates (July 11, 1986) – Evaluation of Fill Soils, Proposed Sylmar Park Business Center. Subsequent to the above-mentioned report by LeRoy Crandall, they were provided with the L.T. Evans January 17, 1962 report titled "Report of Compacted Fill for Bendix-Sylmar Site, Los Angeles, California" on the compaction of fill soils at the site of which the subject site was a part. Based on their review of this report, they determined that the compacted fill would not need to be excavated and compacted as they had previously recommended prior to the receipt of the L.T. Evans report.

Based on our review of the above reports and our testing, the existing compacted fill at the subject site may remain in place.

Field Investigation

Field exploration was performed on September 9, 2020 and September 10, 2020 by representatives from our firm who logged the borings and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging eighteen borings with a truck mounted hollow stem drill rig. Boring B-9 was advanced to an approximate depth of thirty one and a half (31.5) feet, Borings B-1 and B-7 were advanced to an approximate depth of sixteen and a half (16.5) feet, Boring B-15 was advanced to an approximate depth of eleven and a half (11.5) feet, Borings B-8, B-10 through B-12 and B-16 were advanced to an approximate depth of nine (9) feet, Borings B-2, B-6, B-13 and B-17 were advanced to an approximate depth of six and a half (6.5) feet, Borings B-3, B-5, B-14 and B-18 were advanced to an approximate depth of five and a half (5.5) feet and Boring B-4 was advanced to an approximate depth of four and a half (4.5) feet before encountering refusal. Subsequent to drilling, all borings were backfilled with cuttings and sealed with cold patch asphalt, where appropriate. The logs of borings presenting soil conditions and descriptions are presented in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter samples. Driven samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings.

The samples were driven using an automatic 140-pound hammer falling freely from a height of 30 inches. The blow counts for CRS were converted to equivalent SPT blow counts. Soil descriptions were entered on the logs in general accordance with the Unified Soil Classification

System (USCS). The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ moisture content (ASTM D2216) and dry density (ASTM D7263);
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Consolidation (ASTM D2435);
- Direct Shear Strength (ASTM D3080);
- Expansion Potential (ASTM D4829);
- R-Value (CAL 301); and
- Corrosion series:
    1. Soluble Sulfate (CAL.417A);
    2. Soluble Chlorides (CAL.422);
    3. Minimum Resistivity (CAL.643); and
    4. pH

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the borings logs. The results of the laboratory tests are presented in Appendix C.

GEOTECHNICAL FINDINGS

Geology

Regional Geologic Setting

The project site is situated within the northern portion of the San Fernando Valley. Geologically, the valley is a structural basin located south of the San Gabriel Mountains and north of the Santa Monica Mountains. The northern San Fernando Valley is an area of compression between the San Gabriel Mountains and the sediments of the southern portion of the San Fernando Valley. The compression is thought to be the result of the "Big Bend: in the San Andreas Fault, which lies to the north of the San Gabriel Mountains. This compression has caused arches and troughs to form within the valley floor, such as the Mission Hills anticline to the south and the Mission Hills syncline to the north.

Figure 2 presents the Regional Geology Map. Per the Geologic Map of the San Fernando and Van Nuys (north 1/2) Quadrangles, Los Angeles County, California (Dibblee, 1991), the subject site is underlain by Saugus Formation comprised of sandstone and siltstone.

Earth Units

Based on our subsurface investigation, the subject area is covered with a thin (0 to 3 feet) of fill except at the vicinity of B-7, B-9 and B-18. 13.5 feet of fill was encountered at B-7, 22 feet of fill was encountered at B-9 and greater than 5.5 feet of fill was encountered at B-18. The fill materials generally consist of dark brown to brown sandy silt to silty sand and brown to yellowish brown of sandy and silty clay. The fill was generally medium stiff to stiff with a relative compaction of less than 90% in the upper 7 feet and greater than 90 percent below. Underlying the fill is yellowish brown sandstone with interbedded siltstone. The bedrock was slightly weathered at the top and well indurated to the maximum depth explored. The lower portion of the subject site at the vicinity of B-1 is underlain by 2 feet of dark brown to brown sandy silt to silty sand. Below this is native soil consisting of silty sand which was yellowish brown and dense to very dense. Yellowish brown sandstone with interbedded siltstone was encountered at 10 feet to the maximum depth explored of 16.5 feet. Detailed descriptions of the earth units encountered in our borings are presented in the log of the borings.

Groundwater

Subsurface water was not encountered during the exploration to a maximum depth of 31.5 feet below existing ground surface. Based on our review of available historical groundwater information (CDMG, 1998) regional groundwater is not mapped beneath the subject site (Figure 3). Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from our observations may occur. Static groundwater is not anticipated to impact the proposed development.

Seismic Review

Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The State Mining and Geology Board has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1994 (Hart, 1997) as the Alquist-Priolo Geologic Hazard Zoning Act and Earthquake Fault Zones.

The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain inhabited structures across the trace of active faults.

No known faults are indicated to pass directly beneath the site. Ground rupture associated with the 1971 San Fernando earthquake did not occur on the site. In our opinion, there is little probability of surface rupture due to faulting occurring beneath the site.

The subject site is adjacent to but not within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). The edge of the zone borders the southwest side of the site as shown on Figure 5.

The nearest fault to the subject site is the Sierra Madre Fault mapped approximately 0.25 miles to the southwest of the site. Other faults nearby include the Mission Hill Fault located 1.25 miles southwest of the site, the Whitney Fault mapped 2.25 miles north of the site, the Northridge Hills Fault mapped approximately 2.25 miles northeast of the site and the San Gabriel Fault mapped 4.25 miles northeast of the subject site. The regional fault map, Figure 4, shows the location of the subject site in respect to the regional faults.

Secondary Seismic Hazards

Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the close proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy

soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

Based on our review of the seismic hazard zones map for the San Fernardo Quadrangle, the subject site is not in a mapped zone requiring investigation for liquefaction (Figure 5). The site is underlain by sandstone/siltstone bedrock. As such, the potential for liquefaction at the site is considered very low.

Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. Based on the nature of the soils underlying the site the potential for seismically induced settlement is considered very low.

Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. Based on the nature of the soils underlying the site the potential for lateral spreading at the subject site is considered very low.

DISCUSSIONS AND CONCLUSIONS

General

Based on our field exploration, laboratory testing and engineering analysis, it is our opinion that the proposed structures and proposed grading will be safe against hazard from landslide, settlement, or slippage and the proposed construction will have no adverse effect on the geologic stability of the adjacent properties provided our recommendations presented in this report are followed.

Conclusions

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structure and should be designed accordingly.

The primary conditions affecting the proposed project site development are as follows:

- Presence of fill at B-7, B-9 and B-18.
- Presence of approximately 15 feet deep existing basement near the vicinity of B-9.

The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the development of the industrial buildings and associated truck docks, drive aisles and vehicle parkings at the subject property. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations of this report are verified or modified in writing by TGR.

RECOMMENDATIONS

Seismic Design Parameters

When reviewing the 2019 California Building Code the following data should be incorporated into the design.

Parameter	Value
Latitude (degree)	34.30803
Longitude (degree)	-118.48128
Site Class	C
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.4
Mapped Spectral Acceleration at 0.2-sec Period, S_s	2.733 g
Mapped Spectral Acceleration at 1.0-sec Period, S_1	0.881 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, S_{MS}	3.28 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, S_{M1}	1.234 g
Design Spectral Acceleration at 0.2-sec Period, S_{DS}	2.187 g
Design Spectral Acceleration at 1.0-sec Period, S_{D1}	0.823 g

The structural consultant should review the above parameters and the 2019 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is “life safety” and not to completely prevent damage of the structure, since such design may be economically prohibitive.

Foundation Design Recommendations

The proposed industrial buildings may be supported on continuous and/or spread footings. Bearing capacity recommendations for shallow foundations are presented below. These recommendations assume that the footings will be supported on a minimum of three (3) feet or half the width of the footing (whichever is greater) of engineered fill.

For foundations supported on three (3) feet or half the width of the footing (whichever is greater) of engineered fill with minimum ninety (90) percent relative compaction an allowable bearing pressure of 2000 pounds per square foot may be used in design with an increase of 500 pounds per square foot for each additional foot of depth for a maximum 2500 pounds per square foot bearing capacity.

All shallow foundations should extend a minimum of two (2) feet below the lowest adjacent grade. The minimum recommended footing width is eighteen (18) inches for continuous footing and twenty-four (24) inches for pad footing. A minimum reinforcement of two (2) No. 4 steel bar top and two (2) No. 4 steel bar bottom is required for continuous footings from a geotechnical viewpoint. Foundation design details such as concrete strength, reinforcements, etc should be established by the Structural Engineer.

A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

The total and differential static and seismic settlement is anticipated to be 1.0-inches and 0.50-inches over 60 feet or less.

Resistance to lateral loads including wind and seismic forces may be provided by frictional resistance between the bottom of concrete and the underlying fill soils and by passive pressure against the sides of the foundations. A coefficient of friction of 0.30 may be used between concrete foundation and underlying soil. The recommended passive pressure of the engineered fill may be taken as an equivalent fluid pressure of 300 pounds per cubic foot (3,000 psf max).

Footings located near property lines where the lateral removal cannot be achieved shall be designed for a reduced bearing capacity of 1,500 pounds per square foot and the passive resistance shall be ignored.

All foundations excavations shall be approved prior to placement of concrete by the geotechnical consultant. Additional recommendations may be provided if unusual conditions were observed/encountered during excavation

Retaining Wall Recommendations

The following soil parameters may be used for the design of the retaining wall with level backfill and a maximum height of six (6) feet:

Conditions	**Parameters**
Active (Level)	50 psf/ft
Passive	300 (maximum 3,000 psf)
Friction Coefficient	0.30

- The passive pressure in the upper 6 inches of soil not confined by slabs or pavement should be neglected.
- All footings should meet the setback requirements presented in 2019 CBC.
- The retaining wall should be provided with a drainage system (Miradrain or equivalent) to prevent buildup of hydrostatic pressure behind the walls. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of the retaining wall. Loads applied within a 1:1 projection from the surcharging structure on the stem of the wall shall be considered as lateral surcharge. For lateral surcharge conditions, we recommend utilizing a horizontal load equal to 50 percent of the vertical load, as a minimum. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Slab-On-Grade

Slab-on-grade should be a minimum of 5-inches thick and reinforced with a minimum of No. 4 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The slab should not be structurally connected to the buildings. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of three (3) feet. Prior to placement of concrete, the subgrade soils should be moistened to a minimum of 120 percent of moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition and the anticipated use of the building. For moisture sensitive flooring, the floor slab should be underlain by minimum 15-mil impermeable polyethylene membrane (Stego Wrap, Moistop Plus, or any equivalent meeting the requirements of ASTM E1745, Class A rating) as a capillary break. Sand may be placed above and below the impermeable polyethylene membrane at the discretion of the project structural engineer/concrete contractor for proper curing and finish of the concrete slab-on-grade and protection of the membrane and is considered outside the scope of geotechnical engineering.

Flatwork

Flatwork should be a minimum of 4-inches thick should be reinforced with a minimum of No. 3 reinforcing bar on 24-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM D1557) to a minimum depth of one (1) foot. Prior to placement of concrete, the subgrade soils should be moistened to a minimum of 120 percent of optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition.

Modulus of Subgrade Reaction

The modulus of subgrade reaction may be taken as 75 pci (K_1) for one (1) square foot footing/slab founded on site soils. This value should be reduced for change in size per the following formula:

$$K = K_1 \left(\frac{B+1}{2B}\right)^2$$

Where B = Width of slab/footing;
K = Coefficient of Subgrade Reaction of Footings Measuring B(ft) x B(ft).

Cement Type and Corrosion

Based on laboratory testing concrete used should be designed in accordance with the provisions of ACI 318-14, Chapter 19 for Exposure Class S0 with a minimum confined compressive strength of 2,500 psi and for Exposure Class C1 (Moderate) – Concrete in contact with site soils exposed to moisture but not to significant external source of chloride per ACI 318-14 Table 19.3.1.1. Corrosion tests indicate a moderate corrosion potential for ferrous metals exposed to site soils.

TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

Expansive Soil

Onsite silty clay soils and sandstone/siltstone bedrock have an expansion index of 45 and 47,respectively, correlating to a “low to medium” expansion potential.

Shrinkage/Subsidence

Removal and recompaction of the near surface soils is estimated to result in shrinkage ranging from 5 to 10 percent for the existing fill and 0 to 5 bulking for the bedrock. Subsidence is expected to be negligible.

Site Development Recommendations

General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered. During demolition of the existing building and associated site work, voids created from removal of buried elements (footings, pipelines, septic pits etc) shall be backfilled with engineered fill (min 90% relative compaction per ASTM D1557) under the observation of TGR.

Grading

All grading should conform to the guidelines presented in the California Building Code (2019 edition), except where specifically superseded in the text of this report. Prior to grading, TGR’s representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork.

It is recommended that the upper 7 feet of the fill within the building footprint and 5 feet outside should be removed and replaced with engineered fill. Oversized particles may be encountered during grading. All particles greater than 4-inches shall be removed and disposed offsite.

To support the foundation a minimum three (3) feet or half the width of the footing (whichever is greater) of approved engineered fill should be placed under the footings. A minimum of three (3)

feet of engineered fill is recommended under slab-on-grade, and a minimum of one (1) foot of engineered fill is recommended under flatwork, and pavement. Site soils could be reused as engineered fill provided they are free of oversized particles and the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 6-inches, moisture conditioned and compacted to a minimum 90 percent relative compaction. Subsequently, site fill soils should be re-compacted to a minimum of ninety (90) percent relative compaction to a minimum of 120 percent of optimum moisture content. The lateral extent of removals beyond the building/structure/footing limits should be equal to at least the depth of fill or 5 feet, whichever is greater.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

Fill Placement

Prior to any fill placement TGR should observe the exposed surface soils. The site soils may be re-used as engineered fill provided, they are free of organic content and particle size greater than 4-inches. All particles greater than 4-inches shall be removed and disposed offsite. Fill shall be moisture-conditioned to a minimum of 120 percent of optimum and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557. Any import soils shall be non-expansive and approved by TGR Geotechnical Inc.

Crushed concrete generated from demolition of existing on-site structures may be used as fill. The crushed concrete separated from rebars may be mixed with onsite soils to be used as fill with no greater than 50 percent of the total fill volume. The crushed concrete shall have uniform gradation with a maximum particle size of 3-inches and shall have sufficient fines. The gradation shall be verified and approved by TGR prior to placement. The crushed concrete and soil mixture shall be placed uniformly at the bottom of the over-excavation. The total thickness and extent of this crushed concrete fill shall be determined in the field during grading.

Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of six (6) inches, fill placed in six (6) inch loose lifts moisture conditioned to a minimum of 120 percent of optimum and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D 1557.

Trenching

All excavations should conform to CAL-OSHA and local safety codes.

Temporary Excavation and Shoring

Temporary construction excavations in silts may be anticipated during the proposed development. Silts may be cut vertically without shoring to a depth of approximately four (4) feet below adjacent surrounding grade. For deeper cuts, the slopes should be properly shored or sloped back to at least 1.5H:1V (Horizontal: Vertical) or flatter. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. No surcharge

loads should be permitted within a horizontal distance equal to the height of cut from the toe of excavation unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any nearby adjacent existing site facilities should be properly shored to maintain foundation support at the adjacent structures.

Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards street/parking or other approved area.

Utility Trench Backfill

All utility trench backfills in structural areas and beneath hardscape features should be brought to a minimum of 120 percent of moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard. Flooding/jetting is not recommended.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to 90 percent minimum relative compaction.

Preliminary Pavement Design

The Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on an “R-Value” for compacted site subgrade soils of 16.

Traffic indices of 4.5, 5, 6, and 7 were assumed for use in the evaluation of automobile parking stalls and driveways, and medium and heavy truck driveways, respectively. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

ASPHALT PAVEMENT SECTION					PCC PAVEMENT SECTION		
Pavement Utilization	Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	PCC	Aggregate Base (Inch)	Total (Inch)
Parking Stalls	4.5	3.0	7.0	10.0	--	--	--
Auto Driveways	5.0	3.5	8.0	11.5	--	--	--
Truck Aisles/ Driveways	6.0	4.0	11.0	14.0	**7	6	13
Loading Dock	7.0	5.0	12.0	17.0	**7	6	13

**Minimum concrete compressive strength of 3,500 psi.

Aggregate base material should consist of CAB/CMB complying with the specifications in Section 200.2.2/200.2.4 of the current “Standard Specifications for Public Works Construction” and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the aggregate base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving.

The pavement subgrade should be constructed in accordance with the recommendations presented in the grading section of this report.

The R-value and the associated pavement section should be confirmed at the completion of site grading.

An increase in the PCC pavement slab thickness, placement of steel reinforcement (or other alternatives such as Fibermesh) and joint spacing due to loading conditions including shrinkage and thermal effects may be necessary and should be incorporated by the structural engineer as necessary to prevent adverse impact on pavement performance and maintenance.

Geotechnical Review of Plans

All grading and foundation plans should be reviewed and accepted by the geotechnical consultant prior to construction. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

Geotechnical Observation/Testing During Construction

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, periodic special inspection shall be performed to:

- Verify materials below shallow foundations are adequate to achieve the design bearing capacity;
- Verify excavations are extended to the proper depth and have reached proper material;
- Verify classification and test compacted materials; and
- Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly

Per sections 1705.6 and table 1705.6 of the 2019 California Building Code, continuous special inspection shall be performed to:

- Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill.

