Appendix “K”

Geotechnical Updated Evaluation of the 2018 Geotechnical Evaluation

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Subject: ***Geotechnical Due Diligence Subsurface Evaluation and Review of Proposed Residential Development, Tentative Tract Map 39011, North of El Sobrante Road, County of Riverside, California***

Introduction

In accordance with your request, LGC Geotechnical, Inc. has prepared this geotechnical due diligence subsurface evaluation and review for the proposed residential development, Tentative Tract Map 39011, located north of El Sobrante Road in the County of Riverside, California.

The purpose of our study was to form an opinion on the anticipated geotechnical conditions and provide preliminary geotechnical conclusions and recommendations relative to the geotechnical feasibility of the site for development. This report is based on our review of the referenced geotechnical reports (by others), preliminary site plans, readily available geotechnical information, and a limited field evaluation consisting of excavating test pits, seismic refraction lines, and performing laboratory testing.

Project Description

The approximately 37-acre site is bound to the north by proposed HG3 Tract 38605, to the east and south by moderately developed farmland and to the west by proposed HG2 Tract 38901 (see Figure 1 – Site Location Map). Existing grades vary from elevations of approximately 1325 to 1440 feet.

The undeveloped site consists of gentle to steeply sloped hillside land and is generally lightly vegetated with trails throughout. Based on review of historic aerial photographs, it appears that the site was previously used for agricultural farming from prior to 1959 up to 2009. Refer to the attached Site Photos for existing conditions (Figure 2).

The proposed residential development includes the construction of 68 single-family residential lots. Planned residential buildings are anticipated to be at-grade relatively light weight wood-framed structures with on-grade parking. Other planned improvements include open space, water quality basins, streets, and other associated improvements. Planned design cuts and fills are expected to be a maximum of approximately 40 and 22 feet, respectively. Additionally, cut slopes and fill slopes are

planned to be constructed at a maximum inclination of 2:1 (horizontal to vertical) and are expected to be a maximum of approximately 30 feet in height.

Subsurface Geotechnical Evaluation

LGC Geotechnical performed a subsurface geotechnical evaluation of the site consisting of the excavation of thirteen test pits and completion of seven seismic refraction lines to evaluate onsite geotechnical conditions.

Thirteen exploratory test pits (TP-1 through TP-13) were excavated utilizing a standard backhoe with a 2-foot bucket to estimate remedial grading depths and obtain samples for laboratory testing. A geologist observed the operation, logged the geotechnical test pits, and collected the soil samples. Subsequent to logging, the test pits were backfilled with native soils and wheel rolled for densification. Some settlement of the backfill should be expected.

The seven seismic refraction lines (S-1 through S-7) were performed to assess the general seismic velocities of the underlying bedrock materials that can then be correlated with excavation characteristics (rippability). The seismic refraction lines were generally placed in areas of maximum design cut within the hard bedrock areas. Lengths of the seismic refraction lines were up to approximately 200 feet, resulting in maximum explored depths of approximately 20 to 55 feet below the existing ground surface. Please note that seismic refraction lines only characterize the subsurface conditions at the locations where they are performed, and locations were determined based on available plans and our understanding of potential future development of the site. If substantial changes to the current plans or site layout are made in the future, additional subsurface exploration may be needed.

The approximate locations of our subsurface explorations and subsurface explorations performed by others are provided on the Geotechnical Map (Sheet 1). Our test pit and seismic refraction logs as well as exploration logs by others are provided in Appendix B.

Laboratory Testing

Representative bulk samples were obtained for laboratory testing during our field evaluation. Laboratory testing included in-situ moisture content, fines content, expansion index, direct shear, laboratory compaction, R-value and corrosion (sulfate, chloride, pH and minimum resistivity).

The following is a summary of the laboratory test results:

- Field moisture contents ranged from approximately 2.5 to 6.7 percent, with an average of approximately 4.4 percent.
- Four fines content tests were performed and indicated a fines content (passing No. 200 sieve) of approximately 8, 22, 27 and 48 percent. Based on the Unified Soils Classification System (USCS), the tested samples would be classified as “coarse -grained.”
- Two remolded direct shear tests were performed. The plots are provided in Appendix C.
- Two laboratory compaction tests of near surface samples indicated a maximum dry density of 130.5 and 132.5 pcf with an optimum moisture content of 9.5 and 9.0 percent.
- Three Expansion potential tests were performed and indicated an expansion index value of 1, 13

and 19, corresponding to "Very Low" expansion potential.

- Corrosion testing indicated soluble sulfate contents less than 0.01 percent, chloride contents of 60 and 120 parts per million (ppm), pH of 8.44 and 8.29, and minimum resistivity of 1800 and 2900 ohm-centimeters.

A summary of the laboratory test results is presented in Appendix C. The moisture content results are presented on the test pit logs in Appendix B.

Summary of Geotechnical Reports by Others (Adjacent Site to the North and West)

Summary and Findings of AGS, 2018

Advanced Geotechnical Solutions (AGS, 2018) performed a preliminary geotechnical investigation of the site to the north and west of the subject site. Their evaluation consisted of the excavation of 32 backhoe test pits, 19 excavator test pits, 16 air-track borings and 10 seismic refraction lines. Laboratory testing included in-situ moisture and density, maximum density and optimum moisture content, fines content, expansion index, corrosion testing, and R-value. Based on the subsurface data and laboratory test results, AGS (2018) provided the following major conclusions and recommendations regarding development of their subject site. Of the field data obtained as part of the AGS evaluation (2018), only 4 of the excavator test pits were excavated within the subject site (TTM 39011) and all other field work was performed in areas outside the limits of the subject site to the north and west.

Groundwater

- Groundwater was not encountered in any of the exploratory borings/test pits throughout the site. Due to geologic conditions groundwater is expected to be greater than 100 feet deep.

Faulting and Seismic Hazards

- No active faults or fault zones have been mapped within the site or site vicinity.
- The site was characterized using the now outdated 2016 California Building Code (CBC).
- Due to the dense nature of the granitic bedrock, relatively thin veneer of dense granular soils, lack of shallow groundwater and proposed remedial grading, the subject site is not considered to be susceptible to liquefaction.

Expansion Potential

- Based on preliminary observations and laboratory testing for the subject site, the expansion potential of the onsite soil materials is considered to be "Very Low".

Earthwork

- From a geotechnical perspective, the existing onsite soils appear to be suitable material for use as fill, provided they are relatively free of oversize material (greater than 8 inches in maximum dimension), construction debris, trash, and organic material.

- AGS recommended near surface soils including undocumented artificial fill, topsoil, alluvium, and weathered portions of older alluvium and bedrock are considered unsuitable for support of the proposed improvements and should be temporarily removed to expose competent underlying materials.
- Rippability was assessed by AGS based on their seismic refraction lines and air track borings and they determined that blasting will be expected in portions of the granitic bedrock near our subject site at a depth ranging from approximately 5 to 30 feet below existing grade. AGS suggests that street/utility overexcavation be performed by heavy equipment in open excavation to 2 feet below lowest utility and 3 feet below pad grade.
    - *Refer to the discussion in "Preliminary Findings and Recommendations" Section of this report for updated rippability recommendations.*
- During rough grading, generation of oversize rock (greater than 8 inches) is anticipated.
    - *Refer to the discussion in "Preliminary Findings and Recommendations" Section of this report for updated oversized handling recommendations.*
- AGS recommended that cut and fill slopes be constructed at an inclination no steeper than 2:1 (horizontal to vertical) and that keyways be constructed at the toe of all fill slopes and the need for stabilization fill for cut slopes will be determined in the field during grading.
- AGS concluded that slope stability was not considered an issue at this site.

LGC Geotechnical's Preliminary Conclusions

The following general conclusions for development of the proposed site are provided for consideration. From a geotechnical perspective, the site appears to be feasible for construction of the proposed residential development. However, there are some geotechnical items that should be considered, please refer to our preliminary conclusions provided below and our preliminary findings and recommendations in the subsequent section.

- In general, the site consists of near surface soils including topsoil, alluvium, and older alluvium underlain by very dense/hard granitic bedrock (locally as shallow as 6 inches below existing grade).
- The site is not located in a State of California Alquist-Priolo Earthquake Fault Zone or County of Riverside Fault Zone.
- Groundwater was not encountered to a maximum depth of approximately 9.5 feet below existing grade during our subsurface geotechnical evaluation or AGS's geotechnical evaluation (2018).
    - *Groundwater is not expected to be a constraint during construction; however, perched groundwater may be encountered at the contact between existing alluvial soils and bedrock materials.*
- Based on our review of the Riverside County mapping portal for liquefaction potential, the site is not located within a zone of liquefaction potential. Subsurface data suggest the soils are generally very dense sands and very stiff to hard fine-grained soils that are not susceptible to liquefaction.
- In order to provide a relatively uniform bearing condition for the planned building structures we recommend the near surface site soils be temporarily removed and recompacted. Compressible near surface soils shall be removed to suitable, competent native materials prior to re-placement as compacted fill to design grade.
    - *Refer to our "Preliminary Findings and Recommendations" Section and Sheet 1 for updated remedial grading recommendations.*
- The largest slopes at the subject site consists of both 30-foot-high cut and fill slopes inclined at approximately 2:1 (horizontal to vertical) ratio.
    - *We recommend design level slope stability analysis should be performed during a 40-scale grading plan review. Cut and fill slopes are expected to the globally stable.*
    - *It should be noted that cut slopes left with very dense/hard bedrock on the slope face may be difficult to plant and may be prone to increased localized erosion potential. We recommend stabilization fills (replacement slopes) be constructed for cut slopes greater than 5 feet in height to help reduce erosion potential, to promote plantability, to help control subsurface water and seepage, and to improve the cosmetic aspects of the cut slopes.*
- Preliminary laboratory testing indicates site soils were found to have "Very Low" expansion potential. Therefore, building foundations may be constructed with conventional or post-tensioned foundation systems designed in accordance with the California Building Code. We recommend expansion index testing be performed on finish grade pad soils at the completion of grading to confirm the preliminary findings and recommendations.
    - *Refer to our "Preliminary Findings and Recommendations" Section for updated preliminary foundation recommendations.*
- Corrosion testing should be performed on actual subgrade material at the completion of grading.
    - *Refer to our "Preliminary Findings and Recommendations" Section for updated preliminary soil corrosion recommendations.*
- We recommend any proposed import soils match the characteristics of the existing onsite soils (i.e., expansion index, corrosion characteristics, etc.).

- Foundations should be setback from top and toe of slopes in accordance with the County of Riverside grading code or Chapter 18 of the 2022 California Building Code, whichever is more conservative.
- R-value testing indicated a preliminary R-value of 40. These results suggest that the soils are likely to have moderate to favorable subgrade conditions for the proposed street construction. This will result in average street section thicknesses for the region.
- Based on the relatively dense nature of the underlying soils, the presence of some fine-grained soils, hillside nature of the site, and relatively shallow dense bedrock at depth, the subsurface soil conditions are not expected to be conducive to infiltration. We do not recommend intentional infiltration of stormwater. The following should be considered for design of any required water quality system.
    - *We recommend WQMP systems be setback a minimum of 15 feet from structures, and that building footings are designed to be embedded outside a 1:1 (horizontal to vertical) projection up from the bottom of the WQMP system. Deepened footings or repositioning of the infiltration system may be considered if there is conflict. Additionally, the County recommended minimum setback should be incorporated into the design of the unlined systems.*
    - *Due to the hillside nature of the subject site, it is recommended that water quality detention systems/basins be constructed with a liner to reduce the impact of concentrated subsurface water destabilizing slopes or adjacent properties at lower elevations.*
- Protecting existing offsite improvements during grading construction is critical and should be anticipated by the contractor.
    - *We recommend a preconstruction survey be performed to document the existing conditions of the adjacent structures, walls, and improvements prior to initiation of grading and construction activities.*
- Prior to construction, LGC Geotechnical should be provided with the proposed improvement plans for review and/or revision (if necessary).

LGC Geotechnical's Preliminary Findings and Recommendations

The following findings and recommendations are based on review of the provided geotechnical reports as well as the limited field work and laboratory testing performed as part of this due diligence evaluation. These recommendations are to be considered preliminary and should be updated as part of a 40-scale geotechnical grading plan review evaluation and confirmed upon completion of grading and earthwork operations. In addition, they should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the owner.

Geologic Conditions

The subject site is located within an area known as the Perris Block, a relatively seismically stable zone in Riverside County. The Perris Block is generally a broad area of ancient crystalline bedrock that is bounded by the large regional faults including the Elsinore Fault to the west and the San Jacinto Fault to the east; the site itself is located in an area with no known active faults. The site is specifically located within the low hills north of Lake Mathews that generally consist of granitic rock of the Cretaceous- age Cajalco Pluton. The rock in the area has been eroded significantly to the current levels of low hilly relief (Morton & Weber, 2001). A stream passes just south of the site that runs from east to west (locally dammed by placement of older fill), then turns north past the site. A reservoir constructed prior to 1967 is located just north of the site, presumably constructed to irrigate the orchard agricultural uses at the site and/or surrounding areas over the decades (Historic Aerials, 2024).

The geologic formation that underlies the site is Cretaceous Granodiorite and Gabbro, Undifferentiated (Map Symbol: Kcgb). The rock unit is generally medium to coarse grained crystalline bedrock with a weak foliation (alignment of crystals that creates a parting surface). Several prominent rocky knobs appear to be the darker gabbro rock that reportedly intruded into the lighter brown granodiorite material. The bedrock materials in general are anticipated to become increasingly dense and more likely to produce oversize rock with depth, to the point of very difficult excavation within the unweathered/fresh bedrock that may be encountered within the deepest excavations. The hard rock materials are expected to have random corestones or "floaters," defined as zones that are denser and resist weathering and excavation.

The granitic bedrock is mantled within the lower elevations by a relatively thin layer of older alluvial fan deposits, up to about 6 feet in thickness where evaluated (Map Symbol: Qoa). Where observed, the material was a reddish brown, sand to silty sand, dry to slightly moist, loose to medium dense. Relatively thin younger alluvial deposits are present within the few incised drainages that dissect the site (Map Symbol: Qal). Approximate limits of site materials are presented on the Geotechnical Map (Sheet 1). Logs of test pits and results of seismic refraction line testing are presented in Appendix B and Figure 3a-3g, respectively.

Groundwater

Groundwater was not encountered to a maximum depth of approximately 9.5 feet below existing grade during our subsurface geotechnical evaluation or AGS's geotechnical evaluation (2018). Groundwater is not expected to be a constraint during construction; however, perched

groundwater may be encountered at the contact between existing alluvial soils and bedrock materials.

Seismic

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2022 California Building Code (CBC) and applicable portions of ASCE 7-16 which has been adopted by the CBC. **Please note that the following seismic parameters are only applicable for code-based acceleration response spectra and are not applicable for where site-specific ground motion procedures are required by ASCE 7-16.** Representative site coordinates of latitude 33.861573 degrees north and longitude -117.424832 degrees west were utilized in our analyses. The maximum considered earthquake (MCE) spectral response accelerations (S_{MS} and S_{M1}) and adjusted design spectral response acceleration parameters (S_{DS} and S_{D1}) for Site Class C are provided in Table 1 on the following page. The structural designer should contact the geotechnical consultant if structural conditions (e.g., number of stories, seismically isolated structures, etc.) require site-specific ground motions.

A deaggregation of the PGA based on a 2,475-year average return period (MCE) indicates that an earthquake magnitude of 6.77 at a distance of approximately 13.87 km from the site would contribute the most to this ground motion. A deaggregation of the PGA based on a 475-year average return period (Design Earthquake) indicates that an earthquake magnitude of 6.73 at a distance of approximately 15.82 km from the site would contribute the most to this ground motion (USGS, 2014).

Section 1803.5.12 of the 2022 CBC (per Section 11.8.3 of ASCE 7) states that the maximum considered earthquake geometric mean (MCE_G) Peak Ground Acceleration (PGA) should be used for liquefaction potential. The PGA_M for the site is equal to 0.670g (SEAOC, 2024). The design PGA is equal to 0.447g (2/3 PGA_M).

TABLE 1

Seismic Design Parameters

Selected Parameters from 2022 CBC, Section 1613 - Earthquake Loads	Seismic Design Values	Notes/Exceptions
Distance to applicable faults classifies the site as a "Near-Fault" site.		Section 11.4.1 of ASCE 7
Site Class	C	Chapter 20 of ASCE 7
Ss (Risk-Targeted Spectral Acceleration for Short Periods)	1.500g	From SEAOC, 2024
S_1 (Risk-Targeted Spectral Accelerations for 1-Second Periods)	0.593g	From SEAOC, 2024
F_a (per Table 1613.2.3(1))	1.200	For Simplified Design Procedure of Section 12.14 of ASCE 7, F_a shall be taken as 1.4 (Section 12.14.8.1)
F_v (per Table 1613.2.3(2))	1.407	-
S_{MS} for Site Class C [Note: $S_{MS} = F_aS_S$]	1.800g	-
S_{M1} for Site Class C [Note: $S_{M1} = F_vS_1$]	0.835g	-
S_{DS} for Site Class C [Note: $S_{DS} = (^2/_3)\ S_{MS}$]	1.200g	-
S_{D1} for Site Class C [Note: $S_{D1} = (^2/_3)\ S_{M1}$]	0.556g	-
C_{RS} (Mapped Risk Coefficient at 0.2 sec)	0.939	ASCE 7 Chapter 22
C_{R1}(Mapped Risk Coefficient at 1 sec)	0.919	ASCE 7 Chapter 22

Faulting

Prompted by damaging earthquakes in Northern and Southern California, State legislation and policies concerning the classification and land-use criteria associated with faults have been developed. Their purpose was to prevent the construction of urban developments across the trace of active faults, resulting in the Alquist-Priolo Earthquake Fault Zoning Act. Earthquake Fault Zones have been delineated along the traces of active faults within California. Where developments for human occupation are proposed within these zones, the state requires detailed fault evaluations be performed so that engineering geologists can mitigate the hazards associated with active faulting by identifying the location of active faults and allowing for a setback from the zone of previous ground rupture.

The subject site is not located within a State of California Earthquake Fault Zone (Alquist-Priolo) and no faults were identified on the site during our site evaluation (CGS, 2018 & CGS,

2024). The possibility of damage due to ground rupture is considered low since no active faults are known to cross the site. The closest known active faults to the subject site are the San Jacinto Fault Zone located about 14 miles east of the site, and the Elsinore Fault Zone located about 7 miles west of the site (Riverside County, 2024 & CGS, 2024).

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching and shallow ground rupture, soil liquefaction, and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault and the onsite geology. A discussion of these secondary effects is provided in the following sections.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction, depending on their plasticity and moisture content. Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Dynamic settlement of dry loose sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

The subject site is not located within a County of Riverside Seismic Hazard Zone for liquefaction potential (County, 2024b). Groundwater is not anticipated to be present in the upper 50 feet and the site is expected to consist of compacted fill over very hard bedrock. Therefore, liquefaction potential is considered very low.

Lateral Spread

Lateral spreading is a type of liquefaction-induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements, and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the depth to groundwater and very low potential for liquefaction, the potential for lateral spreading is considered very low.

Preliminary Rippability Findings

Preliminary seismic refraction line rippability study was performed as part of this evaluation. This data was used to make preliminary conclusions regarding the rippability of onsite materials. It may be necessary to perform a design level rippability evaluation in the future based on the 40-scale grading plans once available. Additional field work including seismic refraction lines, air track excavations, etc. may be considered.

In general, the topsoil, older fill, alluvium, and older alluvial deposits are anticipated to be easily to moderately rippable utilizing conventional heavy-duty earth moving equipment (Caterpillar D9 or equivalent). A preliminary rippability study of the hard bedrock unit described in the "Site Geology and Generalized Subsurface Conditions" Section was conducted as part of this evaluation using seven seismic refraction lines.

In general, the subsurface data collected indicates that the bedrock materials can be classified into three zones of rippability (rippable, marginally rippable, and non-rippable). Seismic refraction data is summarized below and presented in Appendix B. Refer to the Geotechnical Map (Sheet 1) for seismic refraction line locations. Table 2 presents generalized rippability classifications and velocity ranges based on readily available rippability charts (Caterpillar, 2019) and our local experience with similar nearby projects. These seismic velocities are utilized in estimating the effort required in excavating the onsite crystalline (hard rock) bedrock materials.

TABLE 2

Generalized Rippability Summary of Crystalline Bedrock

Rippability Classification	**Approximate Seismic Velocity (Feet per Second)**
Moderate Rippability	< 4,000
Difficult to Very Difficult Rippability	4,000 to 5,500
Non-Rippable (Blasting Recommended)	> 5,500

Based on the geologic characteristics of the onsite hard bedrock and our local experience, we estimate that a seismic velocity of approximately 5,500 feet per second represents the boundary between a very difficult rippability and non-rippable classification. A seismic velocity of 5,500 feet per second is slightly more conservative than what is presented on the referenced rippability charts, however, it is based on our experience with similar local hard rock grading projects. Please note that the velocity ranges of these classifications (Table 2) are approximate and that rock characteristics, including jointing and fracturing spacing and orientation, are a major factor in determining rippability.

Estimated depths of the difficulty of rippability utilizing large, heavy-duty equipment (Caterpillar D-9 or equivalent) for each of the seven subject seismic refraction lines are presented in Table 3 below. These depth estimates are based on the seismic refraction line data obtained as part of this preliminary evaluation (Appendix B). Figures 3a through 3g (rear of text) present a cross-sectional view of the proposed finish grades and estimated over-excavation limits overlain on the seismic line tomographic plots. Each layer depicts the average velocity for that specific layer of soil/rock.

TABLE 3

Summary of Seismic Line Velocity vs. Rippability (D-9 or Equivalent)

Seismic Line	Approximate Depth (in feet) to Difficult Ripping (Approx. Seismic Velocity 4,000 ft/sec)	Approximate Depth (in feet) to Non-rippable Bedrock (Approx. Seismic Velocity 5,500 ft./sec or Greater)
S-1	2 - 10	>20
S-2	5 - 20	15 - 25
S-3	2 - 10	15 - 25
S-4	2 - 10	15 - 30
S-5	10 - 35	>40
S-6	0 - 15	5 - 40
S-7	10 - 20	>30

In general, the onsite seismic refraction data suggests that the proposed design cuts (plus the underlying overexavations for pads and underground utilities) within the bedrock formation will be moderately rippable to non-rippable with heavy equipment. Blasting should be expected at depths ranging from approximately 10 to 30 feet below existing grade in the bedrock cut areas. Localized zones of potentially non-rippable bedrock should be anticipated to be encountered above the estimated non-rippable bedrock depths. Furthermore, areas of core stones or "floaters" and rock outcrops will likely require very difficult ripping to possible blasting, especially for utilities (i.e., "line shooting"). Based on seismic refraction lines, the excavation difficulty of the bedrock materials generally increases with depth. Once a 40-scale grading plan is made available, a more in-depth study should be conducted to evaluate rippability as it pertains to proposed cuts across the site.

Please note that different earthmoving equipment (excavators, smaller dozers, backhoes, etc.) will not correlate exactly with the velocity ranges and rippability classifications presented above. In general, an excavator typically utilized for underground utility installation will generally encounter difficult ripping conditions in materials having a seismic velocity of approximately 4,000 to 4,500 feet per second. Therefore, any future underground utilities proposed in the area of crystalline bedrock will require over-excavation during rough grading with the larger/heavy duty grading equipment. Areas of proposed underground utilities in hard rock conditions should be overexcavated a minimum depth of 2 feet below the deepest utility during grading operations to facilitate installation after grading is complete. LGC

Geotechnical should review the wet utility plans once available to confirm the street overexcavation depths.

Performing blasting at lower seismic velocities (4,500 to 5,500 feet per second) may be determined to be more economical or beneficial for construction scheduling. This is highly dependent on anticipated production rates of the grading contractor based on the equipment used for ripping/excavation. It is recommended that the grading contractor review the provided subsurface data and independently determine the potential non-rippable/blasting depths, lateral extents, quantities, production rates, etc. based on their experience and final project plans.

Specialized equipment should be anticipated to handle the difficult rippable to non-rippable materials. This equipment may include heavy breakers, large ripper teeth, line-blasting (if allowed), chemical splitting, rock trucks to move materials, and localized core stone blasting (if allowed).

It should be noted that the proposed project is near existing residential developments. Agency approval to perform blasting, if needed, should be determined prior to the start of grading.

Oversized Material Handling

General fill should be relatively free of organics and other deleterious materials and should have a maximum particle size less than 8 inches. Oversized materials (greater than 8 inches in maximum dimension) should be anticipated to be generated during excavation of the hard crystalline bedrock and core stones. Generation of oversized materials as a result of heavy ripping, breaking, or blasting the very dense bedrock should also be expected. These materials will require special handling during grading which may include oversized burial, offsite disposal, or crushing/breaking to meet project requirements.

Recommendations for appropriate handling of oversized materials should be determined prior to the start of grading. If feasible, crushing oversized materials onsite, incorporating oversized materials into “rock fills” or “windrows,” or exporting oversized material from the site may be considered. For preliminary planning purposes, oversized materials should be buried a minimum of 10 feet below finish grades, should be buried a minimum of 2 feet below the deepest utility in the street areas, and should not be buried within 15 feet of slopes, which will limit the available areas that can accommodate oversized materials. Based on our preliminary review of the tentative tract map (Adkan, 2024), the pad areas onsite with fills greater than 10 feet are limited. We estimate approximately 10 to 15 lots will contain fills deep enough to accept the placement of oversized materials. These lots are generally located in the southern and western portions of the site. Additional recommendations are provided for appropriate handling of oversized materials in General Earthwork & Grading Specifications (Appendix D).

Detailed oversized handling recommendations should be provided as part of a comprehensive 40-scale grading plan review evaluation.

Expansion

Based on the results of our laboratory testing and laboratory testing by others, the site soils are anticipated to have a "Very Low" expansion potential. Final expansion potential of site soils should be determined at the completion of grading. Results of expansion testing at finish grades will be utilized to confirm final foundation design.

Site Earthwork

We anticipate that earthwork at the site will consist of required earthwork removals and over excavations, subgrade preparation, placement of fill, precise grading, and construction of the proposed new improvements, including the residential structures, neighborhood amenities, subsurface utilities and interior streets.

We recommend that earthwork onsite be performed in accordance with the following recommendations, future grading plan review evaluation reports, the 2022 CBC, the County of Riverside grading requirements, and the General Earthwork and Grading Specifications included in Appendix D. In case of conflict, the following recommendations shall supersede those included in Appendix D. The following recommendations should be considered preliminary and may be revised based upon future evaluation and review of the project plans and/or based on the actual conditions encountered during site grading/construction.

Additional and/or revised earthwork recommendations should be provided in a comprehensive grading plan review geotechnical evaluation report. The recommendations provided herein are for preliminary planning purposes only.

Site Preparation

Prior to grading of areas to receive structural fill or engineered improvements, the areas should be cleared of any existing structures, asphalt, surface obstructions, and debris. Vegetation and debris should be removed and properly disposed of off-site. Holes resulting from the removal of buried obstructions, which extend below proposed finish grades, should be replaced with suitable compacted fill material. Any abandoned sewer or storm drain lines should be completely removed and replaced with properly placed compacted fill.

If cesspools or septic systems are encountered, they should be removed in their entirety. The resulting excavation should be backfilled with properly compacted fill soils. As an alternative, cesspools can be backfilled with lean sand-cement slurry. Any encountered wells should be properly abandoned in accordance with regulatory requirements. At the conclusion of the clearing operations, a representative of LGC Geotechnical should observe and accept the site prior to further grading.

Removal and Recompaction

The majority of the site is underlain by very dense bedrock, very old alluvial deposits and potentially compressible younger alluvium. The depth of potentially compressible materials recommended for removal and recompaction during site remedial grading are estimated to be on the order of approximately 3 to 8 feet below existing grade. Preliminary removal and recompaction depth recommendations are presented on the Geotechnical Map (Sheet 1).

For preliminary planning purposes, design cut pad overexcavation should be assumed at a depth of 4 feet below finish pad grades. A maximum 3:1 differential fill thickness, up to a maximum over-excavation depth of 10 feet, underneath individual lots should be maintained in order to reduce the potential for future differential settlement. In order to avoid difficult excavation during utility installation with smaller equipment (e.g., excavators, backhoes, etc.), streets in design cut areas should be over-excavated to a depth equivalent to 2-feet below the lowest utility during rough grading. Extending the street over-excavation to 2-feet below the deepest utility will help mitigate potential hard rock excavation difficulties during underground utility installation; core stones (very hard zones) may be present in areas of utility trenches within design cut areas.

The preliminary overexcavation guidance provided above has been simplified and portrayed on the Seismic Refraction Line Figures (Figures 3a through 3g). A pad overexcavation of 4 feet below finish pad grades and an assumed overexcavation of 10 feet below street grades is shown on the Figures, for preliminary planning purposes.

Remedial grading and overexcavation recommendations should be further evaluated at the 40-scale grading plan review phase of the project in order to provide design-level geotechnical recommendations. Additional subsurface evaluation; including excavator test pits, borings, or air track testing can be performed to refine remedial grading recommendations.

Local conditions may be encountered during excavation that could require additional over-excavation beyond the above noted minimum in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading will be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Removal areas and areas to be over-excavated should be accurately staked in the field by the Project Surveyor.

Temporary Excavations

Temporary excavations should be performed in accordance with project plans, specifications, and all Occupational Safety and Health Administration (OSHA) requirements. Excavations should be laid back or shored in accordance with OSHA requirements before personnel or equipment are allowed to enter. Based on our field evaluation and review of the existing geotechnical data, the majority of site soils are anticipated to be OSHA Type “B” soils (refer to the attached test pit logs). Sandy soils are present and should be considered susceptible to caving. Soil conditions should be regularly evaluated during construction to verify conditions are as anticipated. The

contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Close coordination with the geotechnical consultant should be maintained to facilitate construction while providing safe excavations. Excavation safety is the sole responsibility of the contractor.

Where proposed building structures will be adjacent to property lines, the potential for impacting existing offsite improvements may be reduced by performing "ABC" slot cuts. Slot cuts should be backfilled immediately with properly placed compacted fill to finish grade prior to excavation of adjacent slots. Sandy soils are present and should be considered susceptible to caving. Recommendations for ABC slot cuts including dimensions should be provided during grading based on the conditions encountered. Protection of the existing offsite improvements during grading is the responsibility of the contractor.

Vehicular traffic, stockpiles, and equipment storage should be set back from the perimeter of excavations a minimum distance equivalent to a 1:1 projection from the bottom of the excavation or 5 feet, whichever is greater. Once an excavation has been initiated, it should be backfilled as soon as practical. Prolonged exposure of temporary excavations may result in some localized instability. Excavations should be planned so that they are not initiated without sufficient time to shore/fill them prior to weekends, holidays, or forecasted rain.

It should be noted that any excavation that extends below a 1:1 (horizontal to vertical) projection of an existing foundation will remove existing support of the structure foundation. If requested, temporary shoring parameters will be provided.

Removal Bottoms and Subgrade Preparation

In general, removal bottoms, over-excavation bottoms and areas to receive compacted fill should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition (generally within optimum and 2 percent above optimum moisture content), and re-compacted per project recommendations.

Removal bottoms, over-excavation bottoms and areas to receive fill should be observed and accepted by the geotechnical consultant prior to subsequent fill placement.

Material for Fill

From a geotechnical perspective, the onsite soils are generally considered suitable for use as general compacted fill, provided they are screened of organic materials, construction debris and oversized material (8 inches in greatest dimension).

From a geotechnical viewpoint, any required import soils for general fill (i.e., non-retaining wall backfill) should consist of soils of "Very Low" expansion potential (expansion index 20 or less based on American Society for Testing and Materials [ASTM] D 4829), and free of organic materials, construction debris and any material greater than 3 inches in maximum dimension. Import for any required retaining wall backfill should

meet the criteria outlined in the following paragraph. Source samples should be provided to the geotechnical consultant for laboratory testing a minimum of four working days prior to any planned importation.