The geotechnical consultant should also perform observation and/or testing at the following stages:

- During any grading and fill placement;
- During utility trench excavation and backfill;
- After foundation excavation and prior to placing concrete;

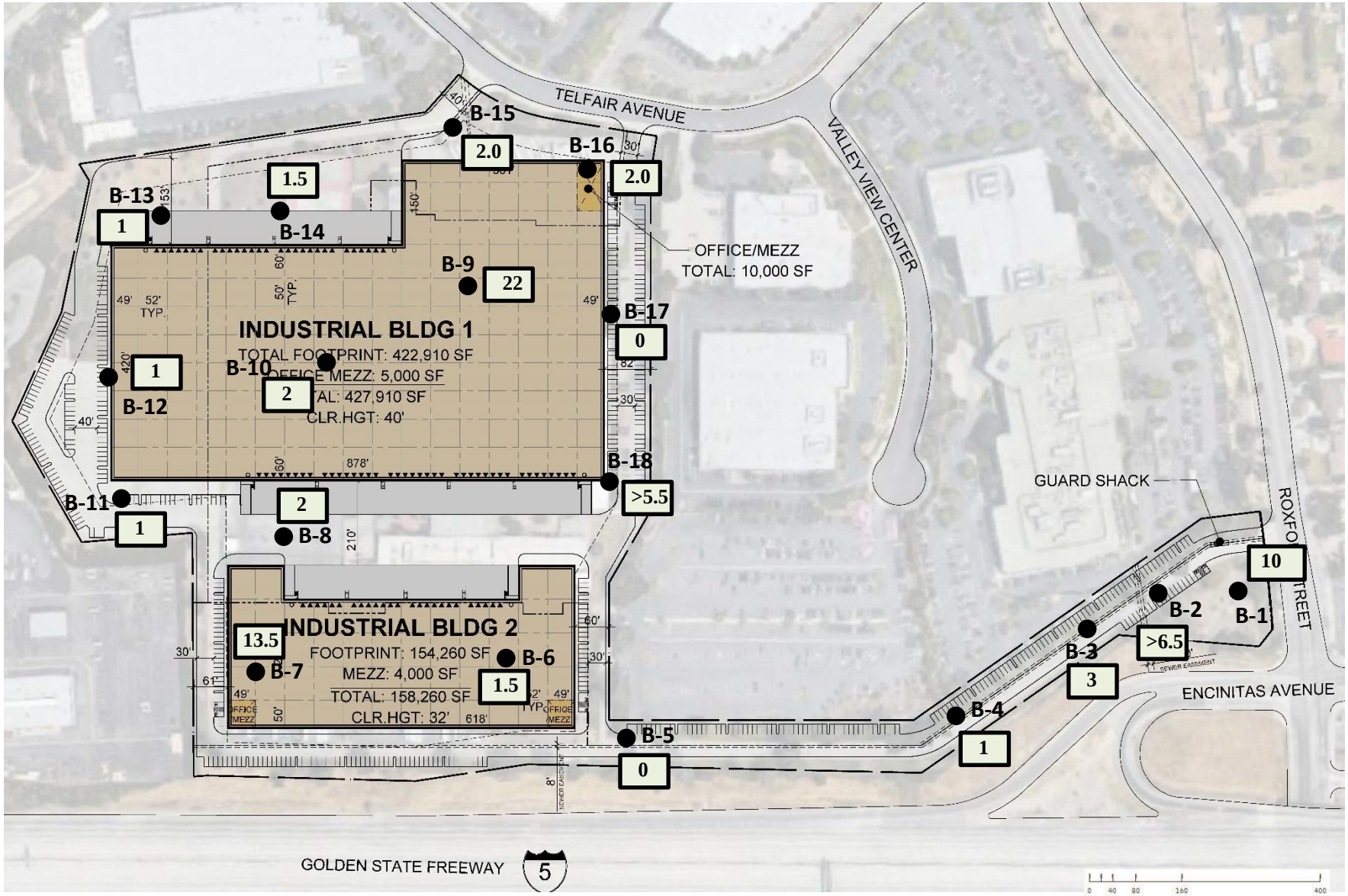
- During placement of aggregate base and asphalt concrete or Portland cement concrete;
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

This report is not authorized for use by, and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.



B-18 ● APPROXIMATE LOCATION OF EXPLORATORY BORING

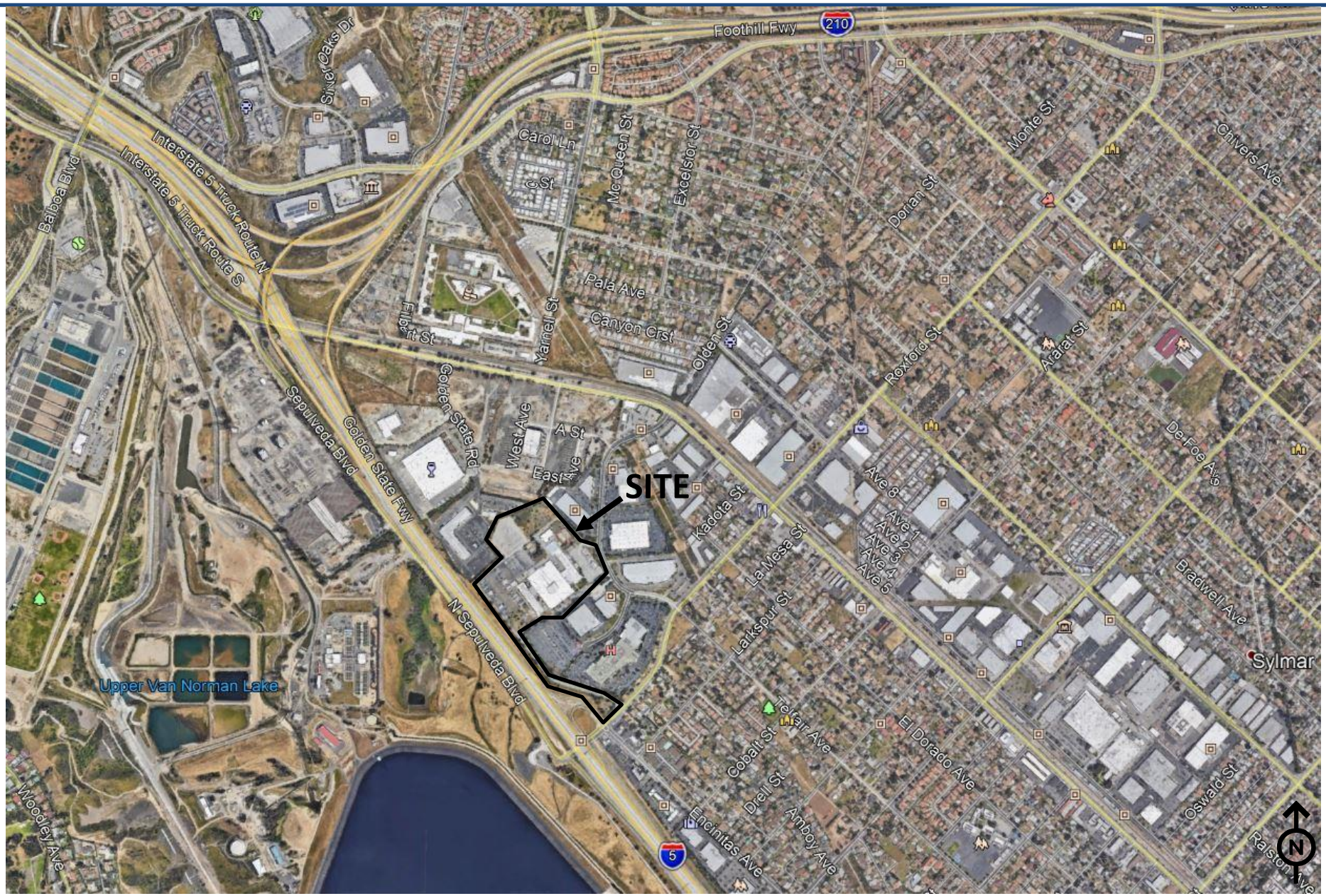
1 APPROXIMATE DEPTH OF BEDROCK BELOW EXISTING GRADE (FT)

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

BORING LOCATION MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

PLATE 1

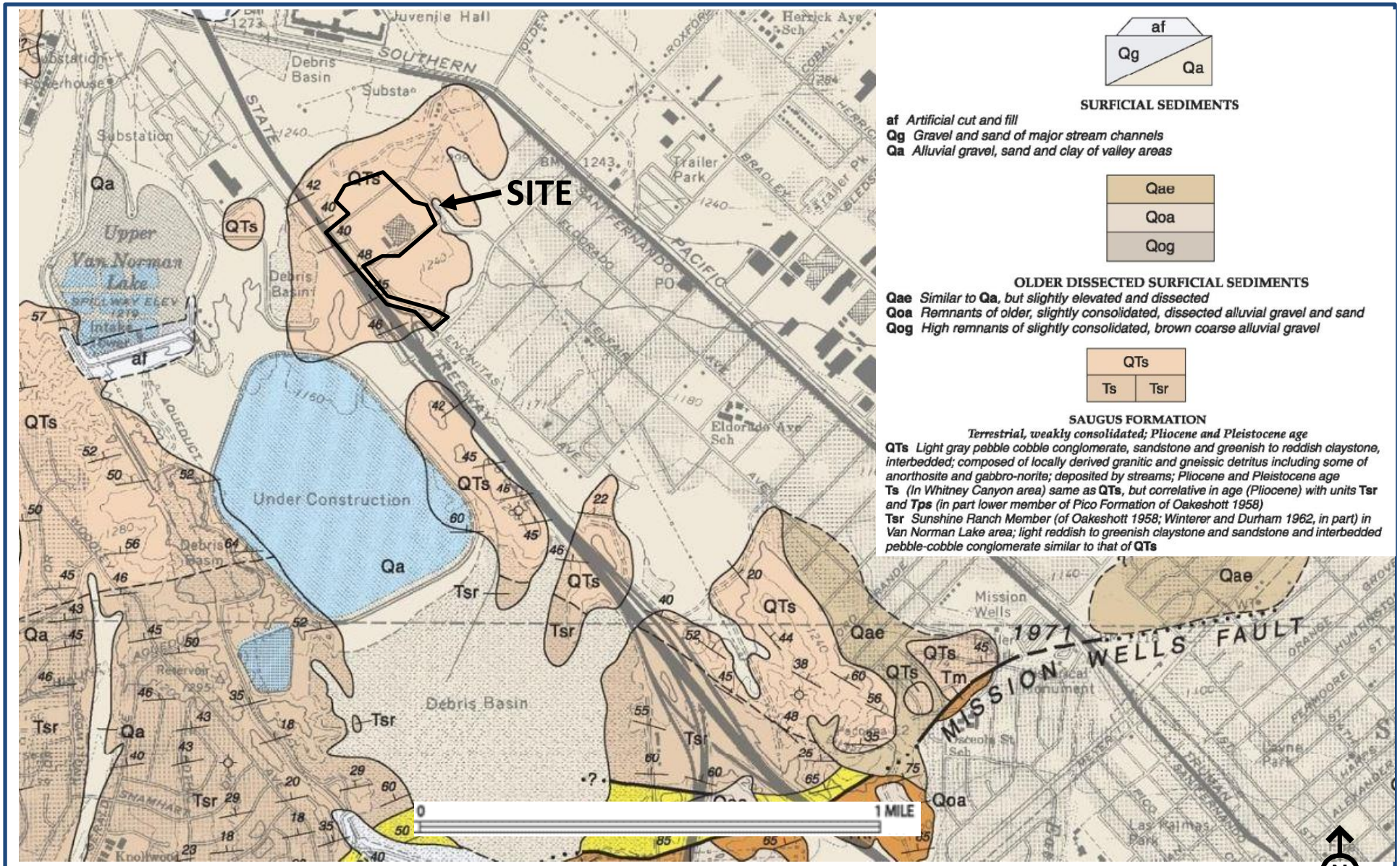


Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

SITE LOCATION MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

FIGURE 1



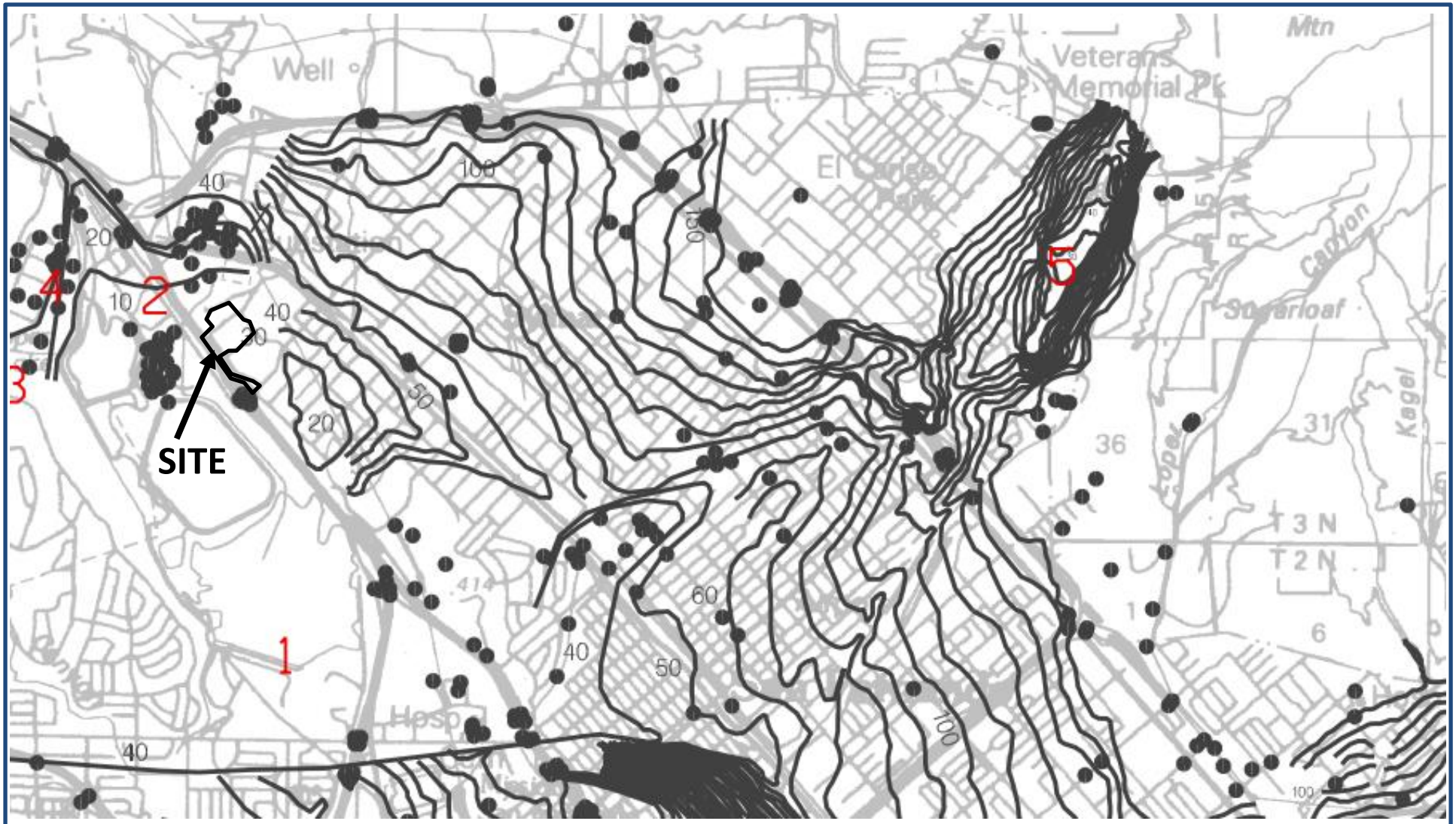
Dibblee, T.W., and Ehrenspeck, H.E., ed., 1991, Geologic map of the San Fernando and Van Nuys (north 1/2) quadrangles, Los Angeles County, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-33, scale 1:24,000.

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

REGIONAL GEOLOGY MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

FIGURE 2



ONE MILE

●Borehole Site

30 Depth to ground water in feet

6 Site of historical earthquake–generated liquefaction.

N

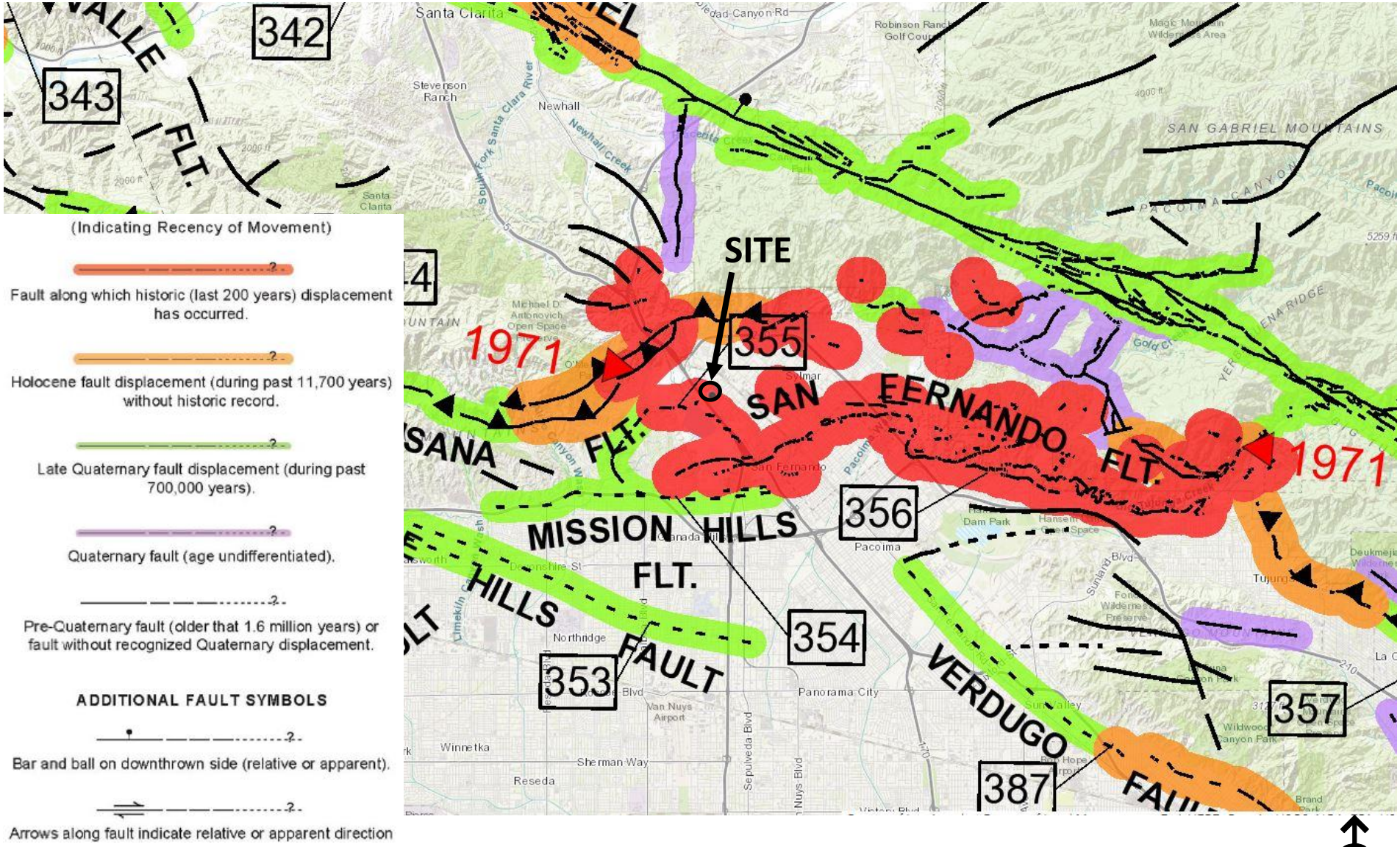
Modified From: California Department of Conservation, Division of Mines and Geology, 1998, Seismic Hazard Zone Report for the San Fernando 7.5-Minute Quadrangle, Los Angeles, California, Report 015.