Retaining wall backfill should consist of imported sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per ASTM Test Method D1140 (or ASTM D6913/D422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). Soils should also be screened of organic materials, construction debris, and any material greater than 3 inches in maximum dimension. A majority of the site contains soils that are suitable for retaining wall backfill based on their fines content and expansion potential; therefore, either selective grading of on-site sandy soils or import of soils will be required by the contractor for obtaining suitable retaining wall backfill soil.

Aggregate base (crushed aggregate base or crushed miscellaneous base) should conform to the requirements of Section 200-2 of the most recent version of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials (except processed miscellaneous base) and/or County of Riverside requirements.

Placement and Compaction of Fills

Material to be placed as fill should be brought to near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content) and recompacted to at least 90 percent relative compaction (per ASTM D1557). Moisture conditioning of site soils will be required in order to achieve adequate compaction. Drying and/or mixing the very moist soils will be required prior to reusing the materials in compacted fills. Soils are also present that will require additional moisture in order to achieve the required compaction.

The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in compacted thickness. Each lift should be thoroughly compacted and accepted prior to subsequent lifts. Generally, placement and compaction of fill should be performed in accordance with local grading ordinances and with observation and testing by LGC Geotechnical. Oversized material as previously defined should be removed from site fills.

During backfill of excavations, the fill should be properly benched into firm and competent soils of temporary backcut slopes as it is placed in lifts.

Aggregate base material should be compacted to a minimum of 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to a minimum of 90 percent relative compaction per ASTM D1557 at near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content.

If gap-graded ¾-inch rock is used for backfill (around storm drain storage chambers, retaining wall backfill, etc.) it will require compaction. Rock shall be placed in thin lifts (typically not exceeding 6 inches) and mechanically compacted with observation by

geotechnical consultant. Backfill rock shall meet the requirements of ASTM D2321. Gap-graded rock is required to be wrapped in filter fabric (Mirafi 140N or approved alternative) to prevent the migration of fines into the rock backfill or at a minimum separated vertically from the trench backfill with filter fabric.

Trench and Retaining Wall Backfill and Compaction

Bedding material used within the pipe zone should conform to the requirements of the current Greenbook and the pipe manufacturer. Where applicable, sand having a sand equivalent (SE) of 30 or greater (per Caltrans Test Method [CTM] 217) may be used to bed and shade the pipes within the bedding zone. Sand backfill should be densified by jetting or flooding and then tamped to ensure adequate compaction. Bedding sand should be from a natural source with a rounded shape, manufactured sand from recycled material is not suitable for jetting/flooding as the grains are typically angular in shape and do not densify well enough with these methods. The onsite soils may generally be considered suitable as trench backfill (zone defined as 12 inches above the pipe to subgrade), provided the soils are screened of rocks greater than 6 inches in maximum dimension, construction debris and organic material. Trench backfill should be compacted in uniform lifts (as outlined above in Section "Material for Fill") by mechanical means to at least 90 percent relative compaction (per ASTM D1557). If gap-graded rock is used for trench backfill, refer to the above Section.

Retaining wall backfill should consist of sandy soils as outlined in preceding "Material for Fill" Section. The limits of select sandy backfill should extend at minimum ½ the height of the retaining wall or the width of the heel (if applicable), whichever is greater. Retaining wall backfill soils should be compacted in relatively uniform thin lifts to at least 90 percent relative compaction (per ASTM D1557). Jetting or flooding of retaining wall backfill materials should not be permitted.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, typically sand-cement slurry may be substituted for compacted backfill. The slurry should contain about one sack of cement per cubic yard. When set, such a mix typically has the consistency of compacted soil. Sand cement slurry placed near the surface within landscape areas should be evaluated for potential impacts on planned improvements.

A representative from LGC Geotechnical should observe, probe, and test the backfill to verify compliance with the project recommendations.

Feasibility Level Shrinkage and Bulking Estimate

Volumetric changes in earth quantities will occur when excavated onsite earth materials are replaced as properly compacted fill. The following is a preliminary feasibility level estimate of shrinkage and bulking factors for the various geologic units found onsite. These estimates are based on limited in-place densities of the various materials and on the estimated average degree of relative compaction that

will be achieved during grading. These estimates are preliminary and should be updated as part of a 40-scale grading plan review evaluation.

TABLE 4

Feasibility Level Shrinkage and Bulking Estimations

Soil Type	Allowance	Estimated Range
Topsoil, Older Fill, and Alluvium	Shrinkage	10 to 20%
Older Alluvium	Shrinkage	0 to 10%
Granodiorite and Gabbro (Weathered Rippable Zone)	Bulking	5 to 15%
Granodiorite and Gabbro / Core Stones (Blasting Zone)	Bulking	15 to 25%

Subsidence due to earthwork equipment is expected to be on the order of 0.1 feet. It should be stressed that these values are only estimates and that actual shrinkage factors are extremely difficult to predict. The effective shrinkage of onsite soils will depend primarily on the type of compaction equipment and method of compaction used onsite by the contractor. Additionally, the geology onsite varies; therefore, the estimates provided above are generalized groupings of similar lithologies and should be expected to vary across the site laterally and with depth. The above shrinkage estimates are intended as an aid for others in determining preliminary earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

Preliminary Foundation Recommendations

Provided that the remedial grading recommendations provided herein are implemented, the site may be considered suitable for the support of the residential structures using a conventional or post-tensioned foundation system. Laboratory testing indicates that the site soils have a "Very Low" expansion potential (EI of 20 or less per ASTM D4829), however, the foundation designer should take into consideration the total and differential settlement in their design. Please note that the following foundation recommendations are preliminary and must be confirmed by LGC Geotechnical at the completion of grading.

Provisional Conventional Foundation Design Parameters

Due to the very low expansion potential of the onsite soils, the foundation/structural engineer may design a conventional foundation system that is tied together based upon the anticipated dead and live loads (wind, seismic) that will be imparted by the structure. The recommendations provided in the "Soil Bearing and Lateral Resistance" section may be utilized in the design of a rigid slab-on-grade conventional foundation designed in accordance with Section 1808 of the 2022 C.B.C. The moisture content of near surface fill soils should be kept at optimum moisture content to a minimum depth of 12 inches prior to trenching and concrete placement.

Provisional Post-Tensioned Foundation Design Parameters

The foundation designer may use a modulus of vertical subgrade reaction (k) of 200 pounds per cubic inch (pounds per square inch per inch of deflection). This value is for a 1-foot by 1-foot square loaded area and should be adjusted by the structural designer for the area of the proposed footing using the following formula:

$k = 200 \times [(B+1)/2B]^2$
k = modulus of vertical subgrade reaction, pounds per cubic inch (pci)
B = foundation width (feet)

The moisture content of near surface fill soils should be kept at optimum moisture content to a minimum depth of 12 inches prior to trenching and concrete placement.

Foundation Subgrade Preparation and Maintenance

The geotechnical parameters provided herein assume that if the areas adjacent to the foundation are planted and irrigated, these areas will be designed with proper drainage and adequately maintained so that ponding, which causes significant moisture changes below the foundation, does not occur. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Plants should only be provided with sufficient irrigation for life and not overwatered to saturate subgrade soils. Sunken planters placed adjacent to the foundation should either be designed with an efficient drainage system or liners to prevent moisture infiltration below the foundation. Some lifting of the perimeter foundation beam should be expected even with properly constructed planters.

In addition to the factors mentioned above, future owners/property management personnel should be made aware of the potential negative influences of trees and/or other large vegetation. Roots that extend near the vicinity of foundations can cause distress to foundations. Future owners (and the owner's landscape architect) should not plant trees/large shrubs closer to the foundations than a distance equal to half the mature height of the tree or 20 feet, whichever is more conservative unless specifically provided with root barriers to prevent root growth below the building foundation.

It is the owner's responsibility to perform periodic maintenance during hot and dry periods to ensure that adequate watering has been provided to keep soil from separating or pulling back from the foundation. Future owners and property management personnel should be informed and educated regarding the importance of maintaining a constant level of soil-moisture. The owners should be made aware of the potential negative consequences of both excessive watering, as well as allowing potentially expansive soils to become too dry. Expansive soils can undergo shrinkage during drying, and swelling during the rainy winter season, or when irrigation is resumed. This can result in distress to building structures and hardscape improvements. The builder should provide these recommendations to future owners and property management personnel.

Slab Underlayment Guidelines

The following recommendations are for informational purposes since they are unrelated to the geotechnical performance of the foundation. Some post-construction moisture migration should be expected below the foundation; the foundation engineer must assume soil moisture to be present below the slab. The following recommendations may be superseded by the foundation engineer and/or owner.

In general, interior floor slabs with moisture sensitive floor coverings should be underlain by a minimum 10-15 mil thick vapor retarder, which has a water vapor transmission rate (permeance) of less than 0.3 perms, as determined by ASTM E 96, and meets the applicable code requirements (ASTM E 1745).

It is the responsibility of the contractor to ensure that the moisture/vapor retarder systems are properly installed in accordance with the project plans and manufacturer's specifications, and that the moisture/vapor retarder materials are free of tears and punctures prior to and as a result of concrete placement. Additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements of future interior floor coverings.

The foundation engineer/architect should determine whether the use of a capillary break (sand or gravel layer) in conjunction with the vapor retarder is necessary or required by code. Sand layer thickness and location (above and/or below vapor retarder) should also be determined by the foundation engineer/architect. However, we often observe the membrane to be sandwiched between a layer of sand, 1-inch above and 1-inch below. Sand layers should be installed, where applicable, in accordance with ACI Publication 302 – "Guide for Concrete Floor and Slab Construction.

Soil Bearing and Lateral Resistance

Provided our earthwork recommendations are implemented, an allowable soil bearing pressure of 2,000 pounds per square foot (psf) may be used for the design of footings having a minimum width of 12 inches and minimum embedment of 12 inches below lowest adjacent ground surface. This value may be increased by 400 psf for each additional foot of embedment and 200 psf for each additional foot of foundation width to a maximum value of 3,000 psf. A post-tensioned mat foundation a minimum of 6 inches below lowest adjacent grade may be designed for an allowable soil bearing pressure of 1,200 psf. These allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. Bearing values indicated are for total dead loads and frequently applied live loads and may be increased by ⅓ for short duration loading (i.e., wind or seismic loads).

In utilizing the above-mentioned allowable bearing capacity and provided our earthwork recommendations are implemented, foundation settlement due to consolidation and structural loads is anticipated to be on the order of 1-inch. Differential static settlement may be taken as half of the total settlement (i.e., ½-inch over a horizontal span of 40 feet due to structural loads).

Resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth pressure. For concrete/soil frictional resistance, an allowable coefficient of friction

of 0.35 may be assumed with dead-load forces. For slabs constructed over a moisture retarder, the allowable friction coefficient should be provided by the manufacturer. An allowable passive lateral earth pressure of 300 psf per foot of depth (or pcf) to a maximum of 3,000 psf may be used for the sides of footings poured against properly compacted fill. Allowable passive pressure may be increased to 400 pcf (maximum of 4,000 psf) for short duration seismic loading. This passive pressure is applicable for level (ground slope equal to or flatter than 5H:1V) conditions. Frictional resistance and passive pressure may be used in combination without reduction. We recommend that the upper foot of passive resistance be neglected if finished grade will not be covered with concrete or asphalt. The provided allowable passive pressures are based on a factor of safety of 1.5 and 1.1 for static and seismic loading conditions, respectively.

Soil Corrosivity

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils to buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary.

Preliminary corrosion testing of near-surface bulk samples from a nearby site indicated soluble sulfate contents less than 0.01 percent, chloride contents ranging from 60 to 120 parts per million (ppm), pH values ranging from 8.29 to 8.44, and minimum resistivities ranging from 1,800 to 2,900 ohm-centimeters. Based on Caltrans Corrosion Guidelines (Caltrans, 2021), soils are considered corrosive to structural elements if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 1,500 ppm (0.15 percent) or greater. Based on the preliminary test results, soils are not considered corrosive using Caltrans criteria. Note that based on minimum resistivity the soils are considered corrosive to metallic improvements. If improvements that may be susceptible to corrosion are proposed, it is recommended that further evaluation by a corrosion engineer be performed.

Based on preliminary laboratory sulfate test results, the near surface soils are designated to a class “S0” per ACI 318, Table 19.3.1.1 with respect to sulfates. Concrete in direct contact with the onsite soils can be designed according to ACI 318, Table 19.3.2.1 using the “S0” sulfate classification.

Laboratory testing may need to be performed at the completion of grading by the project corrosion engineer to further evaluate the as-graded soil corrosivity characteristics. Accordingly, revision of the corrosion potential may be needed, should future test results differ substantially from the conditions reported herein. The client and/or other members of the development team should consider this during the design and planning phase of the project and formulate an appropriate course of action.

Future Geotechnical Evaluation

Final design level recommendations (e.g., earthwork, foundation, retaining wall, pavement, flatwork, etc.) pertaining to the 40-scale rough grading plans should be provided as part of a comprehensive 40-

scale grading plan review geotechnical report. The site should be evaluated to the 2022 California Building Code (CBC) standard, including the characterization of seismic design criteria.

Closure

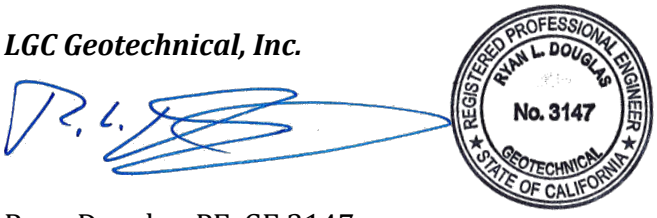
Please note, this letter is based on our review of the referenced reports and our limited due diligence field evaluation. Our proposed services were performed to the general standard of care of geotechnical consulting in Southern California; no other warranty is expressed or implied. This geotechnical due-diligence report has been prepared for the sole use of Trumark, its subsidiaries and affiliates may be relied upon by any of same.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site.

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

Sincerely,

LGC Geotechnical, Inc.





Ryan Douglas, PE, GE 3147
Vice President of Engineering

Katie Maes, CEG 2216
Director of Geology

RLD/KTM/BPP/ala

Attachments: Figure 1 – Site Location Map (Rear of Text)
Figure 2 – Site Photos (Rear of Text)
Figures 3a through 3g – Seismic Line Tomographic Plots (Rear of Text)
Appendix A – References
Appendix B – Field Exploration Logs
Appendix C – Laboratory Testing Results
Appendix D – General Earthwork and Grading Specifications for Rough Grading
Sheet 1 – Geotechnical Map

Distribution: (1) Addressee (electronic copy)



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FIGURE 1
Site Location Map

PROJECT NAME	Trumark - HG5 Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	Not to Scale
DATE	September 2024



Photo 1 - Southern Portion of Site Looking North



Photo 2 - Southern Portion of Site Looking Southwest



Photo 3 - Northwest Portion of Site Looking East



Photo 4 - Northern Portion of Site Looking Southwest

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FIGURE 2
Site Photos

PROJECT NAME	*Trumark - HG5, Riverside*
PROJECT NO.	*24174-01*
ENG. / GEOL.	*RLD / KTM*
SCALE	*Not to Scale*
DATE	*September 2024*

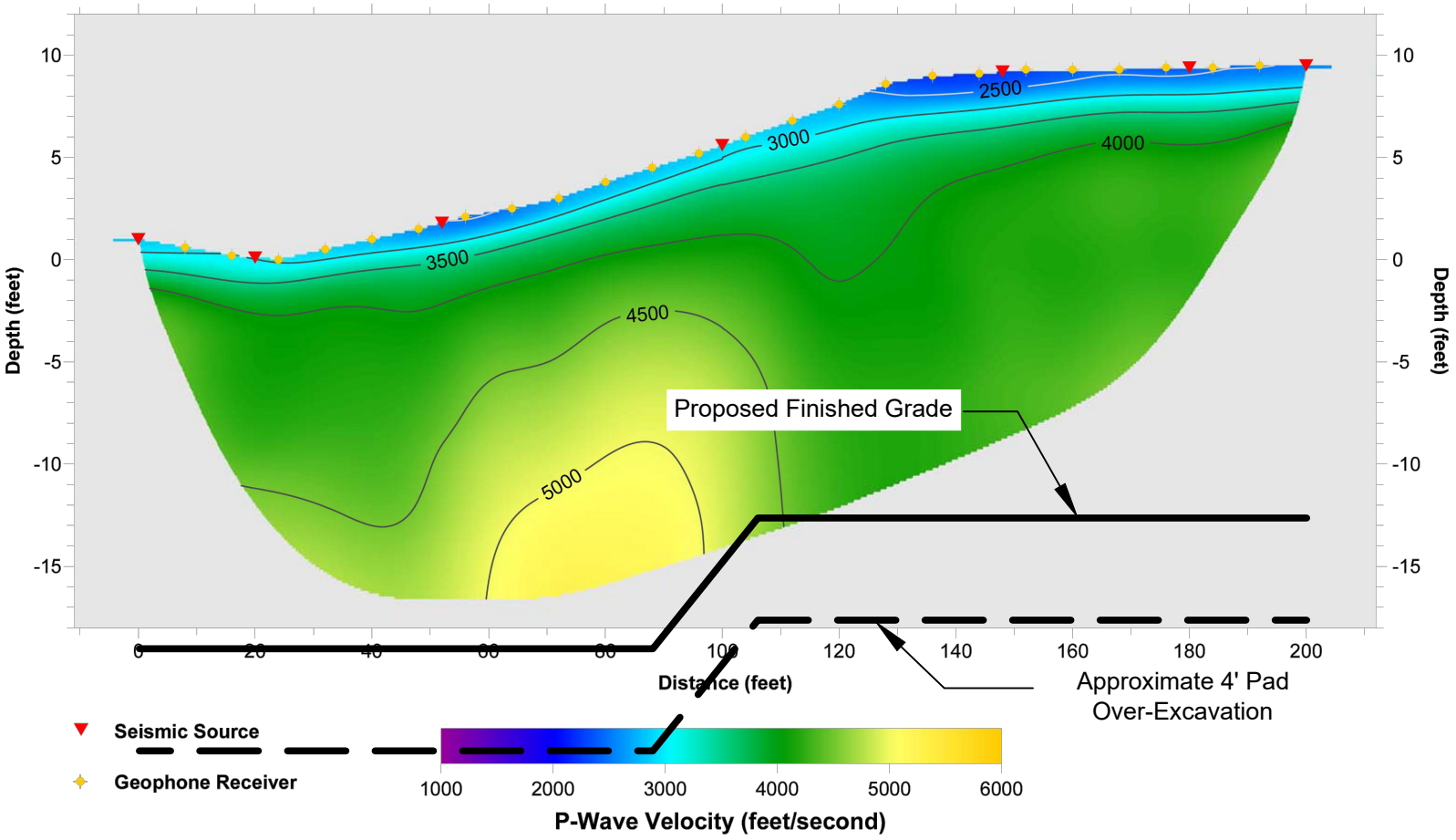
SEISMIC LINE S-1

South 64° East →

SCALE: 1"=30'

30' 0 30' 60'

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 3.5X

RMS error 2.4; Rayfract Version 4.06

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FIGURE 3a
Seismic Line Tomographic Plots
Seismic Line 1

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

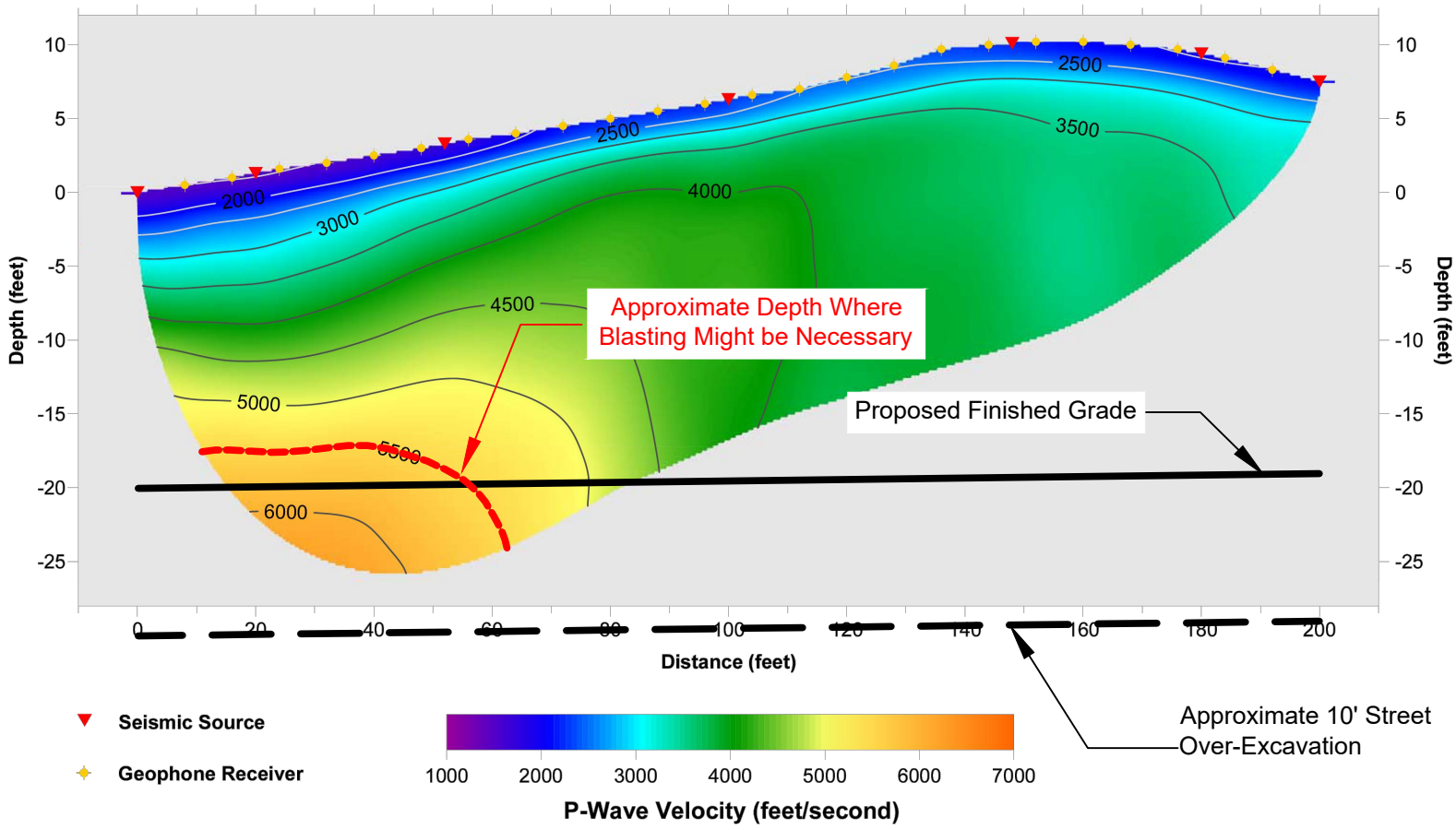
SEISMIC LINE S-2

North 5° East →

SCALE: 1"=30'

30' 0 30' 60'

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 2.5X

RMS error 1.8; Rayfract Version 4.06

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FIGURE 3b
Seismic Line Tomographic Plots
Seismic Line 2

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

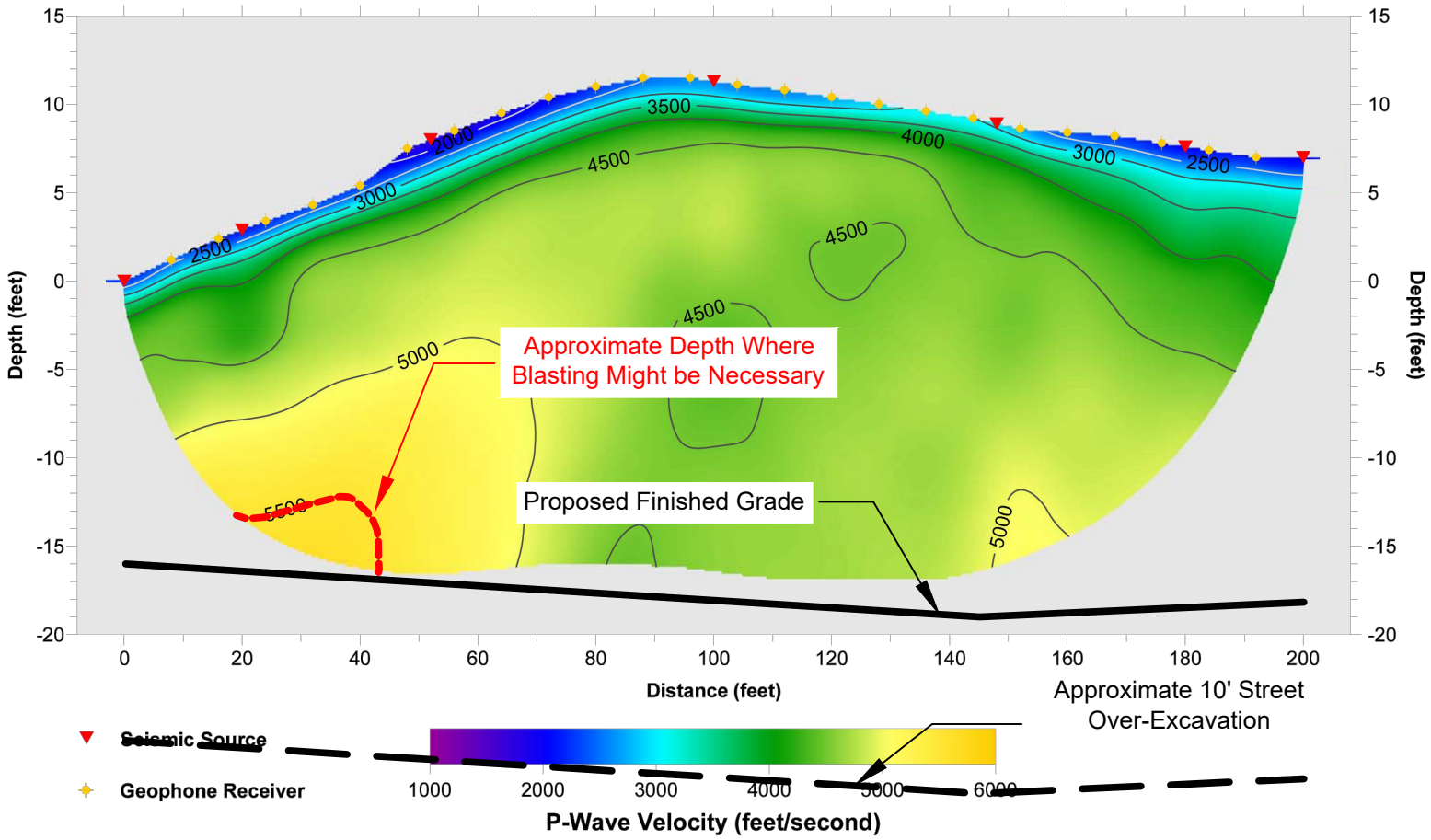
SEISMIC LINE S-3

North 5° East →

SCALE: 1"=30'

30' 0 30' 60'

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 3X

RMS error 1.5; Rayfract Version 4.06

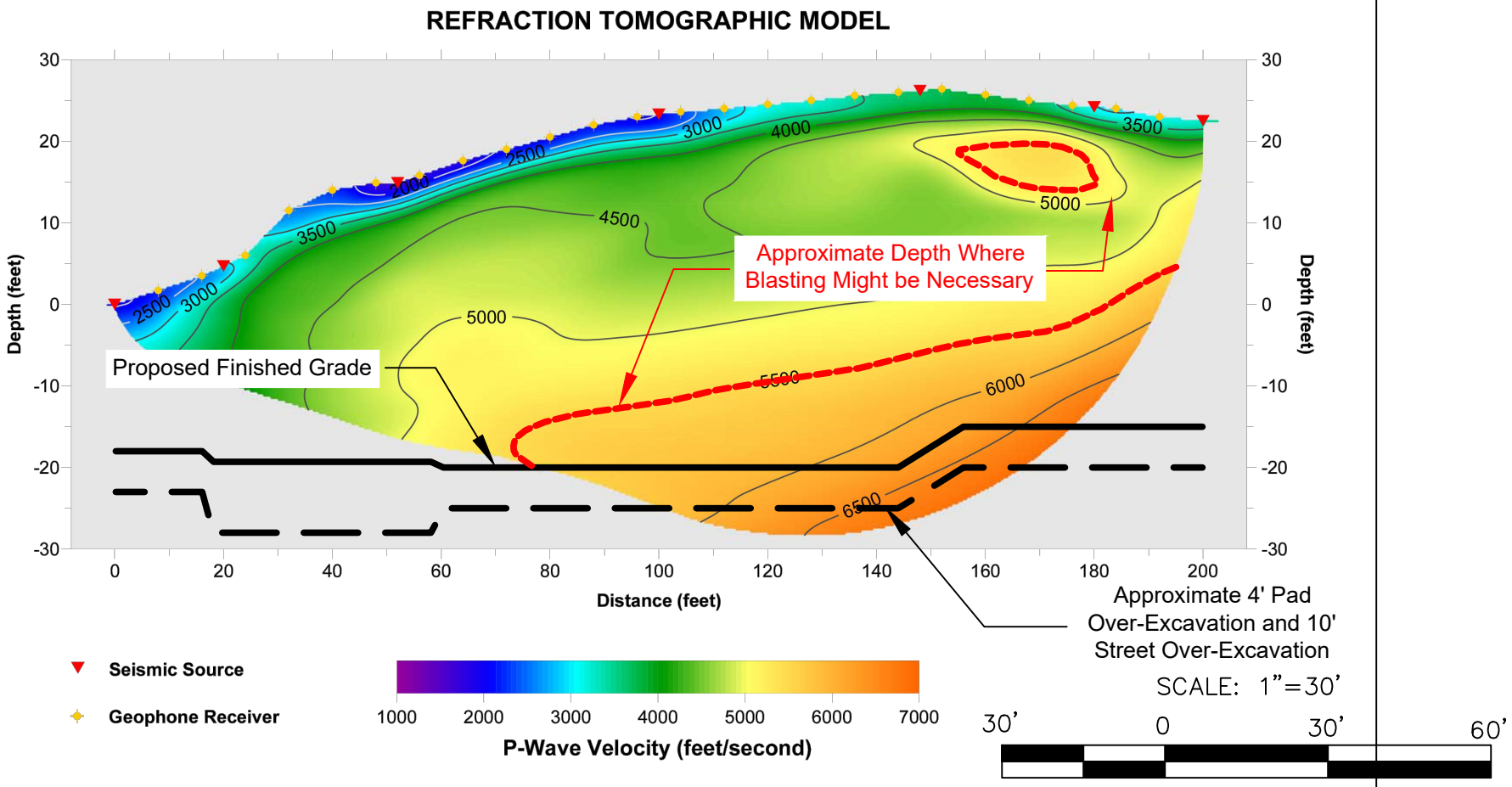
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FIGURE 3c
Seismic Line Tomographic Plots
Seismic Line 3