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

HISTORIC HIGH GROUNDWATER MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

FIGURE 3



Modified From: Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

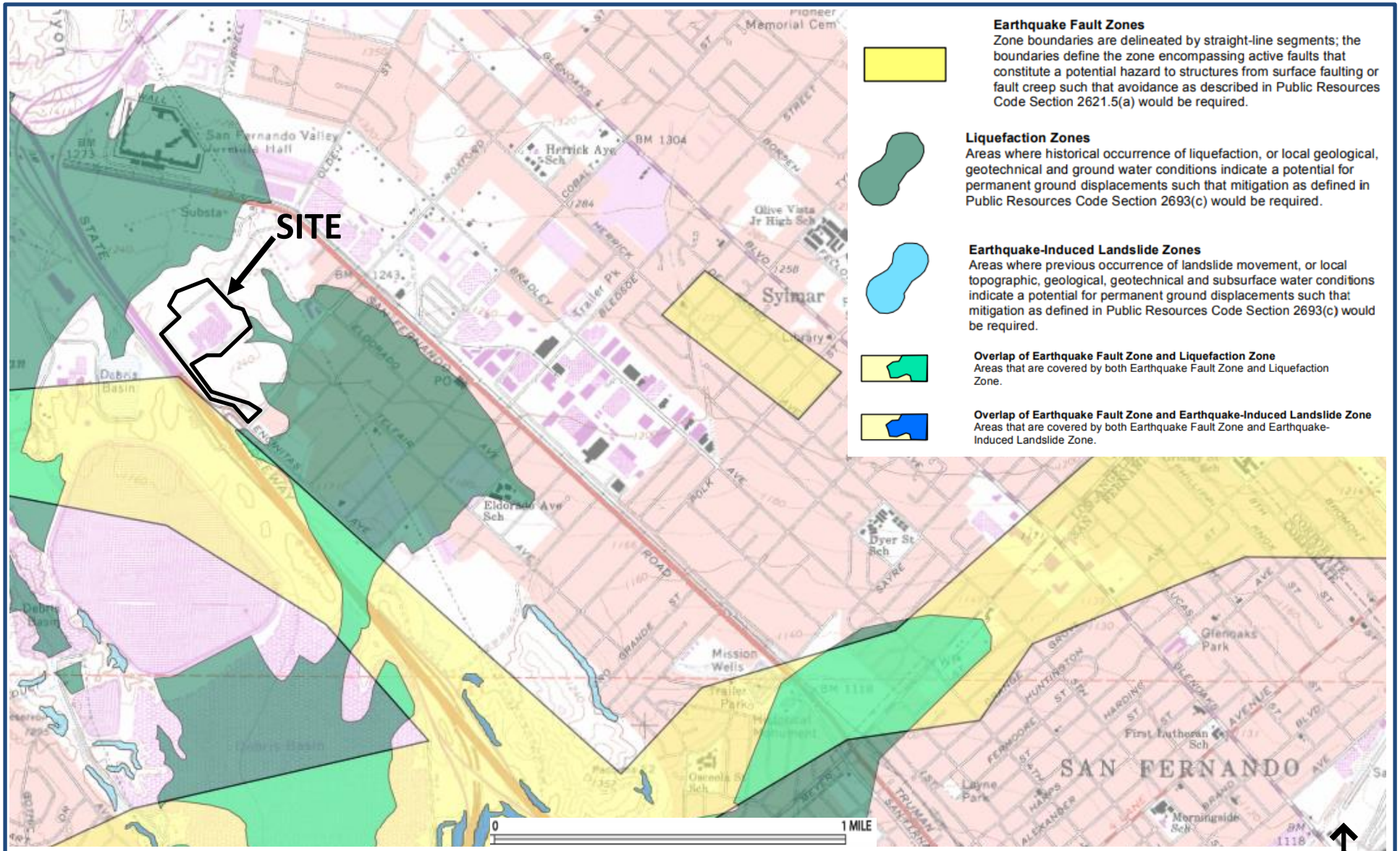
N

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

REGIONAL FAULT MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

FIGURE 4



Modified From: State of California Division of Mines and Geology, Earthquake Zones of Required Investigation, San Fernando Quadrangle Released March 25, 1999, scale 1:24,000

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

SEISMIC HAZARD ZONE MAP
15825 ROXFORD STREET
SYLMAR, CALIFORNIA

PROJECT NO. 20-7110

FIGURE 5

APPENDIX A
REFERENCES

APPENDIX A

References

California, State of, Department of Conservation, Division of Mines and Geology, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, CDMG Special Publication 117A.

_____, 1998, Maps of Known Active Fault Near – Source Zones in California and Adjacent Portions of Nevada.

_____, 1998, Seismic Hazard Zone Report for the San Fernando 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 015.

_____, 1999, State of California Seismic Hazard Zones Map, San Fernando Quadrangle, Official Map Released March 25, 1999, Scale 1:24,000.

Dibblee, T.W., and Ehrenspeck, H.E., ed., 1991, Geologic map of the San Fernando and Van Nuys (north 1/2) quadrangles, Los Angeles County, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-33, scale 1:24,000.

Hart, E. W., 1997, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning with Index to Special Study Zones Maps: Department of Conservation, Division of Mines and Geology, Special Publication 42

International Code Council (ICC), California Building Code, 2016 Edition.

Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

Ware Malcomb, Conceptual Site Plan – Scheme 5a, 15825 Roxford Street, Sylmar, Job No. LAX20-0037-00, dated 7/23/2020

LeRoy Crandall and Associates, Report of Preliminary Foundation Investigation and Geologic-Seismic Study, Parcels A, B, and C, and Parcels 1 through 9, Proposed Sylmar Park Business Center, Roxford Street and Golden State Freeway, Sylmar District, Los Angeles, California, Job No. AE-86004A, dated February 19, 1986

Leroy Crandall and Associates, Evaluation of Fill Soils, Parcels A, B and C, and Parcels 1 through 9, Proposed Sylmar Park Business Center, Roxford Street and Golden State Freeway, Sylmar District, Los Angeles, California, Job Nos. AE86004A and A-86004B, dated July 11, 1986

L. T. Evans, Inc., Foundation Investigation for Welton Becket & Associates Architects-Engineers, Los Angeles, California, Job No. DU9-1347, dated June 21, 1960

L.T. Evans, Inc., Addendum No. 1 for Bendix Pacific, 15825 Roxford, Sylmar Site, Los Angeles, California, dated June 21, 1965

APPENDIX B
LOG OF BORINGS

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING

DENSITY AND CONSISTENCY

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (Tsf)	FINE GRAINED SOILS	
Very Loose	< 4	< 0.25	Very Soft	< 2
Loose	4 – 10	0.35 – 0.50	Soft	2 – 4
Medium	10 – 30	0.50 – 1.0	Firm (Medium)	4 – 8
Dense	30 – 50	1.0 – 2.0	Stiff	8 – 15
Very Dense	> 50	2.0 – 4.0	Very Stiff	15 – 30
		> 4.0	Hard	> 30

PARTICLE SIZE DEFINITION (As per ASTM D2487 and D422)

Boulder	⇒ Larger than 12 inches	Coarse Sands	⇒ No. 10 to No. 4 sieve
Cobbles	⇒ 3 to 12 inches	Medium Sands	⇒ No. 40 to No. 10 sieve
Coarse Gravel	⇒ 3/4 to 3 inches	Fine Sands	⇒ No. 200 to 40 sieve
Fine Gravel	⇒ No. 4 to 3/4 inches	Silt	⇒ 5µm to No. 200 sieve
		Clay	⇒ Smaller than 5µm

SOIL CLASSIFICATION

Soils and bedrock are classified and described based on their engineering properties and characteristics using ASTM D2487 and D2488.

Percentage description of minor components:

Trace	1 – 10%	Some	20 – 35%
Little	10 – 20%	And or y	25 – 50%

Stratified soils description:

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

SOIL CLASSIFICATION CHART

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 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 (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		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 silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

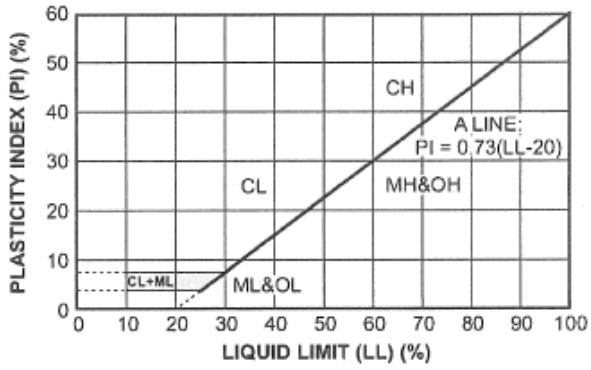
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



PARTICLE SIZE LIMITS

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

3″ ¾″ NO. 4 NO. 10 NO. 40 NO. 200

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

LOG OF BORING EXPLANATION

LOG OF EXPLORATORY BORING B-1

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube; Standard Split Spoon; No recovery; Modified California; Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, dry to slightly moist			
							Native: Silty sand- yellowish brown, medium to coarse sand, medium dense, slightly moist			Corrosion
5				>50		SM	.....same as above, dense to very dense	4	121	Consol
				>50		SM	.....same as above, dense to very dense	5	112	
10				>50			BEDROCK: Sandstone/siltstone- yellowish brown, very dense, slightly moist	8	108	
15				>50			.....same as above	5	115	
							Total Depth: 16.5 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-2

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, slightly moist Native: Silty sand- yellowish brown, medium to coarse sand, medium dense, slightly moist			
5				>50		SM	.....same as above, some gravels, very dense	6	120	
							Total Depth: 6.5 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-3

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand, dark brown to brown, medium dense, slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly moist to moist, medium dense			
5				>50				10	120	
							Total Depth: 5.5 feet. No groundwater encountered. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-4

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand, dark brown to brown, medium dense, slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly moist to moist, medium dense			
			■	>50		BR	.....same as above	12	109	
5							Total Depth: 4.5 feet. No groundwater encountered. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-5

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly weathered upper 2 feet, slightly moist to moist, medium dense			
5				>50		BR	.....same as above, very dense	14	111	EI, R Value, Max, Remolded Shear
							Total Depth: 5.5 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 6

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-6

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, dry to slightly moist BEDROCK: Siltstone/sandstone- yellowish brown, slightly weathered at top, slightly moist to moist, medium dense			
5			■	>50		BR		11	106	
							Total Depth: 6.5 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-7

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							3 inch of asphalt on top surface			
							Fill: Sandy Clay- light brown, stiff, moist			R Value, Max
5				14			.....same as above, dark brown with yellowish brown mottled	17	111	Consol
				10			Silty sand- light brown, medium dense, moist	15	116	
10				14			Sandy silt to Silty Sand- dark brown, medium dense, moist	9	124	
				>50			.....same as above	8	115	
							BEDROCK: Siltstone/sandstone- yellowish brown, moist, medium dense			
15				>50			.....same as above, dense to very dense	17	119	
							Total Depth: 16.5 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 8

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-8

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand- dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly moist to moist, medium dense			
5										
			■	>50		BR	.....same as above, dense to very dense	13	125	
			■	>50		BR	.....same as above	10	130	
10							Total Depth: 9 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 9

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-9

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube; Standard Split Spoon; No recovery; Modified California; Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							Fill: Silty Clay- dark brown, medium stiff, moist			
										EI, Corrosion, Max, Remolded Shear
5				11		CL	.....same as above	21	107	Consol
				14		CL	Silty Clay- dark brown with light yellowish brown mottled, some sand, stiff, moist	15	116	
10				9		CL	Sandy clay- yellowish brown, stiff, moist	19	110	
				16		CL	Silty clay- dark reddish brown, some sand, stiff, moist	15	119	
15				20		CL	.....same as above	13	125	
				23		CL	Sandy clay- reddish brown, fine to medium sand, stiff, moist	14	122	
20				14		CL	.....same as above	14	121	
							BEDROCK: Siltstone/sandstone- yellowish brown, moist, medium dense			
25				42		BR	.....same as above, dense to very dense	15	116	

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 10

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-9

Project Number: **20-7110**
Project Name: **15825 Roxford Street, Sylmar, CA**
Date Drilled: **9/9/20 - 9/10/20**
Ground Elev:

Logged By: **PK**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
				52		BR	...same as above	15	117	

Total Depth: 31.5 feet.
No groundwater encountered.
No caving observed.
Hole backfilled with soil cuttings and patched with asphalt upon completion.

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 11

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-10

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly weathered at top, slightly moist to moist, medium dense			
5				>50		BR	.....same as above, very dense to dense	13	122	
				>50		BR	.....same as above	12	122	
10							Total Depth: 9 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 12

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-11

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							3 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand- dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly moist to moist, medium dense			
5				>50		BR	.....same as above, dense to very dense	13	119	
				50		BR	.....same as above	16	118	
10							Total Depth: 9 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 13

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-12

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							3 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand- dark brown to brown, medium dense, slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly moist to moist, medium dense			
5				>50		BR	.....same as above, dense to very dense	15	116	
				>50		BR	.....same as above	10	112	
10							Total Depth: 9 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 14

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-13

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, dry to slightly moist BEDROCK: Siltstone/sandstone- yellowish brown, slightly weathered at top, slightly moist to moist, medium dense			
5			■	40		BR	.....same as above, very dense to dense	16	111	
							Total Depth: 6.5 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 15

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-14

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface: Dead grass and dirt FILL: Sandy silt to silty sand, dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, slightly weathered at top, slightly moist to moist, medium dense			
5				49		BR	.....same as above, very dense to dense	12	116	
							Total Depth: 5.5 feet. No groundwater encountered. No caving observed. Boring backfilled with soil cutings upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 16

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-15

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand- dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, friable, weathered, moist, medium dense			
5				20		BR	.....same as above, friable, weathered	16	119	
				14		BR	.....same as above	15	104	
10				>50		BR	Siltstone/sandstone- yellowish brown, moist, very dense to dense	9	110	
							Total Depth: 11.5 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 17

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-16

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							FILL: Sandy silt to silty sand- dark brown to brown, medium dense, dry to slightly moist			
							BEDROCK: Siltstone/sandstone- yellowish brown, friable, weathered, moist, medium dense			
5				20		BR	.....same as above, friable, weathered	19	114	
				10		BR	.....same as above	16	115	
							Total Depth: 9 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 18

TGR GEOTECHNICAL, INC.

LOG OF BORING 20-7110 XEBEC ROXFORD STREET, SYLMAR.GPJ TGR GEOTECH.GDT 9/29/20

LOG OF EXPLORATORY BORING B-17

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface			
							BEDROCK: Siltstone/sandstone- yellowish brown, moist, medium dense			
5							.....same as above, dense to very dense			
							Total Depth: 6.5 feet. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon completion.			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 19

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-18

Project Number:	**20-7110**	Logged By:	**PK**
Project Name:	**15825 Roxford Street, Sylmar, CA**	Project Engineer:	**SG**
Date Drilled:	**9/9/20 - 9/10/20**	Drill Type:	**Hollow Stem**
Ground Elev:		Drive Wt & Drop:	**140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							4 inch of asphalt on top surface FILL: Sandy silt- dark brown to brown, medium dense, slightly moist			
5				19		SM	Gravelly Silty Sand- yellowish brown, medium dense, slightly moist	5	120	
							Total Depth: 5.5 feet due to refusal. No groundwater encountered. No caving observed. Hole backfilled with soil cuttings and patched with asphalt upon com			
10										
15										
20										
25										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 20

TGR GEOTECHNICAL, INC.

APPENDIX C
LABORATORY TEST RESULTS

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

APPENDIX C

Laboratory Testing Procedures and Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data and in the table below:

Sample Location	Sample Description	Maximum Dry Density (Pcf)	Optimum Moisture Content (%)
B-5 @ 0-5 feet	Sandstone/siltstone	115.5	16.0
B-7 @ 0-5 feet	Sandy Clay	126.5	11.0
B-9 @ 0-5 feet	Silty Clay	120.5	12.5

Direct Shear Tests: Direct shear test was performed on selected remolded and/or undisturbed sample, which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test results are presented in the test data and in the table below:

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-5 @ 0-5 feet	Sandstone/siltstone- Remolded 90%, Peak	29	180
	Sandstone/siltstone- Remolded 90%, Ultimate	29	174
B-9 @ 0-5' feet	Silty Clay- Remolded 90%, Peak	22	564
	Silty Clay- Remolded 90%, Ultimate	25	360

Consolidation Tests (ASTM D2435): Consolidation test were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data.

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Expansion Index	Expansion Potential
B-5 @ 0-5 feet	Sandstone/siltstone	47	Low
B-9 @ 0-5 feet	Silty Clay	45	Low

Soluble Sulfates: The soluble sulfate content of selected sample was determined by standard geochemical methods. The test results are presented in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-1 @ 0-5 feet	Silty Sand	0.0064	64	S0
B-11 @ 0-5 feet	Silty Clay	0.0042	42	S0

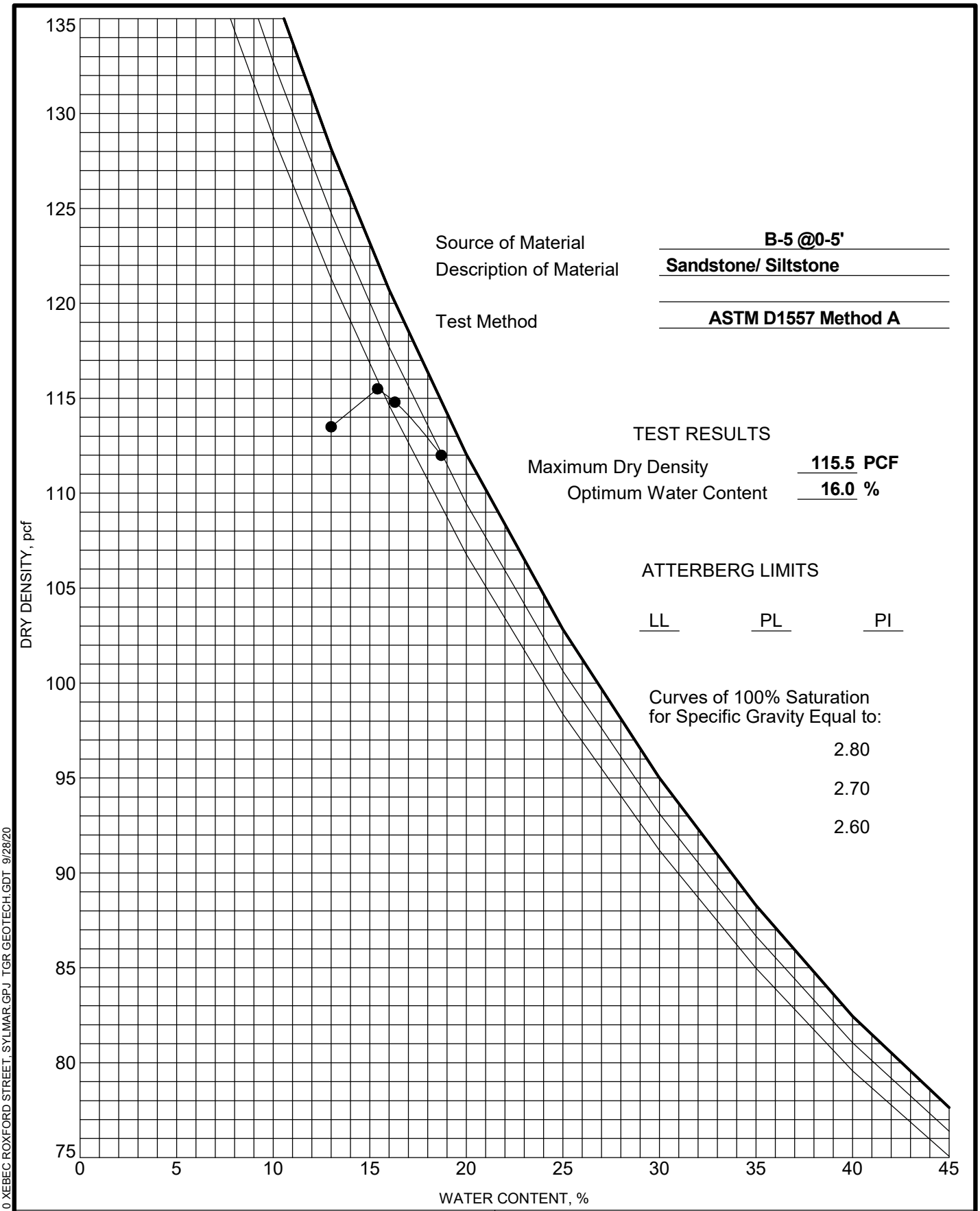
* Based on the current version of ACI 318-14 Building Code, Table No. 19.3.1.1; Exposure Categories and Classes.

Corrosivity Test: Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are presented in the test data and in the table below:

Sample Location	Sample Description	Soluble Chloride (ppm)	Electrical Resistivity (ohm-cm)	pH	Potential Degree of Attack on Steel
B-1 @ 0-5 feet	Silty Sand	64	4,000	8.2	Moderately Corrosive
B-9 @ 0-5 feet	Silty Clay	42	2,700	8.5	Corrosive

R-Value: The resistance “R”-Value was determined by the California Materials Method No. 301 for subgrade soils. One sample was prepared and exudation pressure and “R”-Value determined. The graphically determined “R”-Value at exudation pressure of 300 psi is summarized in the table below:

Sample Location	Sample Description	R-Value
B-5 @ 0-5 feet	Sandstone/siltstone	16
B-7 @ 0-5 feet	Sandy Clay	33



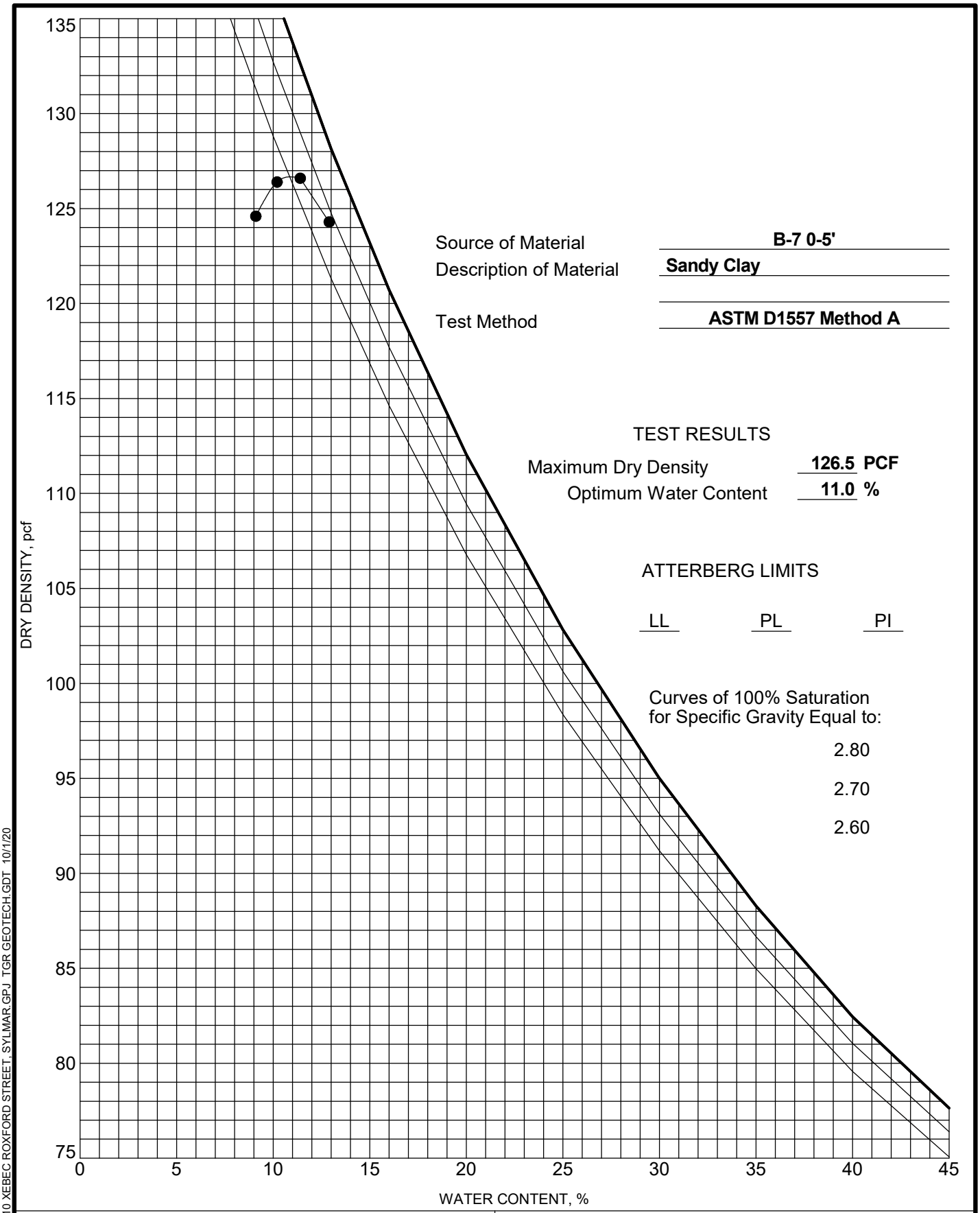
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

MOISTURE-DENSITY RELATIONSHIP

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA

US COMPACTION 20-7110 XEBEC ROXFORD STREET, SYLMAR.GPJ TGR GEOTECH.GDT 9/28/20



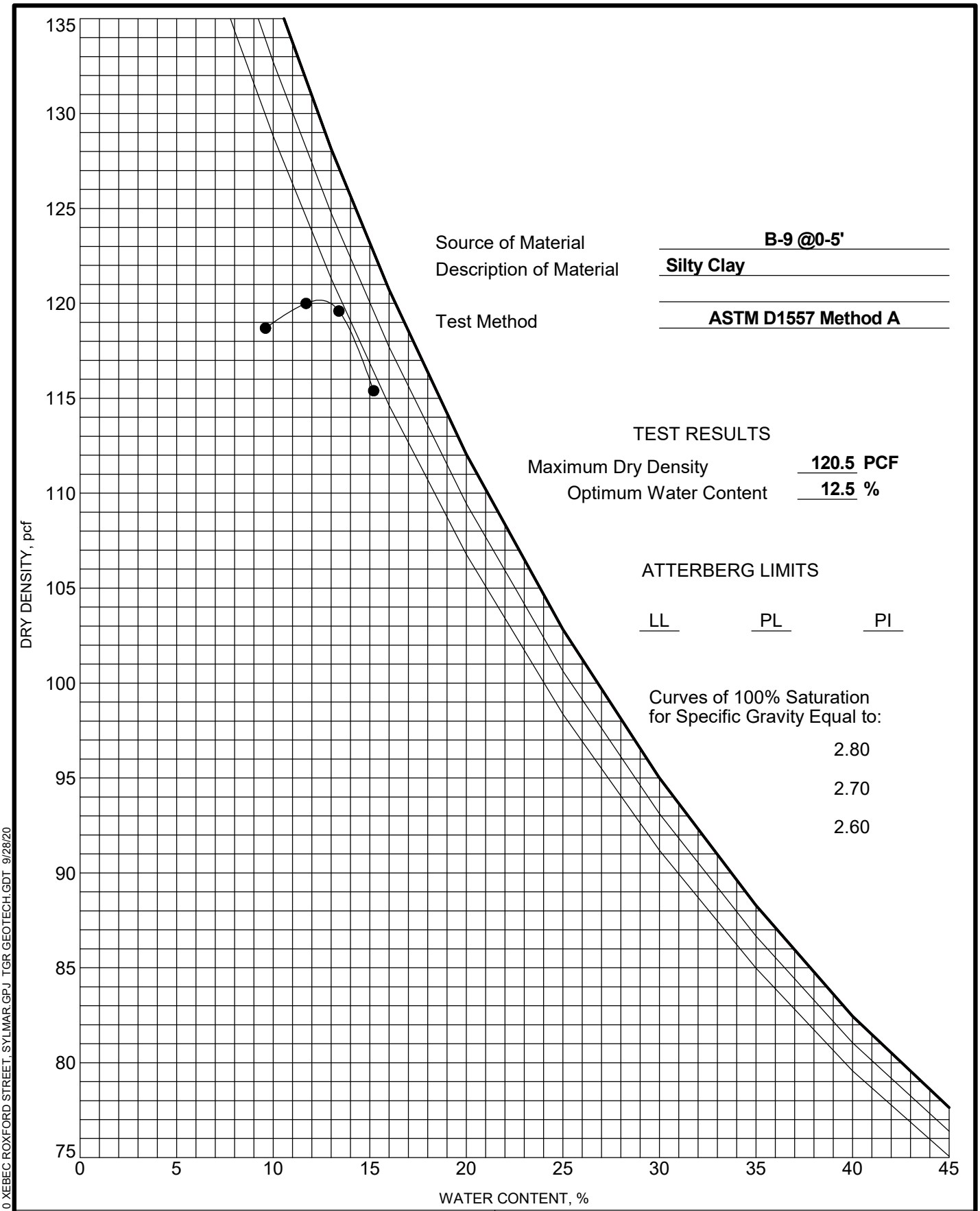
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

MOISTURE-DENSITY RELATIONSHIP

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA

US COMPACTION 20-7110 XEBEC ROXFORD STREET, SYLMAR.GPJ TGR GEOTECH.GDT 10/1/20



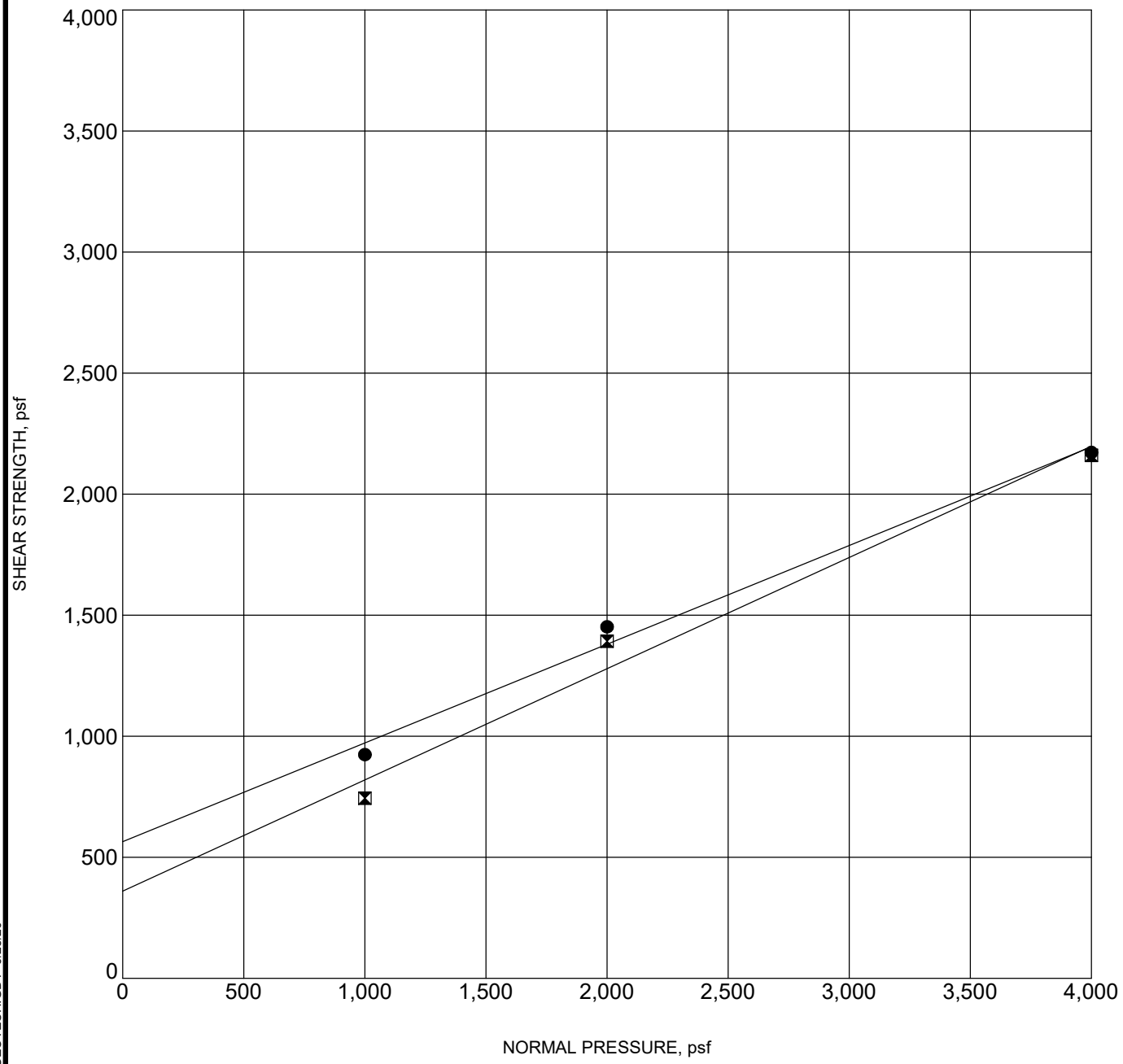
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