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

SEISMIC LINE S-4

North 2° East →



SCALE: Vertical Exaggeration 1.5X

RMS error 1.4; Rayfract Version 4.06

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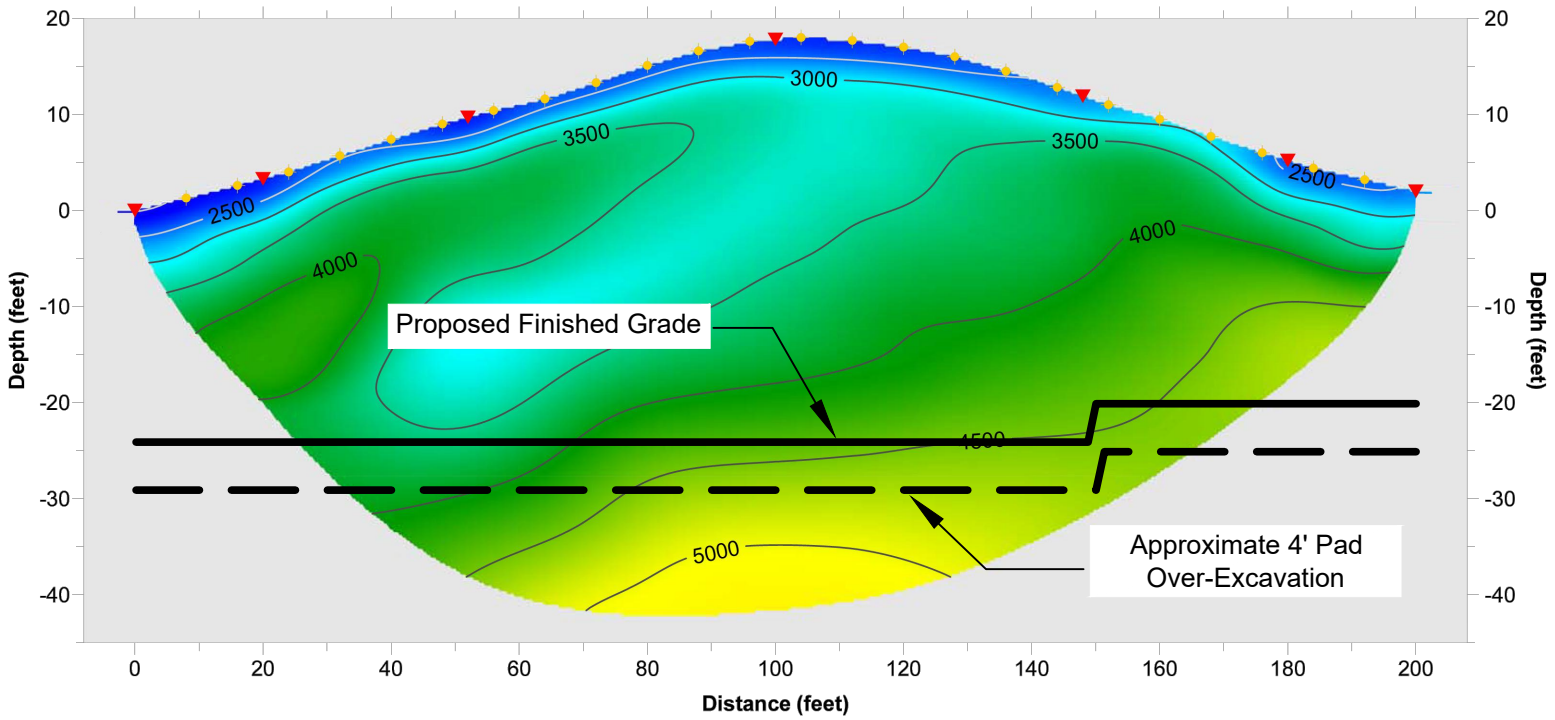
FIGURE 3d
Seismic Line Tomographic Plots
Seismic Line 4

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

SEISMIC LINE S-5

South 87° East →

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 1.5X

RMS error 1.9; Rayfract Version 4.06

LGC Geotechnical, Inc.

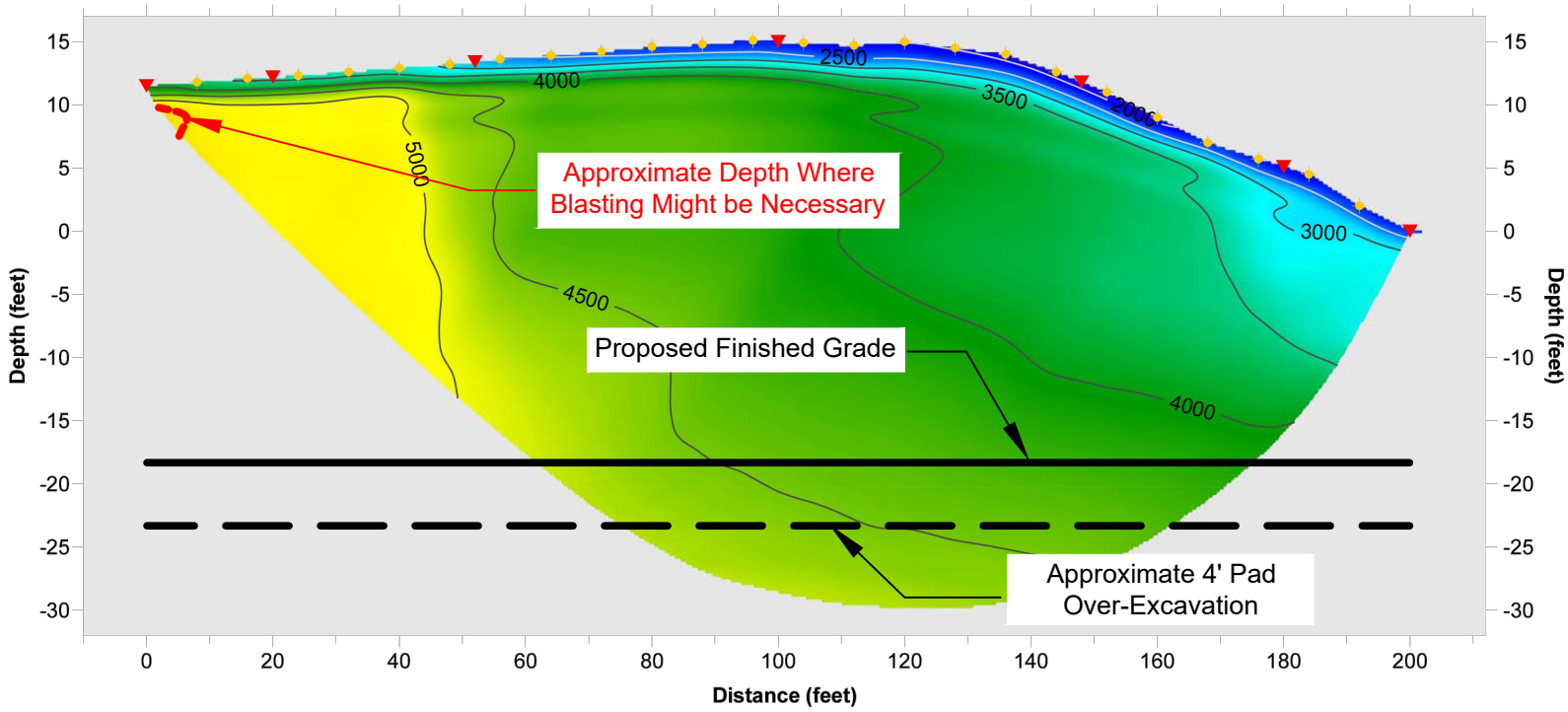
FIGURE 3e
Seismic Line Tomographic Plots
Seismic Line 5

PROJECT NAME	*Trumark - HG5, Riverside*
PROJECT NO.	*24174-01*
ENG. / GEOL.	*RLD / KTM*
SCALE	*1" = 30'*
DATE	*September 2024*

SEISMIC LINE S-6

North 60° East →

REFRACTION TOMOGRAPHIC MODEL



Seismic Source

Geophone Receiver

1000 2000 3000 4000 5000 6000

P-Wave Velocity (feet/second)

SCALE: 1"=30'

30' 0 30' 60'

SCALE: Vertical Exaggeration 2X

RMS error 2.8; Rayfract Version 4.06

LGC Geotechnical, Inc.

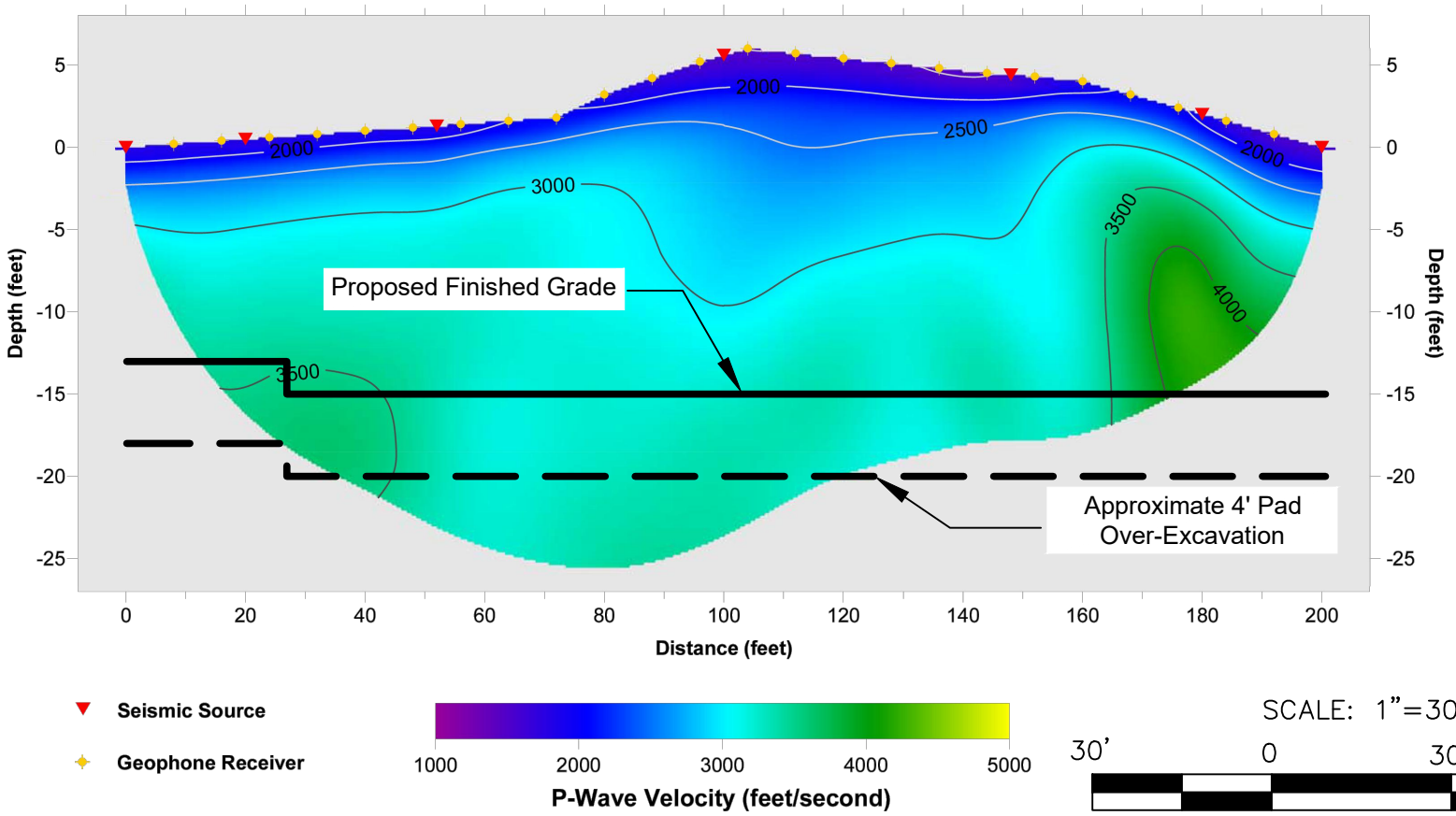
FIGURE 3f
Seismic Line Tomographic Plots
Seismic Line 6

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

SEISMIC LINE S-7

South 63° East →

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 2.75X

RMS error 1.8; Rayfract Version 4.06

LGC Geotechnical, Inc.

FIGURE 3g
Seismic Line Tomographic Plots
Seismic Line 7

PROJECT NAME	Trumark - HG5, Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 30'
DATE	September 2024

Appendix A
References

Appendix A

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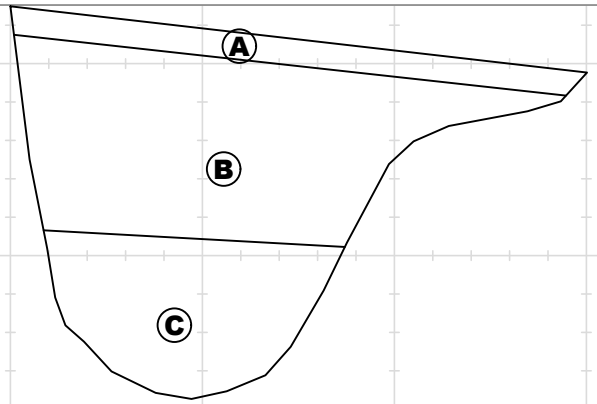
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Appendix B
Field Exploration Logs

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-1**	LGC Geotechnical, Inc.
Project Number : 24174-01	**Date : 9/5/2024**	**Engineering Properties:**	
Equipment: Backhoe	**Location: See Geotechnical Map**		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	0' to 6" - Topsoil Clayey SILT with organics: brown to light brown, dry, soft, vegetation, roots.					
	B	6" to 5.6' - Quaternary Older Alluvium (Qoa) Silty SAND, reddish brown, dry to slightly moist, loose to slightly dense, fine to medium grained sand, roots & rootlets in upper 3'.	Qoa	SM	B-1	6.7	
	C	5.6' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, light yellow to grayish brown, slightly moist, very dense, decomposed or weathered in upper 2.9'.	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1412 ' MSL** **Surface Slope: 0 deg.** **Trend: N13E**



Total Depth: 8.5'
Groundwater: None
Backfilled: 9/5/2024

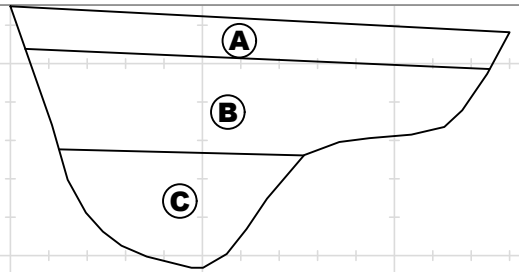
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-2**	LGC Geotechnical, Inc.
Project Number : 24174-01	**Date : 9/5/2024**	**Engineering Properties:**	
Equipment: Backhoe	**Location: See Geotechnical Map**		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	0' to 1' - Topsoil Clayey SILT with organics: light brown to brown, dry, soft, vegetation, roots.					
	B	1' to 3.5' - Quaternary Older Alluvium (Qoa) SAND with Silt, reddish brown, slightly moist, medium dense, fine to coarse grained sand, visibly porous & rootlets in upper 1.5'.	Qoa	SP-SM	B-1	3.5	
	C	3.5' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, reddish brown to yellowish brown, dry to slightly moist, dense, decomposed or weathered in upper 3'.	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1409' MSL** **Surface Slope: 0 deg.** **Trend: N63E**



Total Depth: 6.6'
Groundwater: None
Backfilled: 9/5/2024

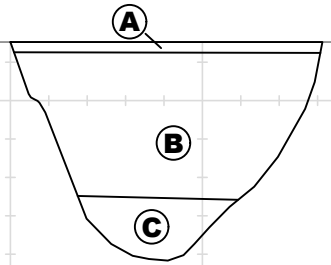
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-3**	LGC Geotechnical, Inc.
Project Number : 24174-01	**Date : 9/5/2024**	**Engineering Properties:**	
Equipment: Backhoe	**Location: See Geotechnical Map**		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	0' to 3" - Topsoil Clayey SILT with Sand: brown, dry, soft, vegetation, roots porous.					
	B	3" to 4' - Quaternary Older Alluvium (Qoa) Clayey SAND, reddish brown, dry to slightly moist, medium dense to dense, medium to coarse grained sand, porous & rootlets in upper 1.5'.	Qoa	SC	B-1	4.9	
	C	4' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, yellowish brown to light brown, dry, very dense, decomposed or weathered in upper 1'.	Kcgb				
		Note: abandoned 8" cement irrigation pipe 1.5' deep.					

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1410' MSL** **Surface Slope: 0 deg.** **Trend: N45E**



Total Depth: 5.5'
Groundwater: None
Backfilled: 9/5/2024

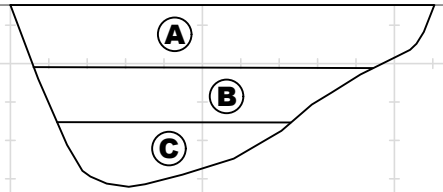
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-4	LGC Geotechnical, Inc.
Project Number : 24174-01	Date : 9/5/2024	Engineering Properties:	
Equipment: Backhoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	0' to 1.5' - Topsoil Clayey SILT with Sand: light brown to brown, dry, soft, vegetation, roots.					
	B	1.5' to 3' - Quaternary Older Alluvium (Qoa) Clayey SAND, reddish brown, dry to slightly moist, medium dense, fine to coarse grained sand, porous & rootlets.	Qoa	SC	B-1	3.2	
	C	3' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, brown, dry, very dense to hard, shallow refusal.	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1392' MSL** **Surface Slope: 0 deg.** **Trend: N43E**



Total Depth: 4.5'
Groundwater: None
Backfilled: 9/5/2024

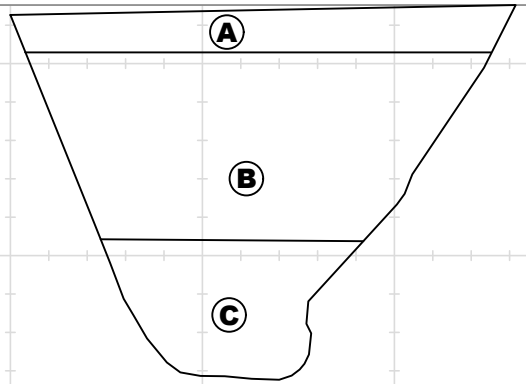
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-5**	LGC Geotechnical, Inc.
Project Number : 24174-01	**Date : 9/5/2024**	**Engineering Properties:**	
Equipment: Backhoe	**Location: See Geotechnical Map**		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	0' to 1' - Topsoil Clayey SILT with Sand: brown, dry, soft, vegetation, roots.					
	B	1' to 6' - Quaternary Older Alluvium (Qoa) SAND with Silt, reddish brown, dry to slightly moist, medium dense, fine to medium grained sand, porous & rootlets in upper 2.5'.	Qoa	SP-SM	B-1	3.1	
	C	6' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, yellowish brown, dry, very dense to hard, decomposed or weathered in upper 2'.	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1398' MSL** **Surface Slope: 0 deg.** **Trend: N41W**



Total Depth: 9.5'
Groundwater: None
Backfilled: 9/5/2024

scale : 1 in = 5 ft

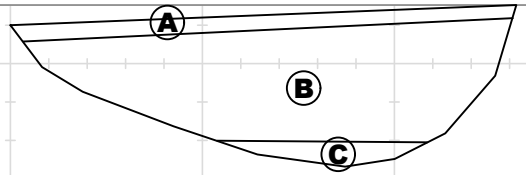
Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-6**
Project Number : 24174-01	**Date : 9/6/2024**	**Engineering Properties:**
Equipment: Backhoe	**Location: See Geotechnical Map**	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A	**0' to 3" - Topsoil** **Clayey SILT with Sand: brown, dry, soft, vegetation, roots.**					
	B	**3" to 3.5' - Quaternary Older Alluvium (Qoa)** **Silty SAND, reddish brown, dry to slightly moist, dense, fine to medium grained sand, porous, rootlets.**	**Qoa**	**SM**	**B-1**	**3.4**	
	C	**3.5' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb)** **Granitic rock, reddish brown, dry, very dense to hard, decomposed or weathered in upper 6".**	**Kcgb**				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1395' MSL** **Surface Slope: 0 deg.** **Trend: N15E**



Total Depth: 4'
Groundwater: None
Backfilled: 9/6/2024

scale : 1 in = 5 ft

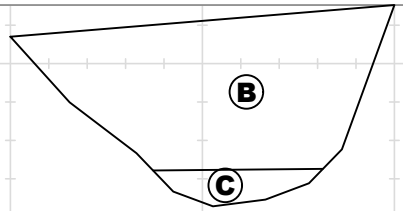
Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-7**
Project Number : 24174-01	**Date : 9/6/2024**	**Engineering Properties:**
Equipment: Backhoe	**Location: See Geotechnical Map**	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	**0' to 4' - Quaternary Older Alluvium (Qoa)** Sandy CLAY to Sandy SILT, reddish brown to brown, dry, medium dense, fine to medium grained sand, porous, rootlets, vegetation and roots in upper 3".	Qoa	CL/ML	B-1	4.8	
	C	**4' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb)** Granitic rock, yellowish brown to brown, dry, very dense to hard, decomposed or weathered in upper 8".	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1392' MSL** **Surface Slope: 0 deg.** **Trend: N87E**



Total Depth: 5'
Groundwater: None
Backfilled: 9/6/2024

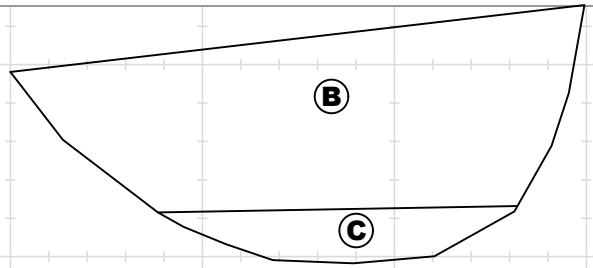
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-8	LGC Geotechnical, Inc.
Project Number : 24174-01	Date : 9/6/2024	Engineering Properties:	
Equipment: Backhoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	0' to 5' - Quaternary Older Alluvium (Qoa) Clayey Silty SAND, reddish brown to brown, dry, medium dense, fine to medium grained sand, porous, rootlets, vegetation and roots in upper 3".	Qoa	SC/SM	B-1	4.3	
	C	5' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, reddish brown to light brown, dry, very dense to hard, decomposed or weathered in upper 6".	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1412' MSL** **Surface Slope: 0 deg.** **Trend: N19E**



Total Depth: 6.5'
Groundwater: None
Backfilled: 9/6/2024

scale : 1 in = 5 ft

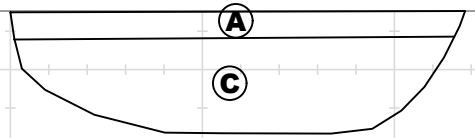
Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	**Logged By: HPB**	**Trench No: TP-9**
Project Number : 24174-01	**Date : 9/6/2024**	**Engineering Properties:**
Equipment: Backhoe	**Location: See Geotechnical Map**	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	A C	0' to 6" - Topsoil Sandy SILT, brown, dry, soft, vegetation and roots. 6" to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, reddish brown to light gray, dry, dense to hard, decomposed or weathered in upper 2.5'.	Kcgb	SM	B-1	5.6	

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1390' MSL** **Surface Slope: 0 deg.** **Trend: N47W**



Total Depth: 3'
Groundwater: None
Backfilled: 9/6/2024

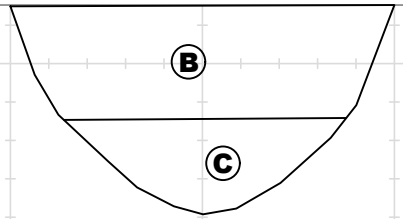
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-10
Project Number : 24174-01	Date : 9/6/2024	Engineering Properties:
Equipment: Backhoe	Location: See Geotechnical Map	

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	0' to 3' - Quaternary Older Alluvium (Qoa) Sandy SILT to Silty SAND, reddish brown, dry, medium dense or medium stiff, porous, rootlets.	Qoa	SM	B-1	4.8	
	C	3' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, yellowish brown, dry, hard, decomposed or weathered in upper 1.5'.	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1396' MSL** **Surface Slope: 0 deg.** **Trend: N61W**



Total Depth: 5'
Groundwater: None
Backfilled: 9/6/2024

scale : 1 in = 5 ft

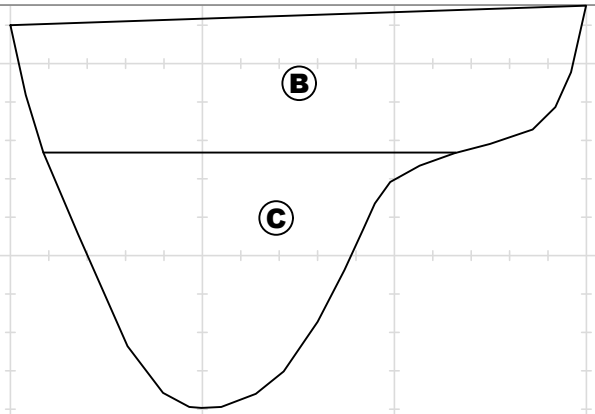
Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-11
Project Number : 24174-01	Date : 9/6/2024	Engineering Properties:
Equipment: Backhoe	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	0' to 3.5' - Quaternary Older Alluvium (Qoa) Clayey SAND, reddish brown to brownish red, dry, medium stiff.	Qoa	SC	B-1	6.6	
	C	3' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, pale yellowish brown to light gray, dry, loose to very dense with depth, decomposed or weathered in upper 5.5'.	Kcgb	SM	B-2	2.5	

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1391' MSL** **Surface Slope: 0 deg.** **Trend: N85W**



Total Depth: 9.5'
Groundwater: None
Backfilled: 9/6/2024

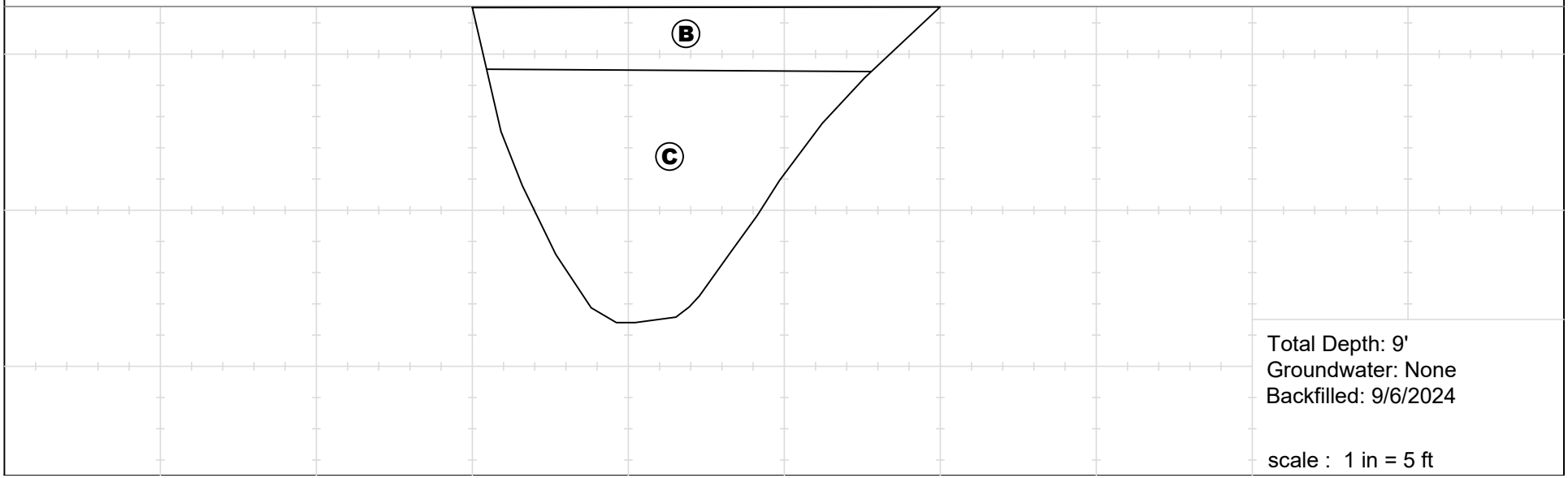
scale : 1 in = 5 ft

Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-12	LGC Geotechnical, Inc.
Project Number : 24174-01	Date : 9/6/2024	Engineering Properties:	
Equipment: Backhoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	0' to 2' - Quaternary Older Alluvium (Qoa) Sandy SILT, brownish red, dry, soft to medium stiff, roots and vegetation in upper 1'.	Qoa				
	C	2' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, reddish brown to grayish brown, dry them moist at 5', medium dense to hard, decomposed or weathered in upper 6.5'.	Kcgb	SM	B-1	3.9	

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1362' MSL** **Surface Slope: 0 deg.** **Trend: N80W**

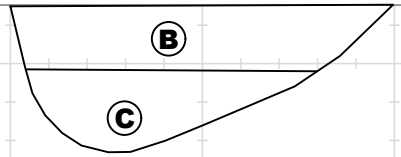


Last Edited: 9/20/2013

Project Name: Trumark - HG5 Riverside	Logged By: HPB	Trench No: TP-13	LGC Geotechnical, Inc.
Project Number : 24174-01	Date : 9/6/2024	Engineering Properties:	
Equipment: Backhoe	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
	B	0' to 1.5' - Quaternary Older Alluvium (Qoa) Sandy SILT to Silty SAND, brownish red, dry, soft or loose, roots and vegetation in upper 6".	Qoa	SM	B-1	4.3	
	C	1.5' to T.D. - Granodiorite and Gabbro, Undifferentiated (Kcgb) Granitic rock, reddish brown, dry, hard, decomposed or weathered in upper 6".	Kcgb				

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1374' MSL** **Surface Slope: 0 deg.** **Trend: N76W**



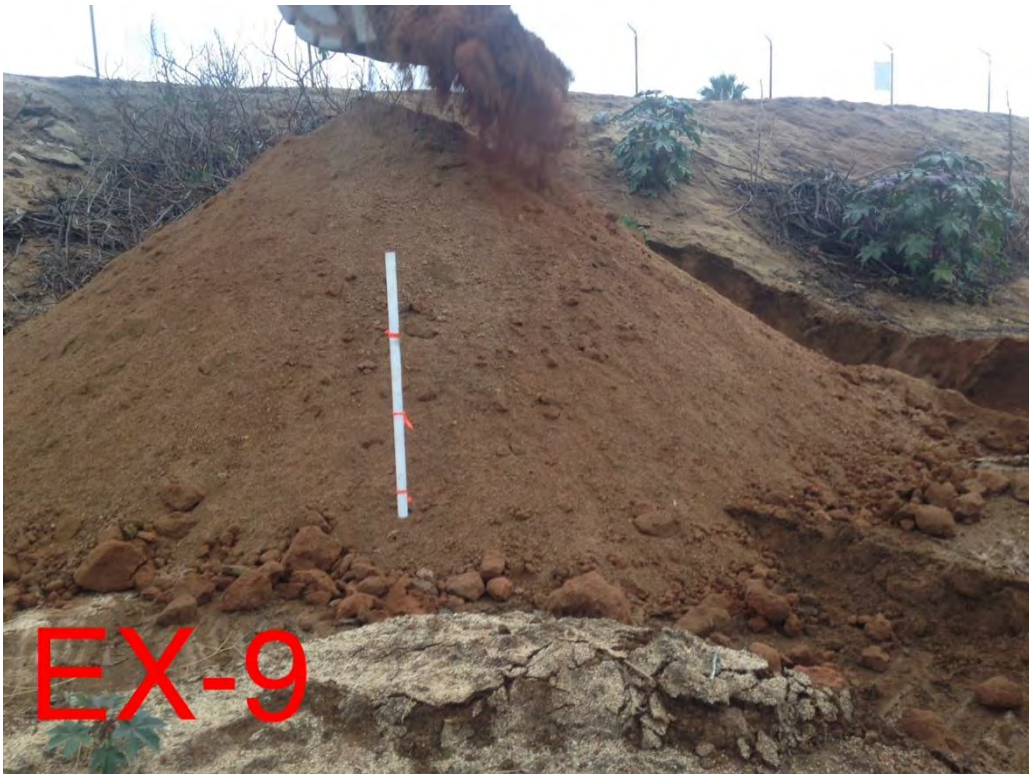
Total Depth: 4'
Groundwater: None
Backfilled: 9/6/2024

scale : 1 in = 5 ft

Last Edited: 9/20/2013

Date Excavated 8/28/2015

Test Pit No.	Depth (ft.)	USCS	Description
EX-9	0.0 – 2.0	SM	**Artificial Fill - undocumented:** SILTY SAND; brown, moist, loose, fine to coarse grained.
	2.0 – 20.0		**Granodiorite/Gabbro undifferentiated (Kcgb):** Red, dry, soft, fine to medium grained, highly weathered to clayey sand, abundant secondary clays. @ 4 ft. brownish gray, moderately soft, breaks into clayey sand. @ 6 ft. breaks into fine to coarse grained sand, some silt and clay. @ 7 ft. Some ½ inch thick pegmatite dikes. @ 11 ft. gray, large crystal size/coarse grained. @ 15 ft. moderately hard. @ 16 ft. light gray, breaks into fine to coarse grained sand, (SE 30+) @ 20 ft. still rippable. TOTAL DEPTH 20 FT. NO WATER, NO CAVING