MOISTURE-DENSITY RELATIONSHIP

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA

US COMPACTION 20-7110 XEBEC ROXFORD STREET, SYLMAR.GPJ TGR GEOTECH.GDT 9/28/20



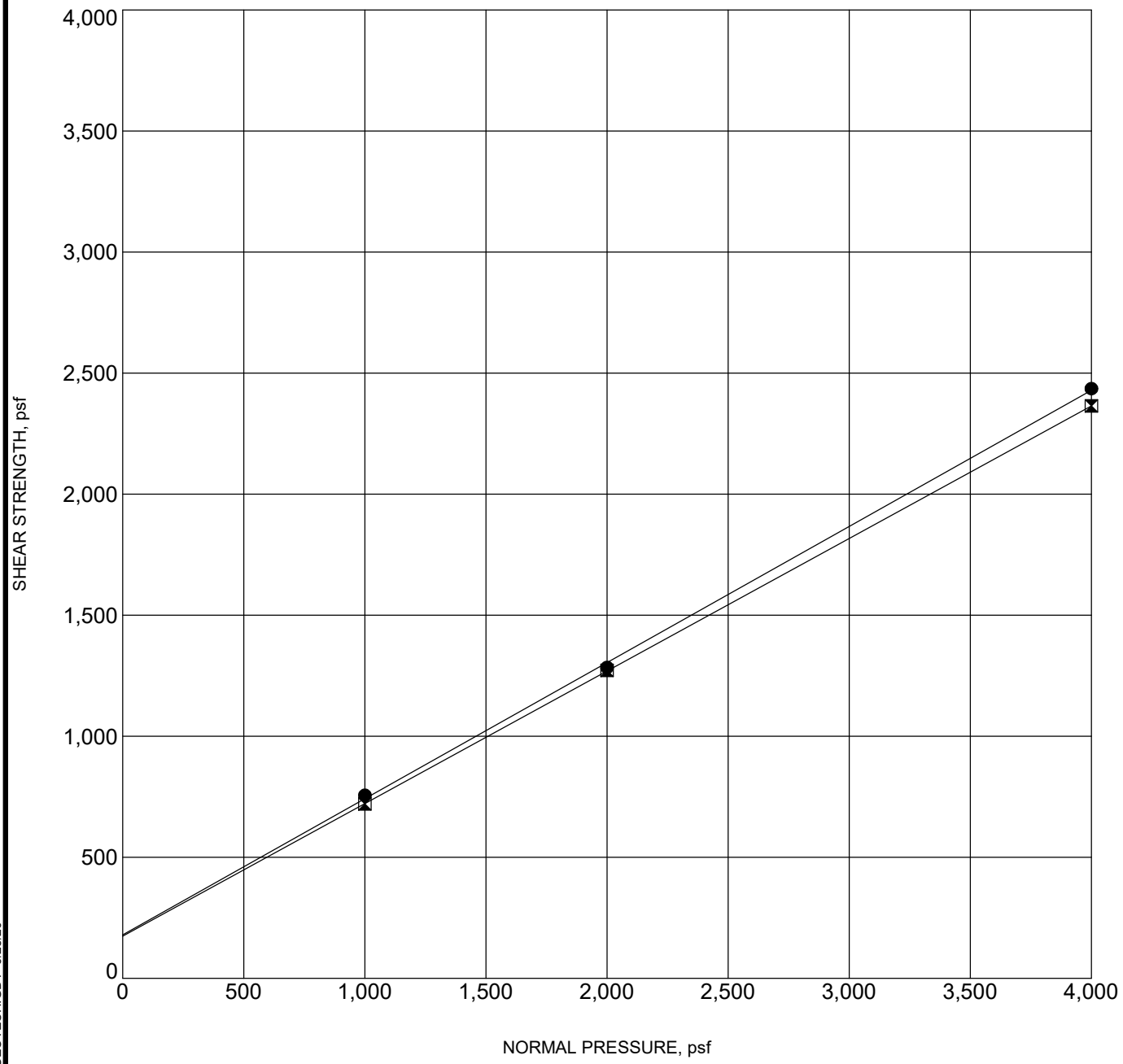
Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	**B-9**	**0-5'**	**Silty Clay, Remolded-90%, Peak**	**109**	**13**	**564**	**22**
⊠	**B-9**	**0.5**	**Silty Clay, Remolded-90%, Ultimate**	**109**	**13**	**360**	**25**

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

DIRECT SHEAR TEST

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA



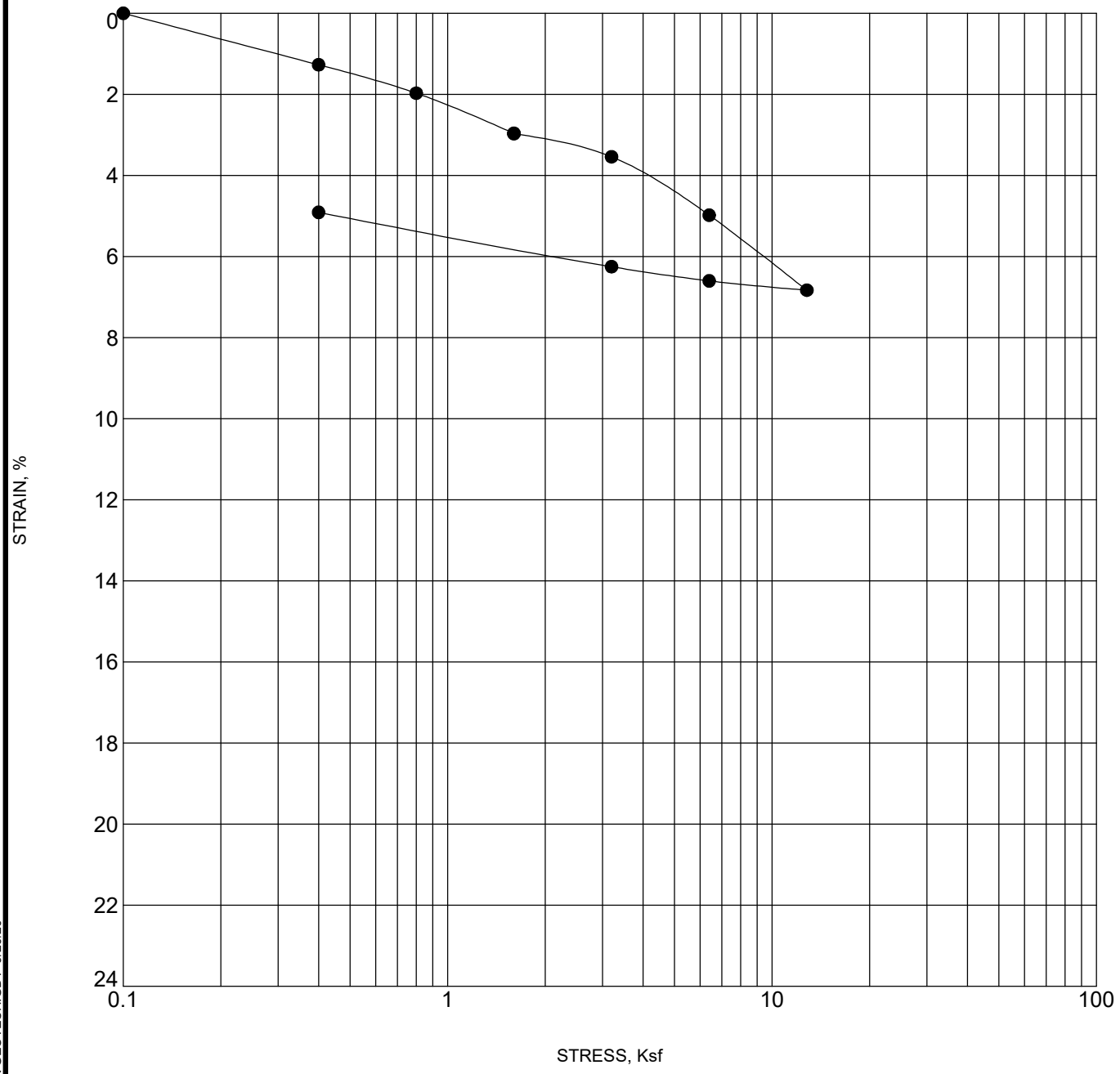
Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	**B-5**	**0-5'**	**Sandstone/ siltstone, Remolded-90%, Peak**	**104**	**12**	**180**	**29**
⊠	**B-5**	**0-5'**	**Sandstone/ siltstone, Remolded-90%, Ultimate**	**104**	**12**	**174**	**29**

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

DIRECT SHEAR TEST

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA



Specimen Identification			Classification	γ_d	MC%
●	**B-9**	**5.0**	**Silty Clay**	**107**	**21**

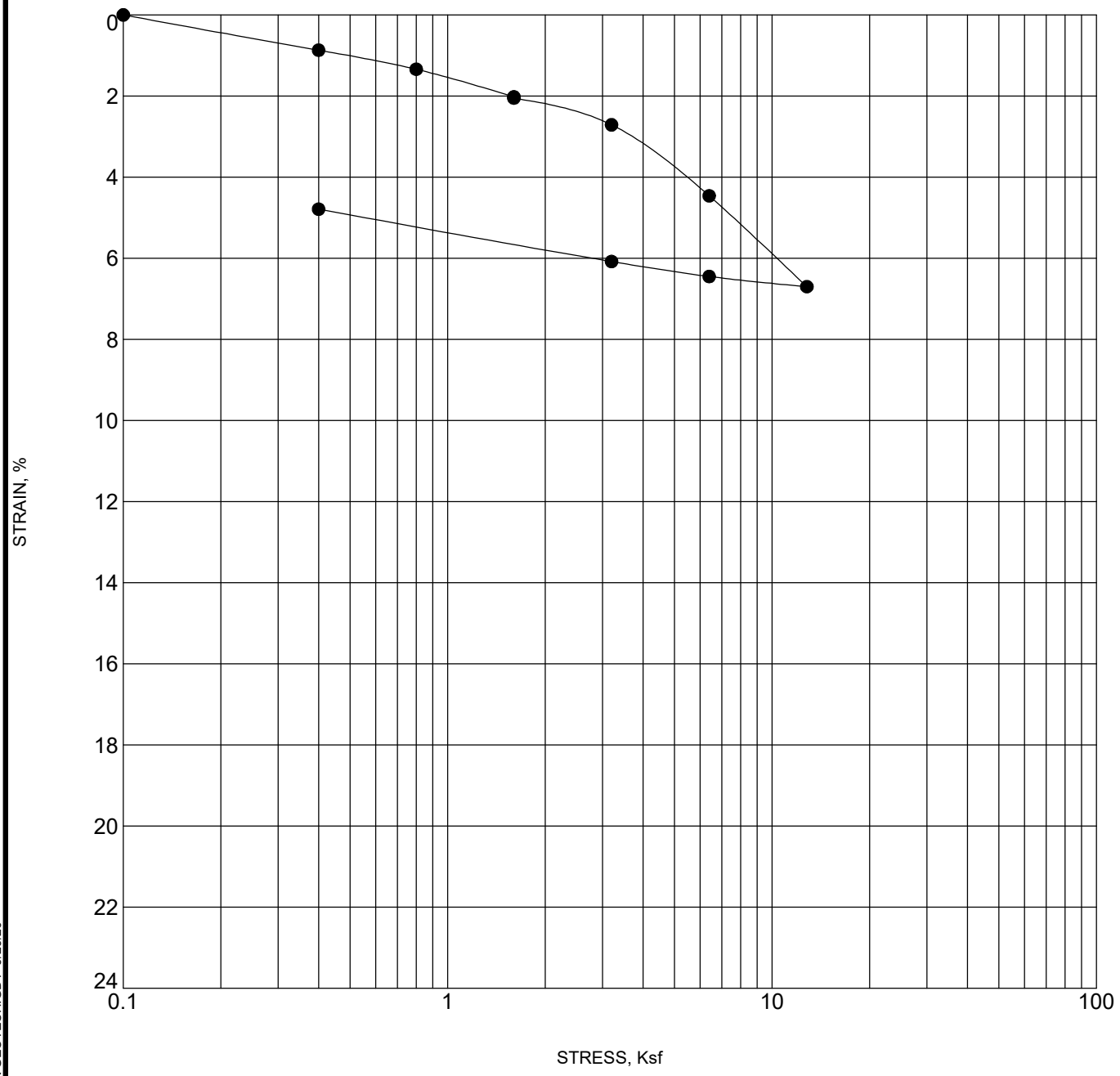
TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

CONSOLIDATION TEST

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA

US CONSOL STRAIN 20-7110 XEBEC ROXFORD STREET, SYLMAR.GPJ TGR GEOTECH.GDT 9/29/20



Specimen Identification			Classification	γ_d	MC%
●	**B-7**	**5.0**	**Sandy Clay**	**111**	**17**

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd
Santa Ana, CA 92704
Telephone: 714-641-7189
Fax:

CONSOLIDATION TEST

Project Number: 20-7110

Project Name: 15825 Roxford Street, Sylmar, CA

ANAHEIM TEST LAB, INC

196 Technology Dr., Unit D
Irvine, CA 92618
Phone (949)336-6544

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA 92704

DATE: 09/22/2020

P.O. NO: VERBAL

LAB NO: C-4111, 1-2

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 20-7110
Project: XEBEC-15825 Rexford Street

ANALYTICAL REPORT

CORROSION SERIES

SUMMARY OF DATA

	pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
1) B-1 @ 0-5'	8.2	4,000	111	64
2) B-9 @ 0-5'	8.5	2,700	78	42

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA. 92704

DATE: 09/24/2020

P.O. NO.: VERBAL

LAB NO.: C-4111-2, 1-2

SPECIFICATION: CTM- 301

MATERIAL: Soil

Project No.: 20-7110
Project: XBC-15825 Rexford Street

ANALYTICAL REPORT

"R" VALUE

	BY EXUDATION	BY EXPANSION
1) B-5 @ 0-5' Brown, Siltstone/ sandstone	23	16
2) B-7 @ 0-5' Brown, Sandy Clay	36	33

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: TGR **ATL No.:** C-4111-2 #1 **Date:** 9/23/2020

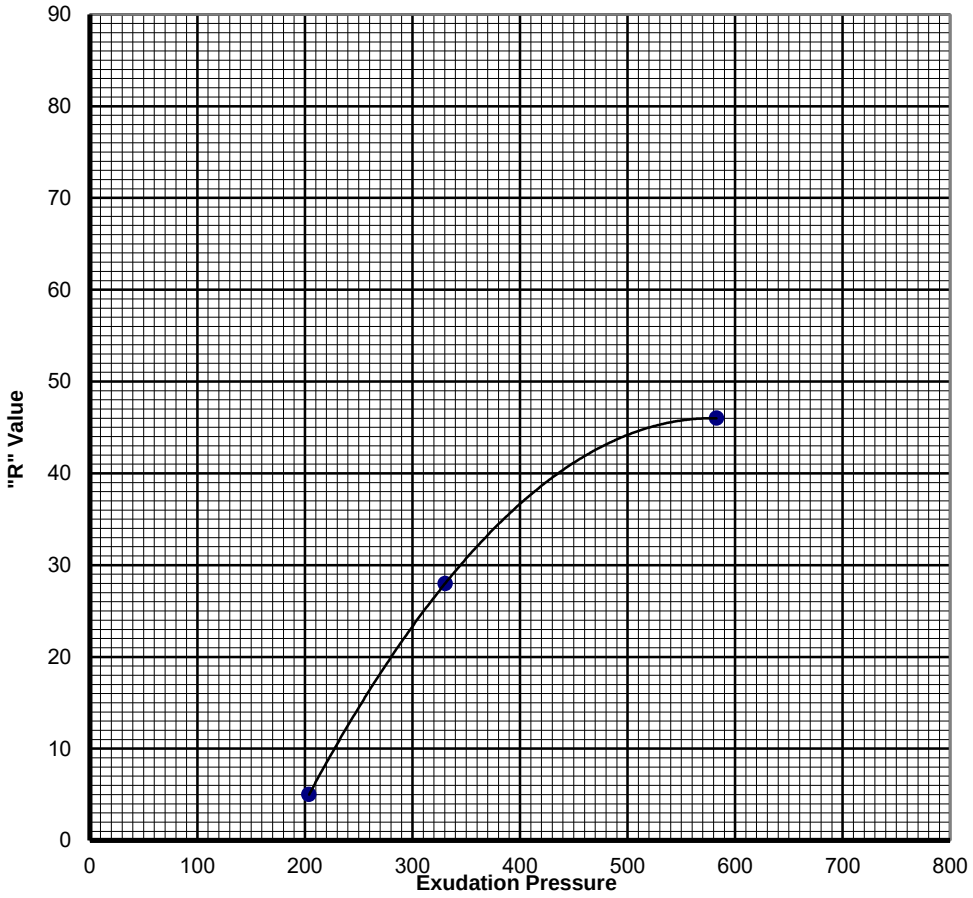
Client Reference No.: 20-7110

Sample: B-5 @ 0 - 5' **Soil Type:** Brown, Siltstone/ sandstone

.

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	200	100	150	
Initial Moisture Content	%	12.5	12.5	12.5	
Moisture at Compaction	%	14.4	17.4	15.8	
Briquette Height	in.	2.52	2.50	2.48	
Dry Density	pcf	116.9	108.4	112.5	
EXUDATION PRESSURE	psi	583	204	330	
EXPANSION dial	(x .0001)	95	10	52	
Ph at 1000 pounds	psi	29	70	40	
Ph at 2000 pounds	psi	64	145	92	
Displacement	turns	4.42	5.11	4.82	
"R" Value		46	5	28	
CORRECTED "R" VALUE		46	5	28	

Final "R" Value	
BY EXUDATION: @ 300 psi	**23**
BY EXPANSION: TI = 5.0	**16**



"R" VALUE CA 301

Client: TGR **ATL No.:** C-4111-2 #2 **Date:** 9/23/2020

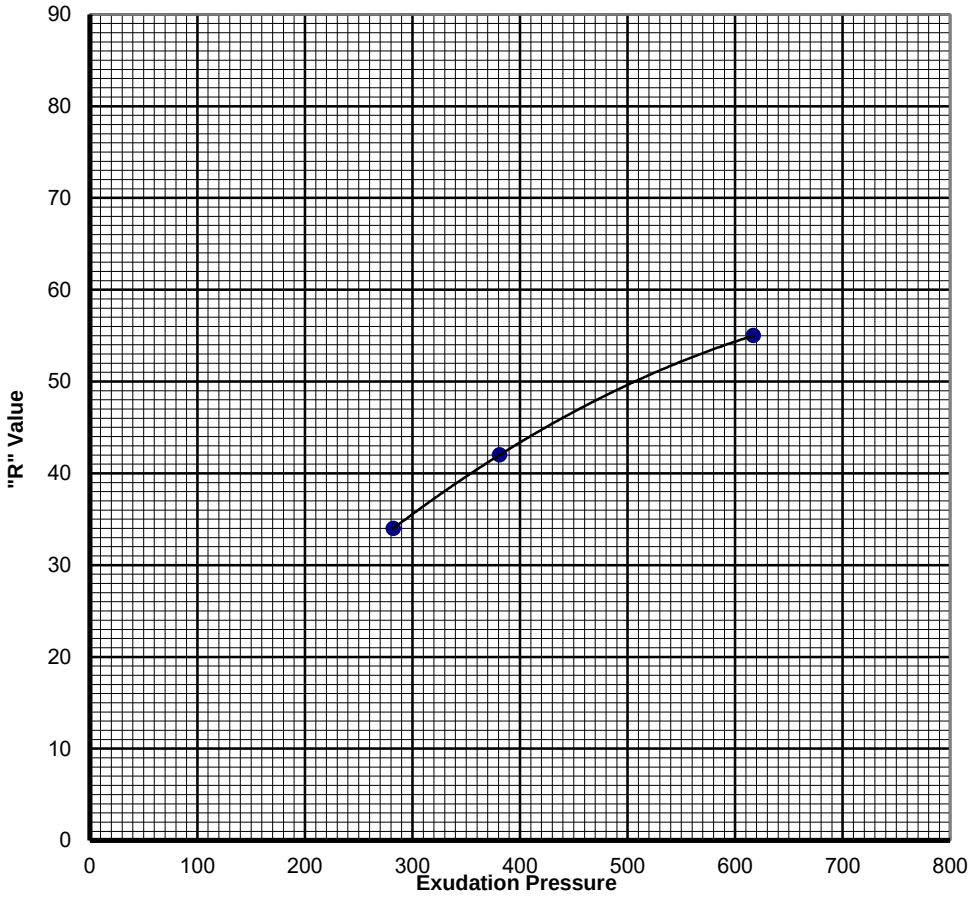
Client Reference No.: 20-7110

Sample: B-7 @ 0 - 5' **Soil Type:** Brown, Sandy Clay

.

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	100	100	180	
Initial Moisture Content	%	9.5	9.5	9.5	
Moisture at Compaction	%	11.3	12.2	10.4	
Briquette Height	in.	2.51	2.52	2.52	
Dry Density	pcf	124.7	121.6	126.1	
EXUDATION PRESSURE	psi	381	282	617	
EXPANSION dial	(x .0001)	30	22	43	
Ph at 1000 pounds	psi	33	38	27	
Ph at 2000 pounds	psi	70	84	53	
Displacement	turns	4.4	4.48	4.18	
"R" Value		42	34	55	
CORRECTED "R" VALUE		42	34	55	

Final "R" Value	
BY EXUDATION: @ 300 psi	**36**
BY EXPANSION: TI = 5.0	**33**



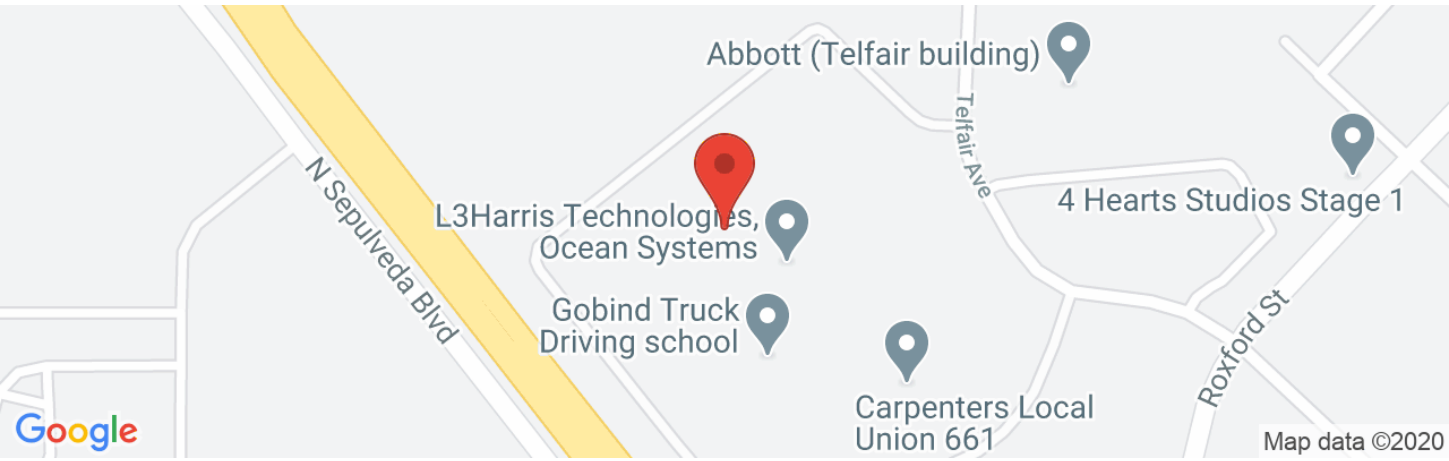
APPENDIX D
SITE SEISMIC DESIGN

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

XEBEC Sylmar

15825 Roxford St, Sylmar, CA 91342, USA

Latitude, Longitude: 34.3080379, -118.4812869



Date	9/28/2020, 1:40:15 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	2.733	MCE_R ground motion. (for 0.2 second period)
S_1	0.881	MCE_R ground motion. (for 1.0s period)
S_{MS}	3.28	Site-modified spectral acceleration value
S_{M1}	1.234	Site-modified spectral acceleration value
S_{DS}	2.187	Numeric seismic design value at 0.2 second SA
S_{D1}	0.823	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.4	Site amplification factor at 1.0 second
PGA	1.11	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	1.332	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.739	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	3.026	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.733	Factored deterministic acceleration value. (0.2 second)
S1RT	0.969	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.087	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.881	Factored deterministic acceleration value. (1.0 second)
PGAd	1.11	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.905	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.891	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

While the information presented on this website is believed to be correct, SEAOC /OSHPD and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in this web application should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. SEAOC / OSHPD do not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the seismic data provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the search results of this website.

APPENDIX E
STANDARD GRADING GUIDELINES

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for grading operations performed under the observation and testing of TGR Geotechnical, Inc.

No deviation from these specifications will be allowed, except where specifically superseded in the Preliminary Geotechnical Investigation report, or in other written communication signed by the Soils Engineer or Engineering Geologist.

1.0 GENERAL

- The Soils Engineer and Engineering Geologist are the Owner's or Builder's representatives on the project. For the purpose of these specifications, observation and testing by the Soils Engineer includes that observation and testing performed by any person or persons employed by, and responsible to, the licensed Geotechnical Engineer or Geologist signing the grading report.

- All clearing, site preparation or earthwork performed on the project shall be conducted by the Contractor under the observation of the Geotechnical Engineer.

- It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Engineer and to place, spread, mix, water and compact the fill in accordance with the specifications of the Geotechnical Engineer. The Contractor shall also remove all material considered unsatisfactory by the Geotechnical Engineer.

- It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of Compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.

- A final report will be issued by the Geotechnical Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.

2.0 SITE PREPARATION

- All vegetation and deleterious material such as rubbish shall be disposed of off-site. The removal must be concluded prior to placing fill.

- The Civil Engineer shall locate all houses, sheds, sewage disposal systems, large trees or structures on the site, or on the grading plan to the best of his knowledge prior to preparing the ground surface.

- Soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and wasted from the site. Any material incorporated as part of a compacted fill must be approved by the Geotechnical Engineer.

- After the ground surface to receive fill has been cleared, it shall be scarified, disced 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 content, 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 restricted to six inches. Prior to placing fill, the ground surface to receive fill shall be inspected, tested and approved by the Geotechnical Engineer.

- Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines or others not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer.

3.0 COMPACTED FILLS

- Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Geotechnical Engineer. Roots, tree branches and other matter missed during clearing shall be removed from the fill as directed by the Geotechnical Engineer.
- Rock fragments less than six inches in diameter may be utilized in the fill, provided:

- They are not placed in concentrated pockets.
- There is a sufficient percentage of fine-grained material to surround the rocks.
- The distribution of the rocks is observed by the Geotechnical Engineer.

- Rocks greater than six inches in diameter shall be taken off-site, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal. Details for rock disposal such as location, moisture control, percentage of the rock placed, etc., will be referred to in the "Conclusions and Recommendations" section of the Geotechnical Report, if applicable.

  If rocks greater than six inches in diameter were not anticipated in the Preliminary Geotechnical report, rock disposal recommendations may not have been made in the "Conclusions and Recommendations" section. In this case, the Contractor shall notify the Geotechnical Engineer if rocks greater than six inches in diameter are encountered. The Geotechnical Engineer will then prepare a rock disposal recommendation or request that such rocks be taken off-site.

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

- Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the Geotechnical Engineer to determine their 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 Geotechnical Engineer as soon as possible.

- Material used in the compacting process shall be evenly spread, watered or dried, 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 Geotechnical Engineer.

- If the moisture content or relative compaction varies from that required by the Geotechnical Engineer, the Contractor shall rework the fill until it is approved by the Geotechnical Engineer.

- Each layer shall be compacted to 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency; (in general, ASTM D1557 will be used.)

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

- All fill 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, in accordance with the recommendations of the Geotechnical Engineer.

- The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the Preliminary report. (See details)

- Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendation of the Geotechnical Engineer and Engineer Geologist.

- The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses and stabilization fills. This may be achieved by either overbuilding 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.

The Contractor shall prepare a written detailed description of the method or methods he will employ to obtain the required slope compaction. Such documents shall be submitted to the Geotechnical Engineer for review and comments prior to the start of grading.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the contractor will be notified by the Geotechnical Engineer.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer.

- All fill slopes should be planted or protected from erosion by methods specified in the preliminary report or by means approved by the governing authorities.

- 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 soil prior to placing fill. (See detail)

4.0 CUT SLOPES

- The Engineering Geologist shall inspect all cut slopes excavated in rock, lithified or formation material at vertical intervals not exceeding ten feet.

- If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these

conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer; and recommendations shall be made to treat these problems.

- Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erosive interceptor swale placed at the top of the slope.

- Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

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

5.0 GRADING CONTROL

- Inspection of the fill placement shall be provided by the Geotechnical Engineer during the progress of grading.

- In general, density tests should be made at intervals not exceeding two feet of fill height or every 500 cubic yards of fill placed. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction of being achieved.
- Density tests should be made on the surface material to receive fill as required by the Geotechnical Engineer.

- All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal must be inspected and approved by the Geotechnical Engineer (and often by the governing authorities) prior to placing any fill. It shall be the Contractor's responsibility to notify the Geotechnical Engineer and governing authorities when such areas are ready for inspection.

6.0 CONSTRUCTION CONSIDERATIONS

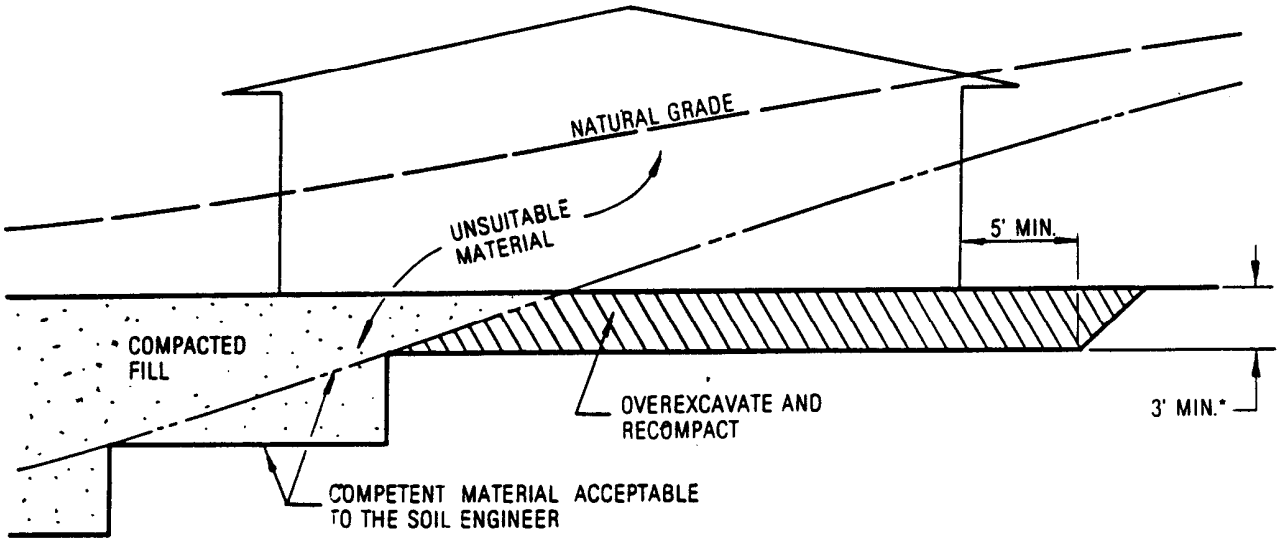
- Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

- Upon completion of grading and termination of observations by the Geotechnical Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Geotechnical Engineer or Engineering Geologist.

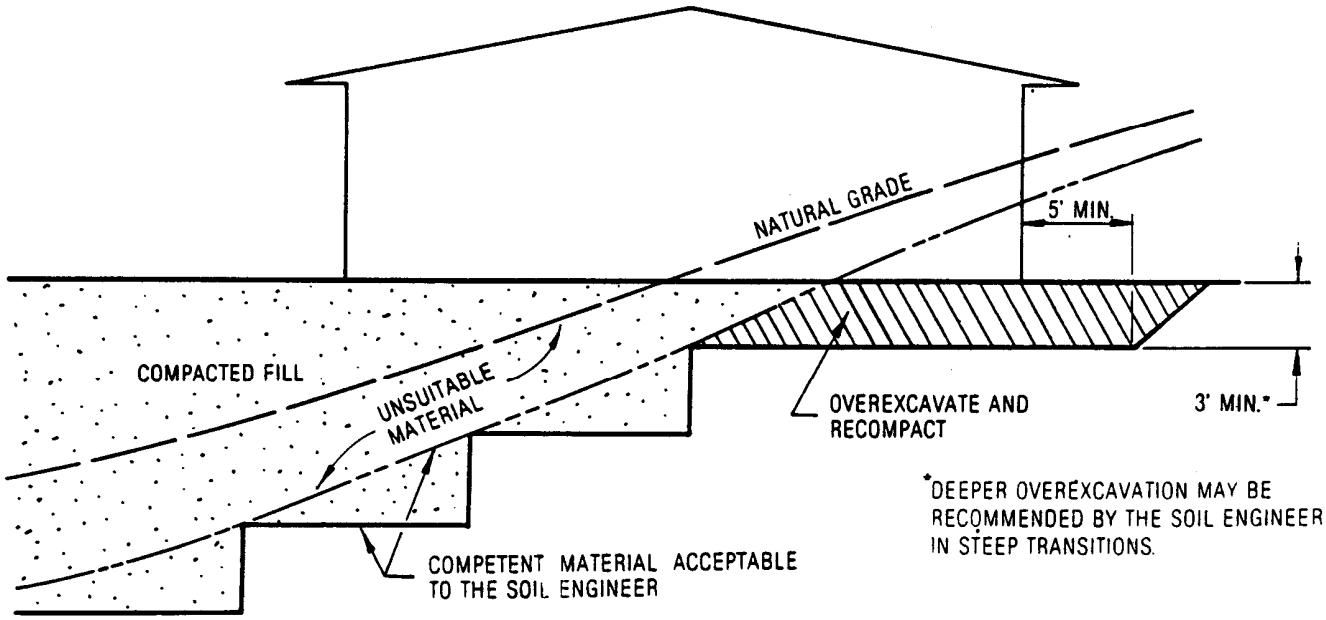
- Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

TYPICAL OVEREXCAVATION OF DAYLIGHT LINE

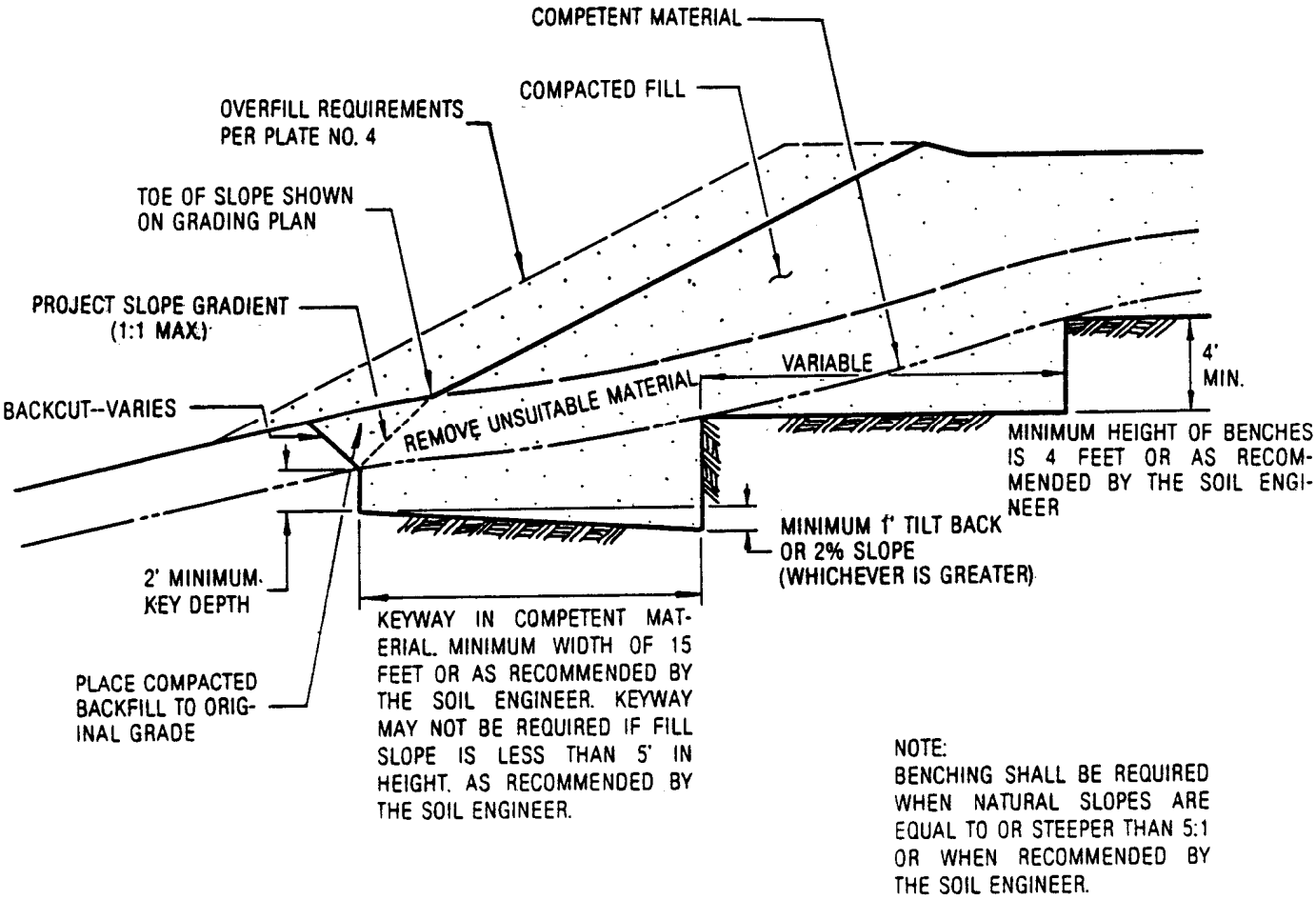
CUT LOT



CUT FILL LOT (TRANSITION)