Test Pit No.	Depth (ft.)	USCS	Description
EX-10	0.0 – 2.0	SM	**Artificial Fill - undocumented:** SILTY SAND; reddish brown and brown, slightly moist, loose, fine to coarse grained.
	2.0 – 20.5		**Granodiorite/Gabbro undifferentiated (Kcgb):** Yellowish brown and gray, dry, moderately hard, coarse grained, moderately weathered, breaks into fine to coarse grained sand with some silt and clay. Steeply dipping clay-lined joints, approximately 8-inch spacing. @ 7 ft. N32E, 82SE - Joint @ 7 ft. N33W, 85N - Joint @ 10 ft. moderately hard. @ 16 ft. gray with trace of iron oxide, moderately hard to hard. @ 19 ft. bluish gray, hard, very slow digging. @ 20.5 ft. still rippable. TOTAL DEPTH 20.5 FT. NO WATER, NO CAVING



Test Pit No.	Depth (ft.)	USCS	Description
EX-11	0.0 – 1.0	SM	**Topsoil:** SILTY SAND; reddish brown, dry, loose, fine to coarse grained, some angular granitic gravel.
	1.0 – 20.0		**Granodiorite/Gabbro undifferentiated (Kcgb):** Red, dry, soft, fine to medium grained, highly weathered, densely fractured, abundant secondary clays. @ 2.5 ft. gray to dark gray (Gabbro), hard, some flat-lying to shallowly dipping fine fractures with iron oxide. @ 5 ft. N20W, 55NE – parallel joints. @ 18 ft. very slow digging. @ 20 ft. still rippable. TOTAL DEPTH 20 FT. NO WATER, NO CAVING



Test Pit No.	Depth (ft.)	USCS	Description
EX-14	0.0 – 16.5		**Granodiorite/Gabbro - undifferentiated (Kcgb):** Brownish red, slightly moist, moderately soft, fine to coarse grained, highly to moderately weathered. @4 ft. light yellowish brown, moderately hard, breaks-up to fine to coarse grained sand. @ 5 ft. gray, hard, slow digging. @ 6 ft. N60E, Vertical - Joint @ 6 ft. N40W, 80NE - Joint @ 12 ft. gray, very slow digging. @ 16.5 ft. Practical Refusal. TOTAL DEPTH 16.5 FT NO WATER, NO CAVING

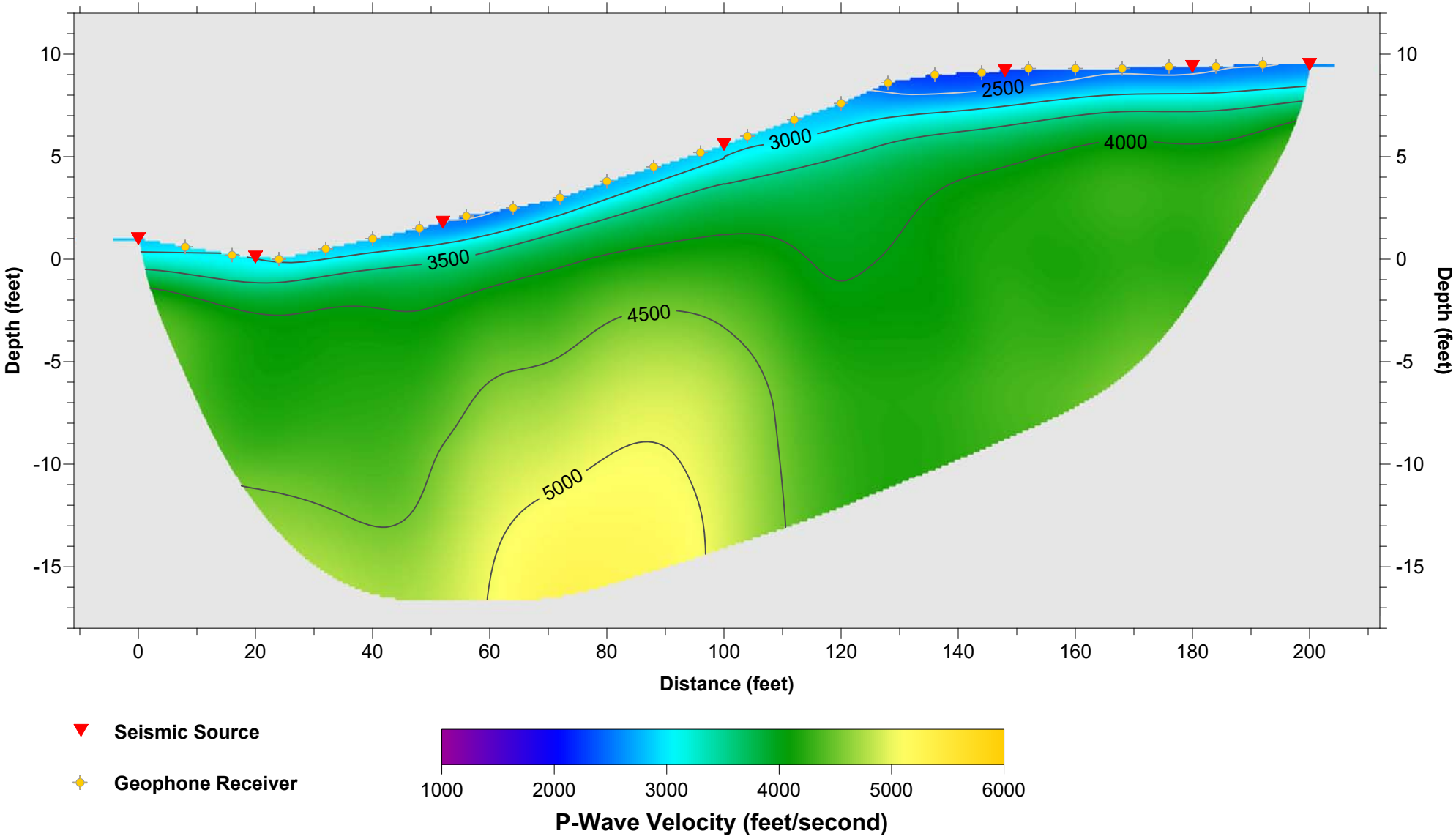



EX-14@15'

SEISMIC LINE S-1

South 64° East →

REFRACTION TOMOGRAPHIC MODEL



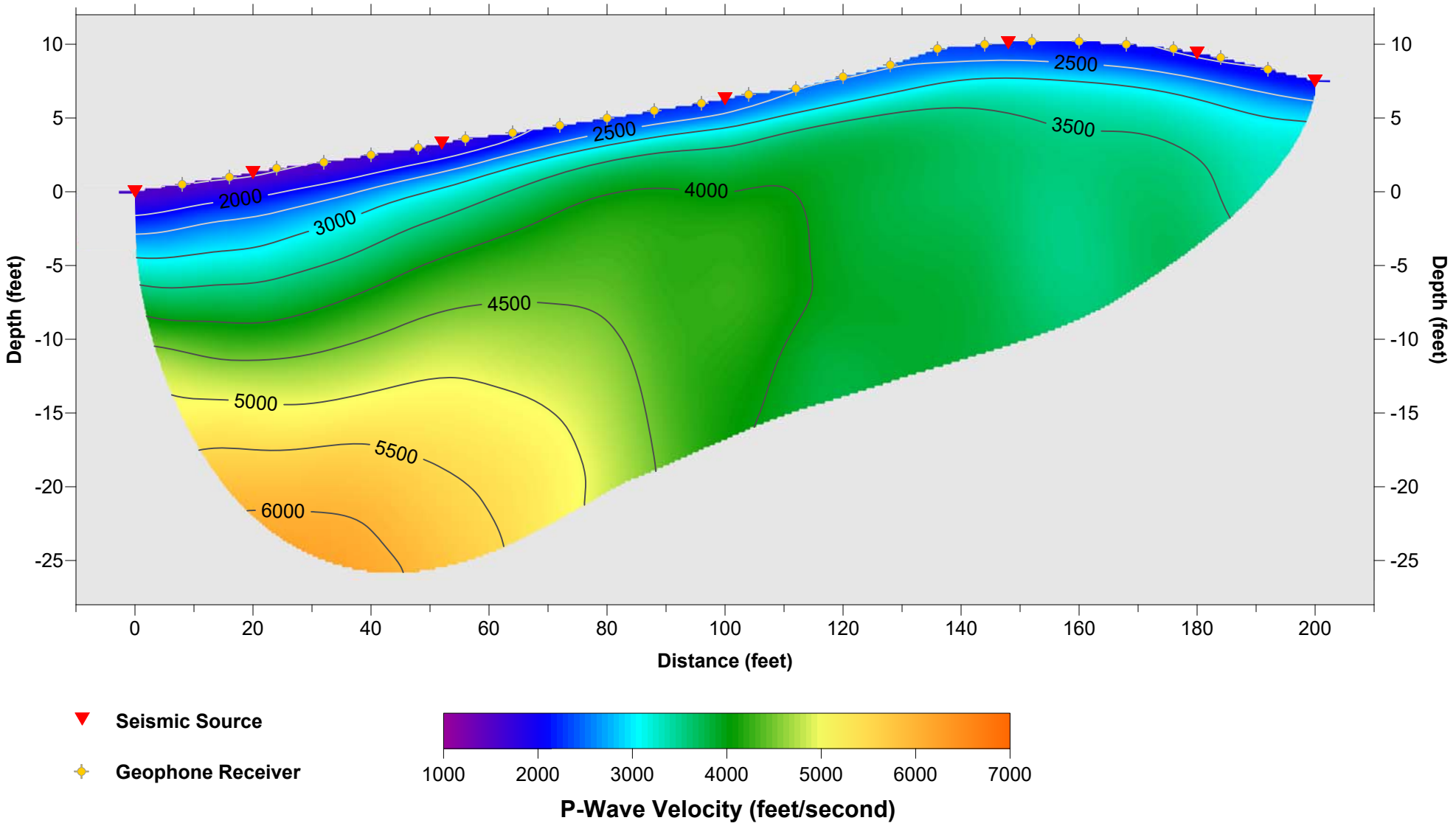
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RMS error 2.4; Rayfract Version 4.06

SEISMIC LINE S-2

North 5° East →

REFRACTION TOMOGRAPHIC MODEL



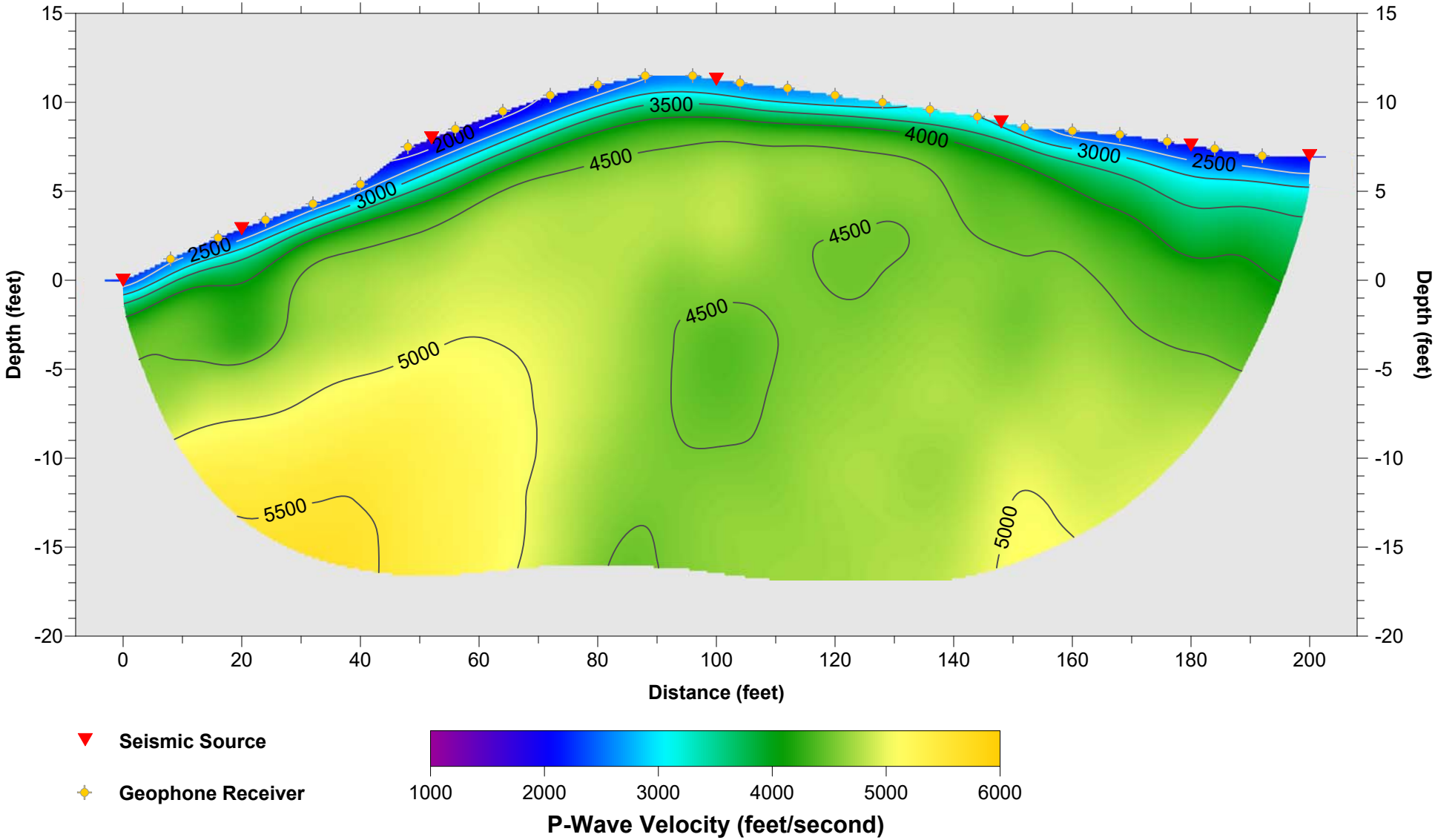
SCALE: Vertical Exaggeration 2.5X

RMS error 1.8; Rayfract Version 4.06

SEISMIC LINE S-3

North 5° East →

REFRACTION TOMOGRAPHIC MODEL



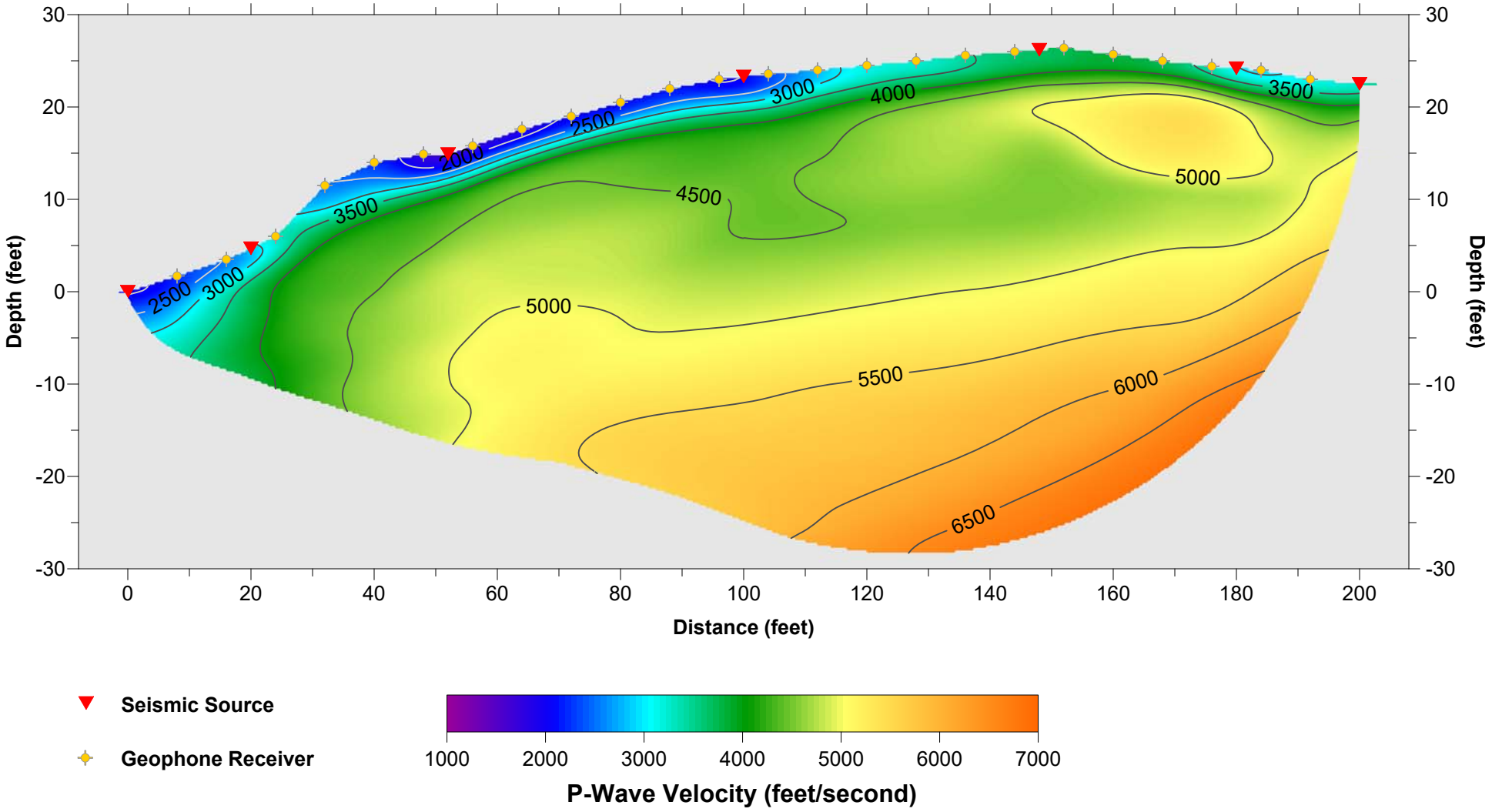
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RMS error 1.5; Rayfract Version 4.06