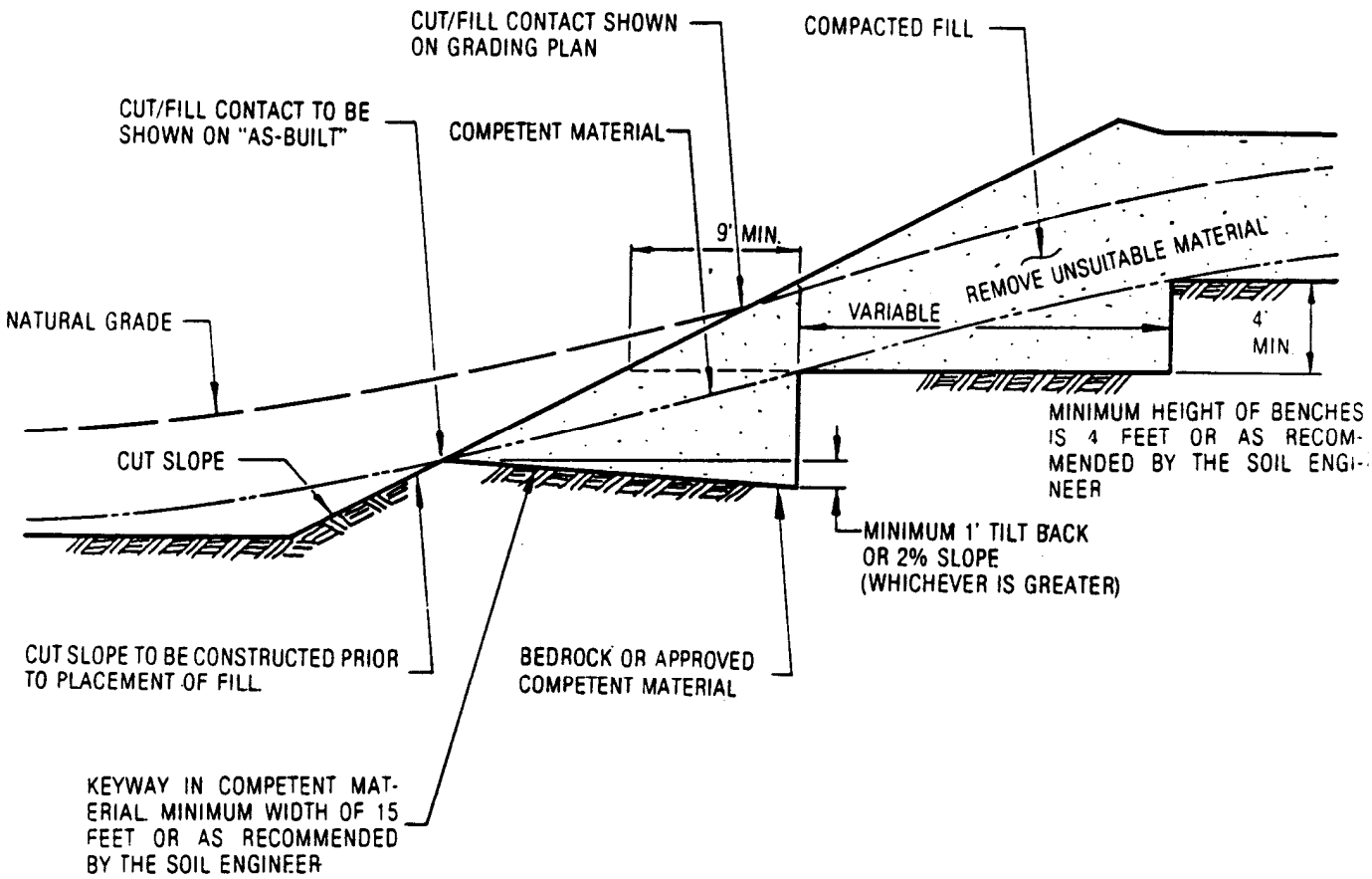


TYPICAL FILL OVER NATURAL SLOPE

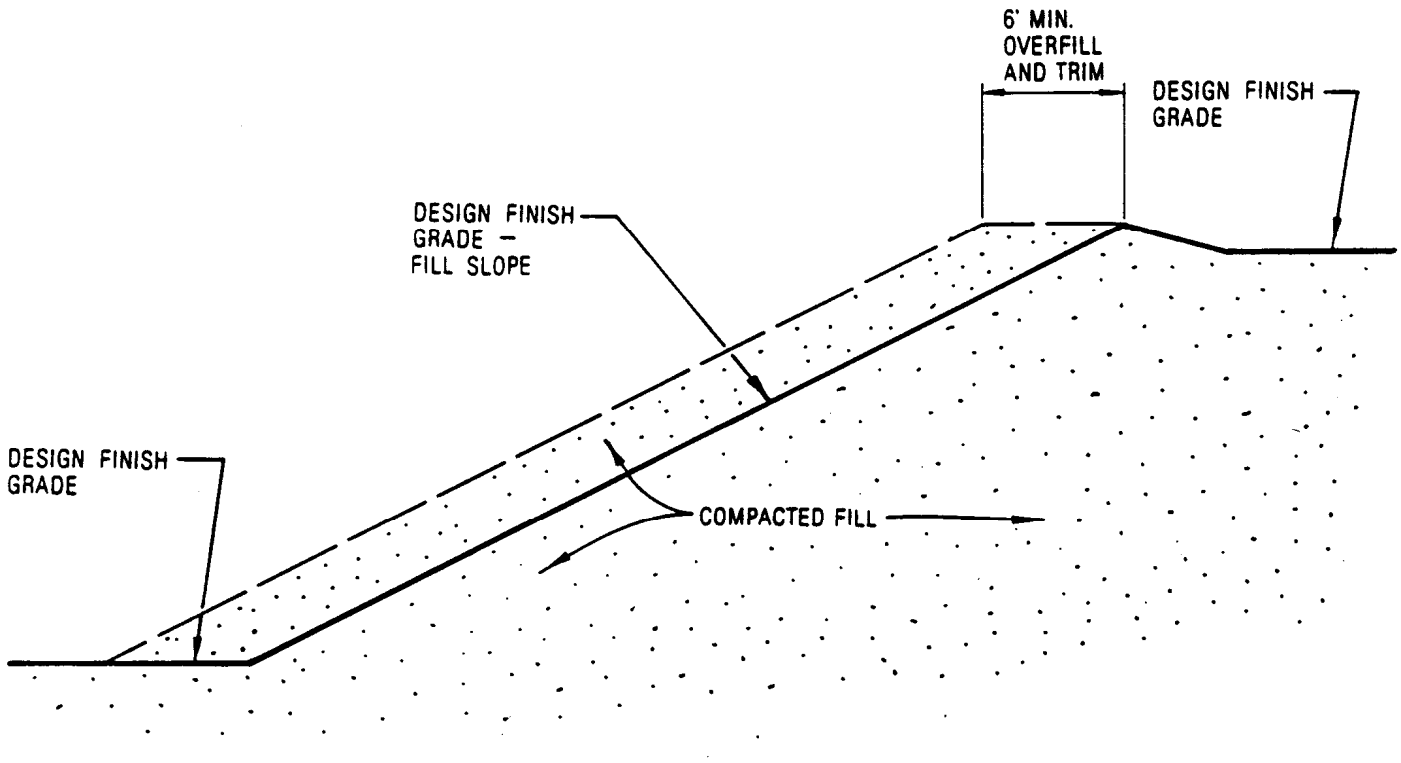


NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE SOIL ENGINEER.

TYPICAL FILL-OVER-CUT SLOPE



TYPICAL FILL SLOPE CONSTRUCTION



NOTES:

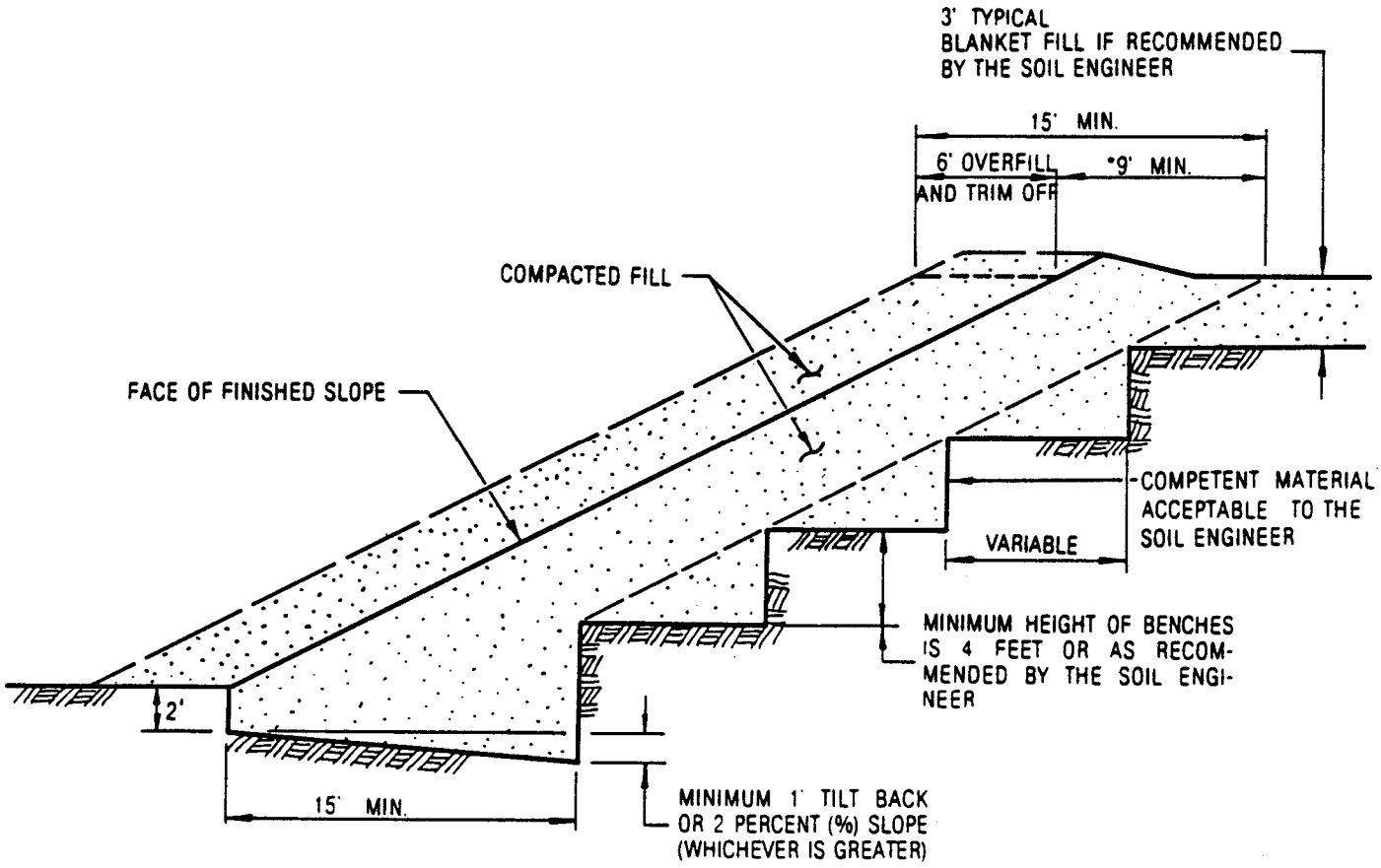
1. ALL FILL SLOPES, INCLUDING BUTTRESS AND STABILIZATION FILLS, SHALL BE OVERFILLED A MINIMUM OF SIX FEET HORIZONTALLY WITH COMPACTED FILL AND TRIMMED TO THE DESIGN FINISH GRADE.

   EXCEPTIONS:

   A. FILL SLOPE OVER CUT SLOPE.
   B. FILL SLOPE ADJACENT TO EXISTING IMPROVEMENTS.

2. THE EXCEPTIONS ABOVE WHICH DO NOT HAVE THE 6 FOOT SLOPE OVERFILL AND TRIM SHALL BE COMPACTED AS STATED IN THE PROJECT SPECIFICATIONS.

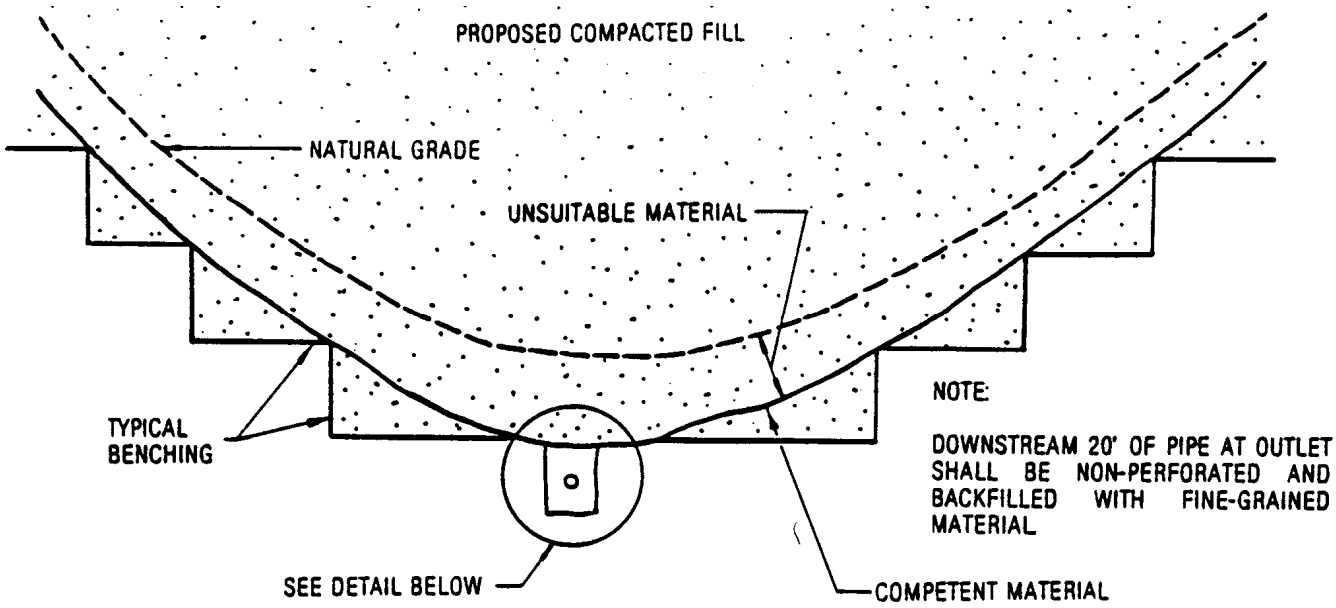
TYPICAL STABILIZATION FILL



NOTE:
SEE PLATE 6 FOR TYPICAL SUBDRAIN DETAILS FOR STABILIZATION FILLS. IF RECOMMENDED BY THE SOIL ENGINEER.

*GREATER THAN 9' IF RECOMMENDED BY THE SOIL ENGINEER: 15' WHERE NO 6' OVERFILL

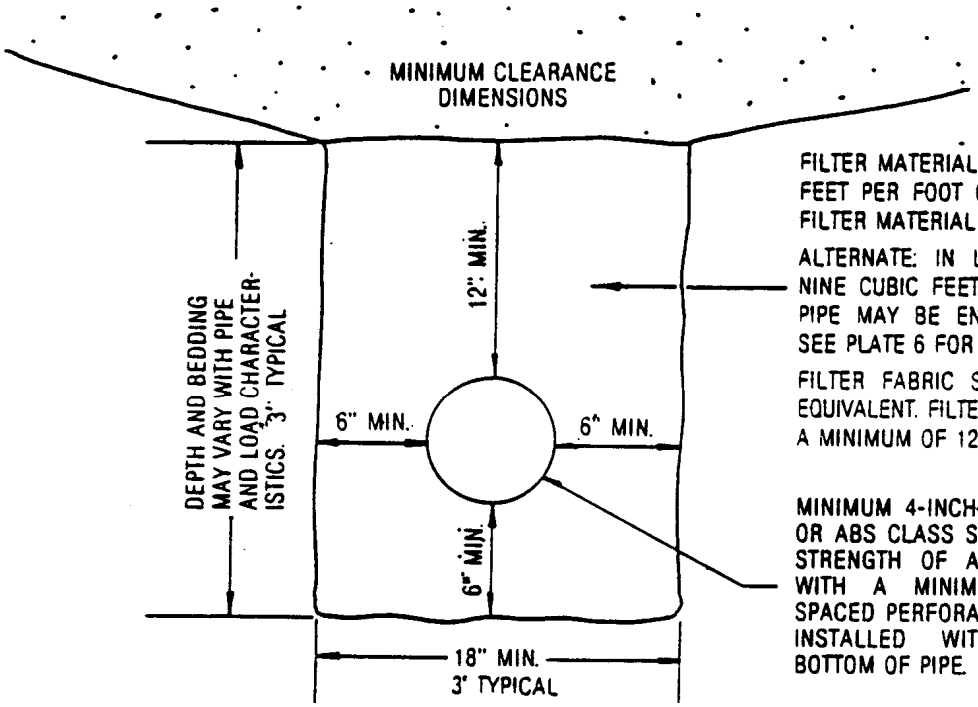
TYPICAL CANYON SUBDRAIN



NOTE:

DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL

NOTES:
PIPE SHALL BE A MINIMUM OF 4 INCHES DIAMETER AND RUNS OF 500 FEET OR MORE USE 6-INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE SOIL ENGINEER



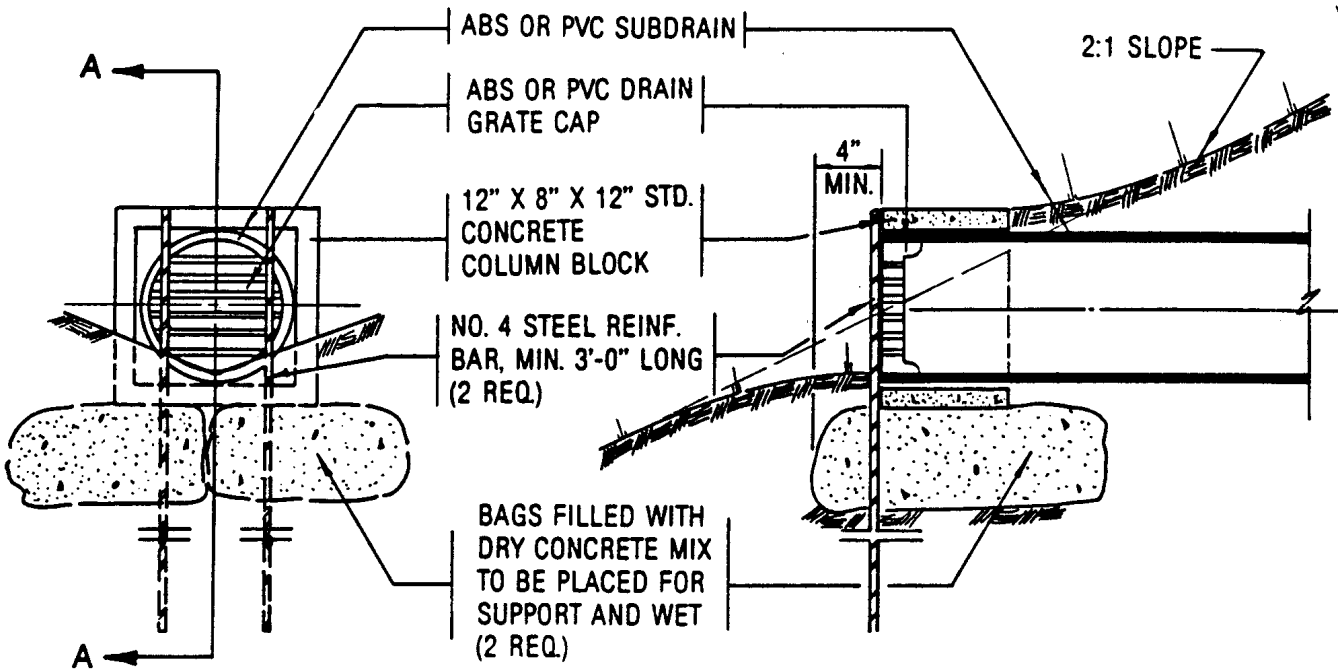
FILTER MATERIAL – MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE. SEE PLATE 6 FOR FILTER MATERIAL SPECIFICATION.

ALTERNATE: IN LIEU OF FILTER MATERIAL NINE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE PLATE 6 FOR GRAVEL SPECIFICATIONS.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH-DIAMETER, PVC SCH. 40 OR ABS CLASS SDR-35 WITH A CRUSHING STRENGTH OF AT LEAST 1000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE, INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE.

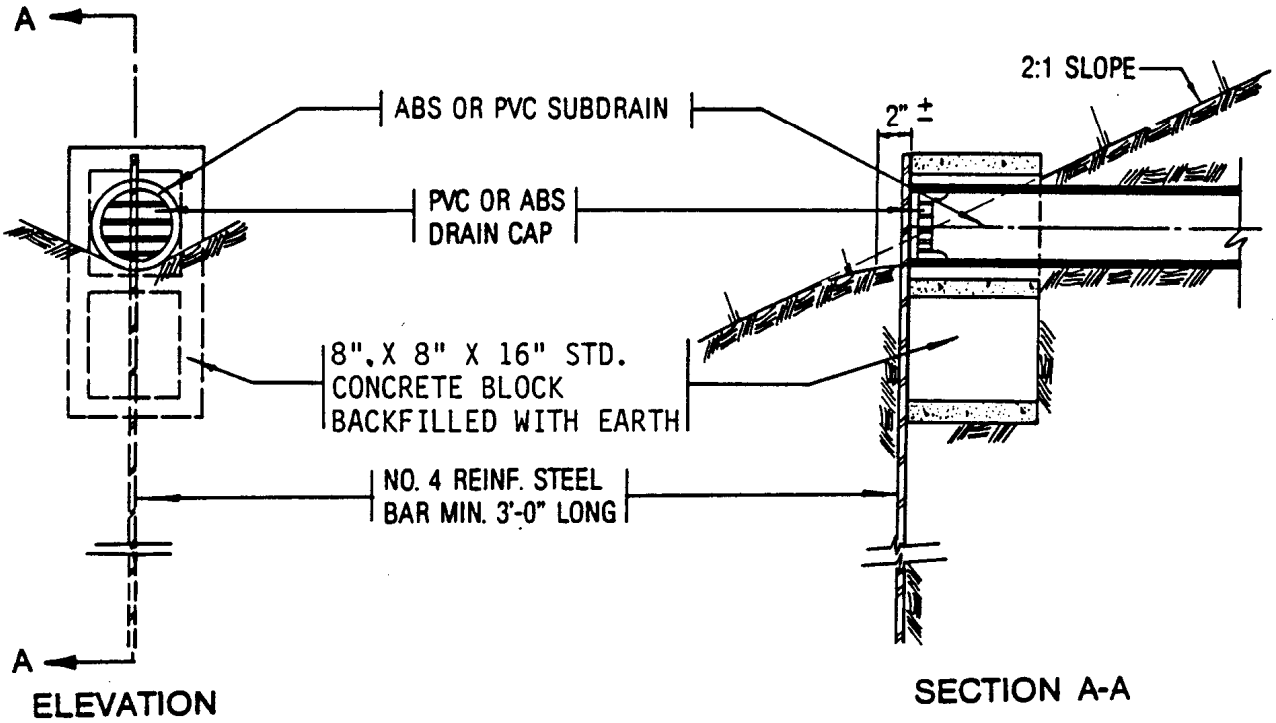
SUBDRAIN OUTLET MARKER



ELEVATION

SECTION A-A

SUBDRAIN OUTLET MARKER FOR 6" AND 8" PIPES

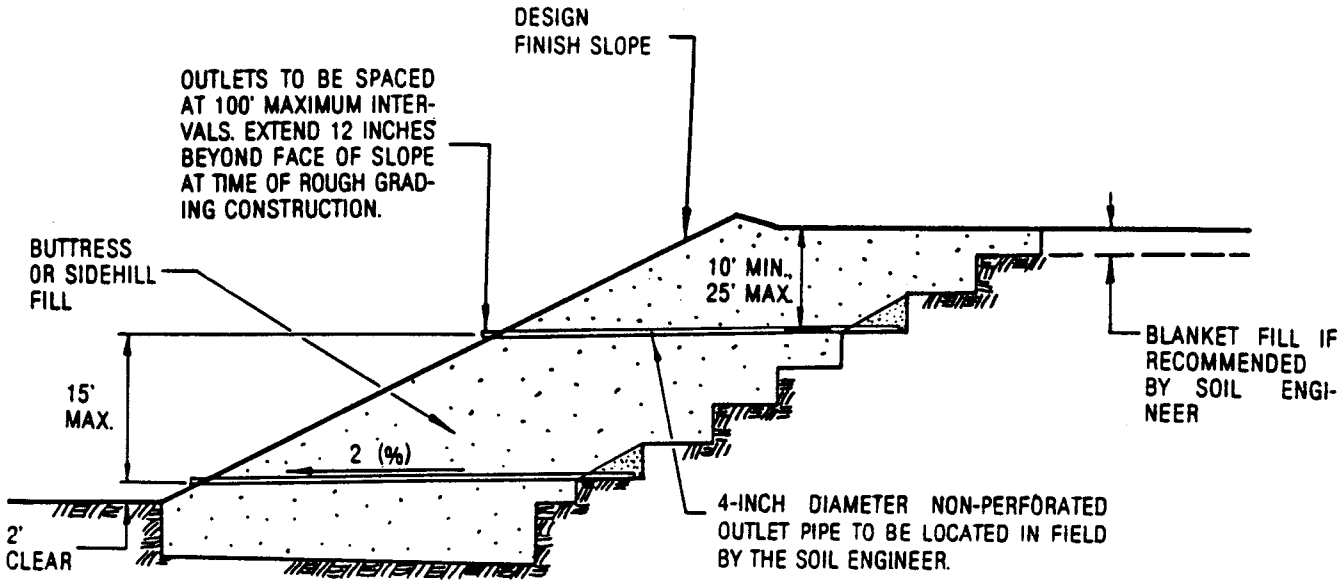


ELEVATION

SECTION A-A

SUBDRAIN OUTLET MARKER – 4" PIPE

TYPICAL STABILIZATION AND BUTTRESS FILL SUBDRAIN



FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO MA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1½"	100
NO. 4	50
NO. 200	8

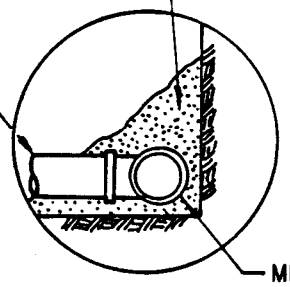
SAND EQUIVALENT = MINIMUM OF 50

FILTER MATERIAL – MINIMUM OF FIVE CUBIC FEET PER FOOT OF PIPE. SEE ABOVE FOR FILTER MATERIAL SPECIFICATION.

ALTERNATIVE: IN LIEU OF FILTER MATERIAL, FIVE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE ABOVE FOR GRAVEL SPECIFICATION.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW



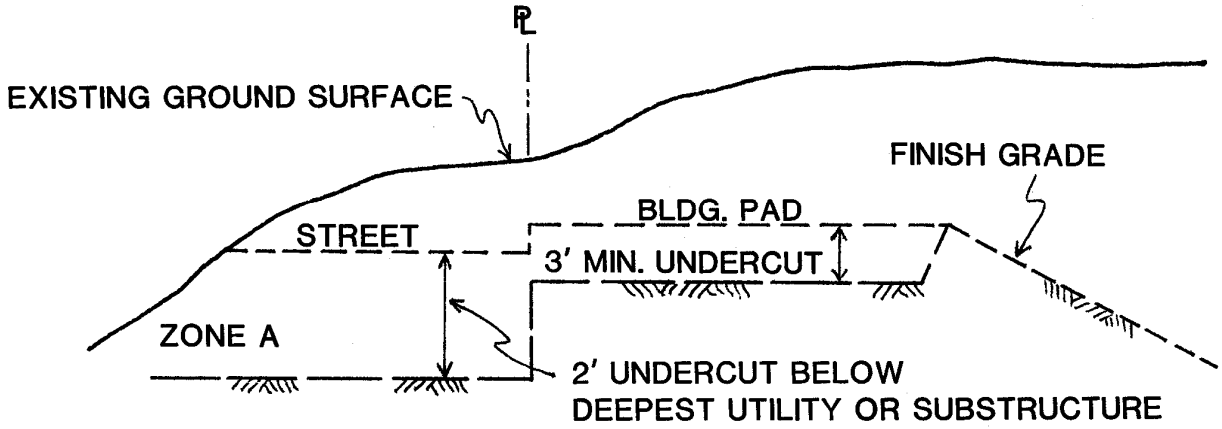
MINIMUM 4-INCH DIAMETER PVC SCH 40 OR ABS CLASS SDR 35 WITH A CRUSHING STRENGTH OF AT LEASE 1,000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

NOTES:

1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

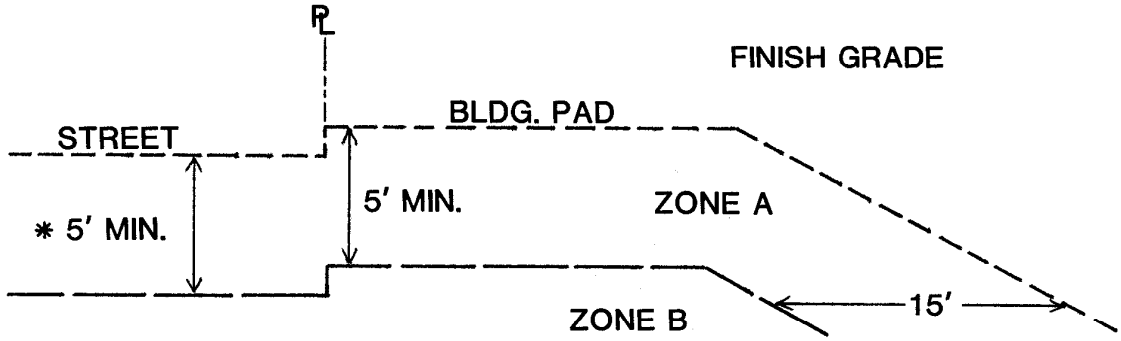
TYPICAL CUT AND FILL GRADING DETAILS

TYPICAL GRADING WITHIN PROPOSED DEEP BEDROCK CUT AREAS



NO SCALE

TYPICAL GRADING WITHIN PROPOSED FILL AREAS



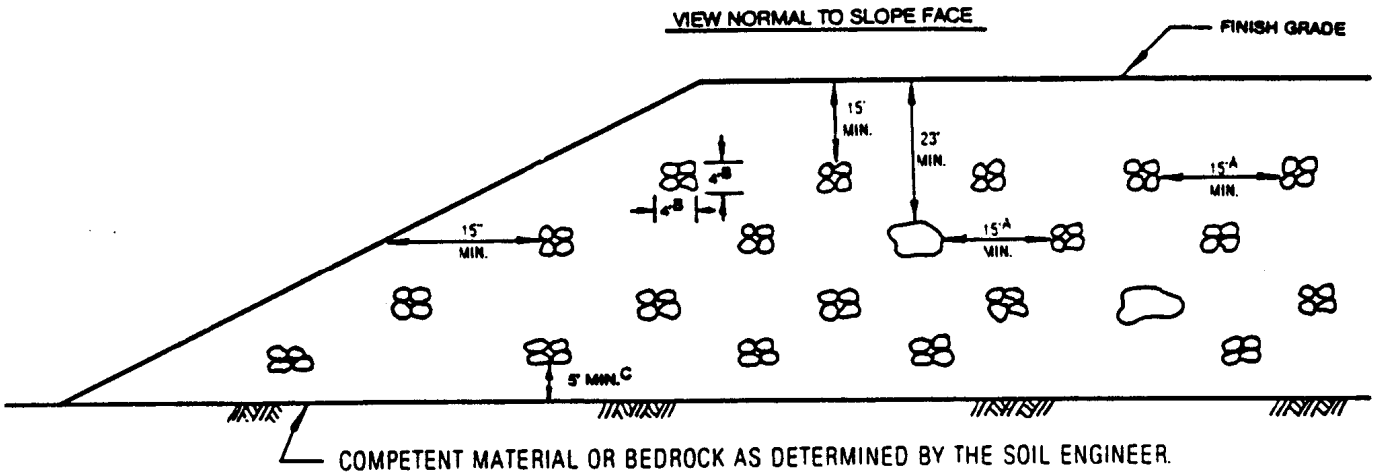
LEGEND

ZONE A ....."SOIL" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

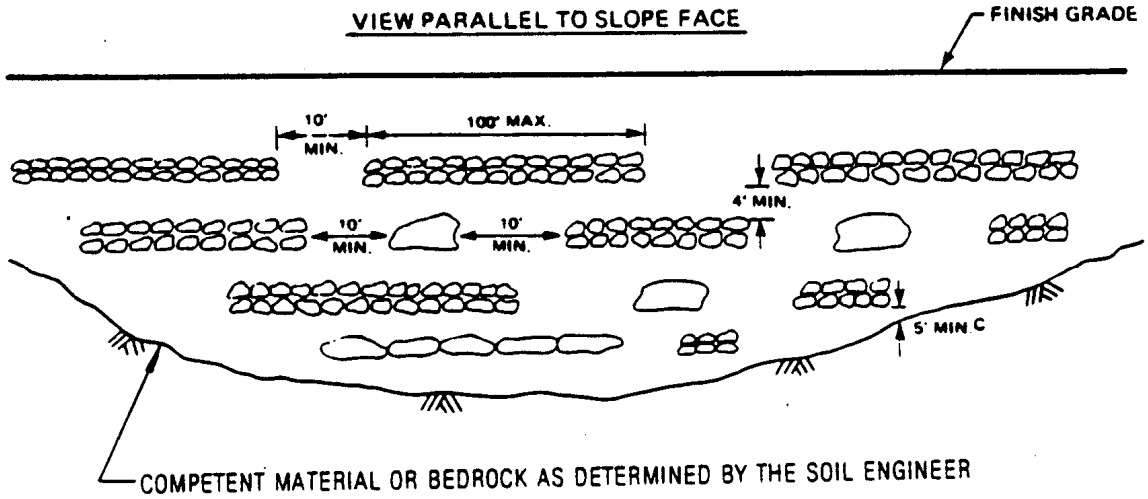
ZONE B ....."SOIL-ROCK" AND/OR "ROCK" FILL PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS PRESENTED IN SECTION 11.2.3 OF THIS REPORT

* 5′ OR 1′ BELOW DEEPEST UTILITY, WHICHEVER IS GREATER

TYPICAL OVERSIZE ROCK DISPOSAL – "SOIL-ROCK" FILL



NOTE:
ORIENTATION OF WINDROWS MAY VARY BUT SHALL BE AS RECOMMENDED BY SOIL ENGINEER.



NOTES:

A. ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.
B. HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE AND TYPE OF EQUIPMENT.
C. IF APPROVED BY THE SOIL ENGINEER, WINDROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK PROVIDING ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.
D. VOIDS IN WINDROW TO BE FILLED BY FLOODING GRANULAR SOIL INTO PLACE. GRANULAR SOIL SHALL MEAN ANY SOIL WHICH HAS A UNIFIED SOIL CLASSIFICATION SYSTEM (UBC 29-1) DESIGNATION OF SM, SP, SW, GM, GP, OR GW.
E. AFTER FILL BETWEEN WINDROWS IS PLACED AND COMPACTED WITH THE LIFT OF FILL COVERING WINDROW, WINDROW SHALL BE PROOF-ROLLED WITH D-9 DOZER OR EQUIVALENT.
F. OVERSIZED ROCK IS DEFINED AS LARGER THAN 12" IN SIZE.