SEISMIC LINE S-4

North 2° East →

REFRACTION TOMOGRAPHIC MODEL



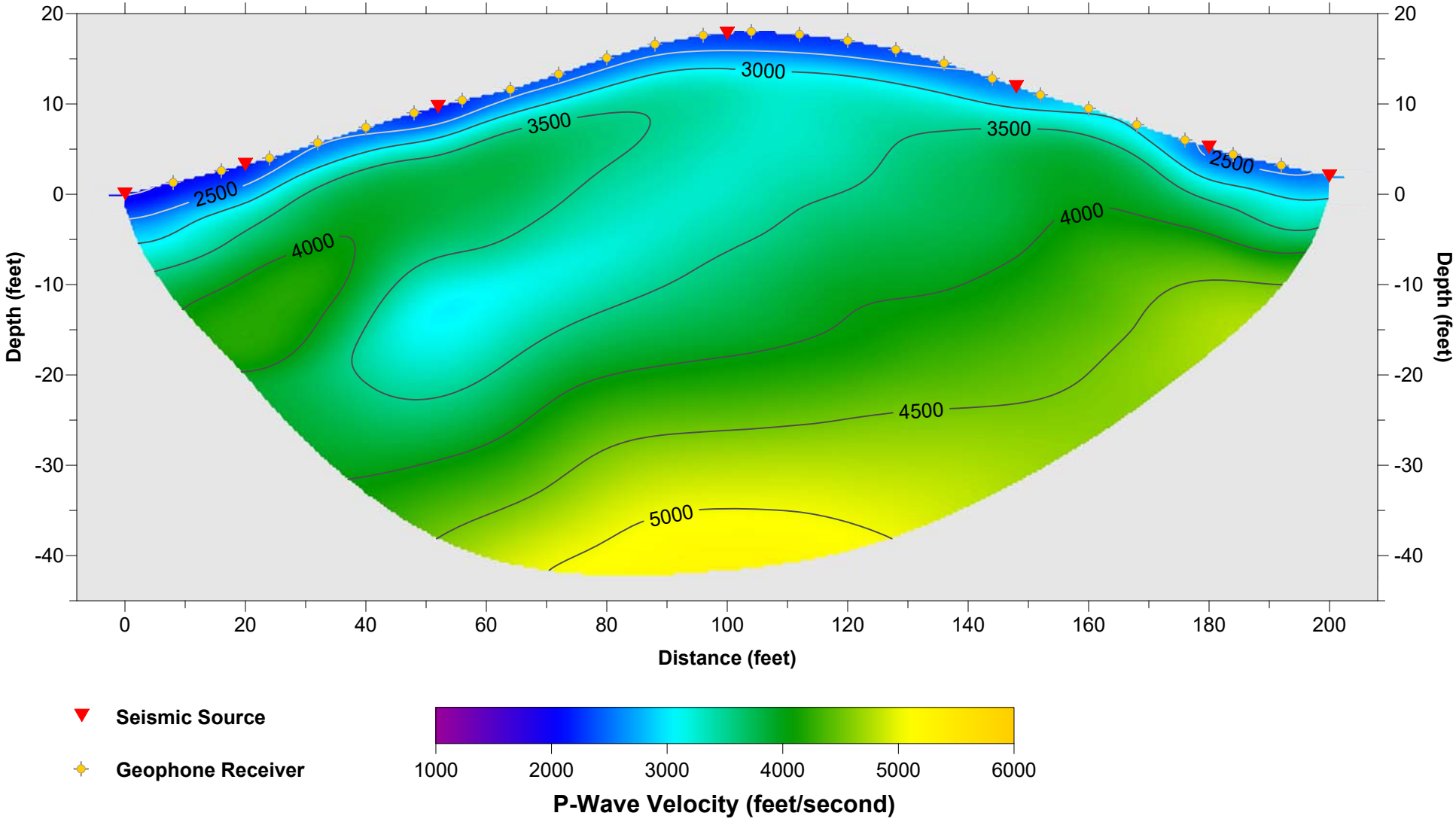
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RMS error 1.4; Rayfract Version 4.06

SEISMIC LINE S-5

South 87° East →

REFRACTION TOMOGRAPHIC MODEL



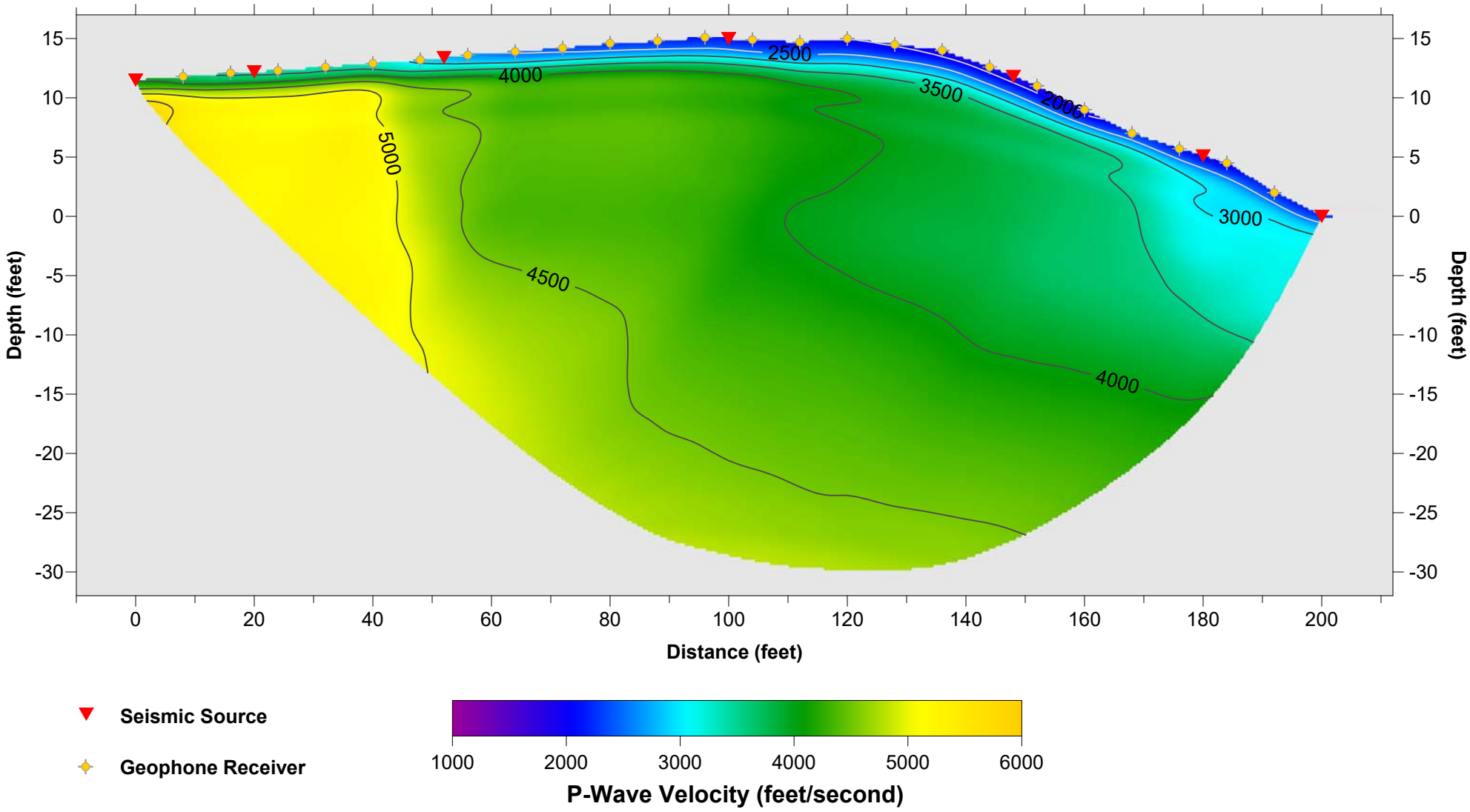
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RMS error 1.9; Rayfract Version 4.06

SEISMIC LINE S-6

North 60° East →

REFRACTION TOMOGRAPHIC MODEL



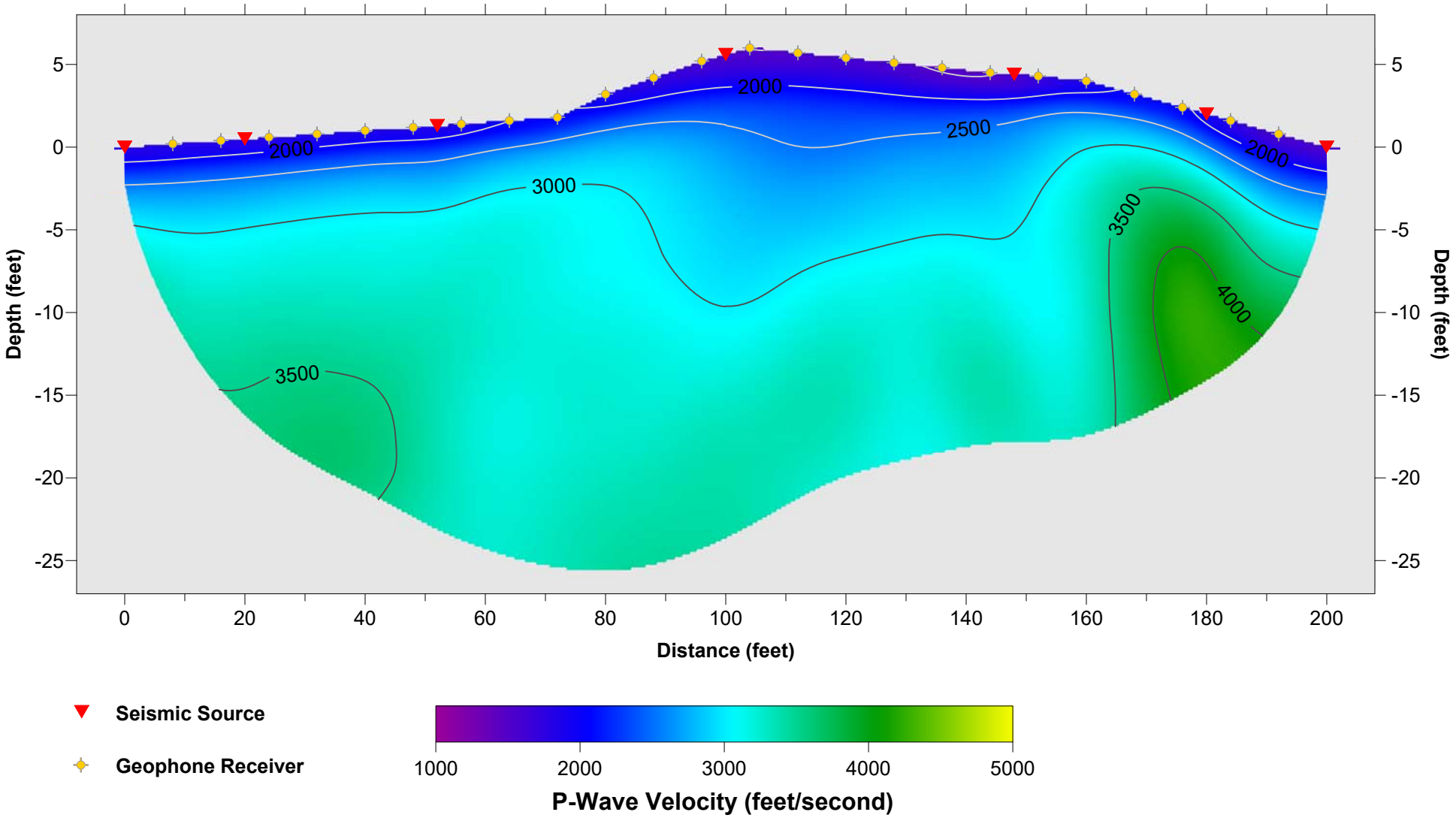
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RMS error 2.8; Rayfract Version 4.06

SEISMIC LINE S-7

South 63° East →

REFRACTION TOMOGRAPHIC MODEL



SCALE: Vertical Exaggeration 2.75X

RMS error 1.8; Rayfract Version 4.06

Appendix C
Laboratory Test Results

APPENDIX C

Laboratory Testing Procedures and Test Results

The laboratory testing program was formulated towards providing data relating to the relevant engineering properties of the soils with respect to residential construction. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Moisture Determination Tests: Moisture content (ASTM D2216) was performed on relatively undisturbed samples obtained from the trenches. The results of these tests are presented in the test pit logs (Appendix B). 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 D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
TP-2 @ 1-3 feet	Orangish Brown Sand with Silt	130.5	9.5
TP-10 @ 0-5 feet	Light Brown Silty Sand	132.5	9.0

Grain Size Distribution: Representative samples were dried, weighed, and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve. The portion retained on the No. 200 sieve was dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D422 (CTM 202). Where an appreciable amount of fines were encountered (greater than 20 percent passing the No. 200 sieve) a hydrometer analysis was done to determine the distribution of soil particles passing the No. 200 sieve.

Sample Location	**Description**	**% Passing # 200 Sieve**
TP-2 @ 1-3 feet	Sand with Silt	8
TP-4 @ 0-4.5 feet	Clayey Sand	22
TP-10 @ 0-5 feet	Silty Sand	27
TP-11 @ 0-3.5 feet	Clayey Sand	48

Laboratory Testing Procedures and Test Results

Expansion Index: The expansion potential of selected samples was evaluated by the Expansion Index Test, Standard ASTM D4829. Specimens are molded under a set compactive effort 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	Expansion Index	Expansion Potential*
TP-4 @ 0-4.5 feet	1	Very Low
TP-10 @ 0-5 feet	13	Very Low
TP-11 @ 0-3.5 feet	19	Very Low

Direct Shear: Two direct shear tests were performed on a selected remolded 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 samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.05 inch per minute (for sandy soil). The results of this test are presented in this Appendix.

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method (CTM) 422. The results are presented below.

Sample Location	Chloride Content, ppm
TP-4 @ 0-4.5 feet	60
TP-10 @ 0-5 feet	120

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below.

Sample Location	Sulfate Content (ppm)	Sulfate Exposure Class *
TP-4 @ 0-4.5 feet	95	S0
TP-10 @ 0-5 feet	29	S0

*Based on ACI 318R-14, Table 19.3.1.1

Laboratory Testing Procedures and Test Results

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
TP-4 @ 0-4.5 feet	8.44	1,800
TP-10 @ 0-5 feet	8.29	2,900

R-value Test: R-value test was performed in general accordance with California Test Method 301. The plot is attached.

Sample No.	R-Value
TP-11 @ 0-3.5 feet	40

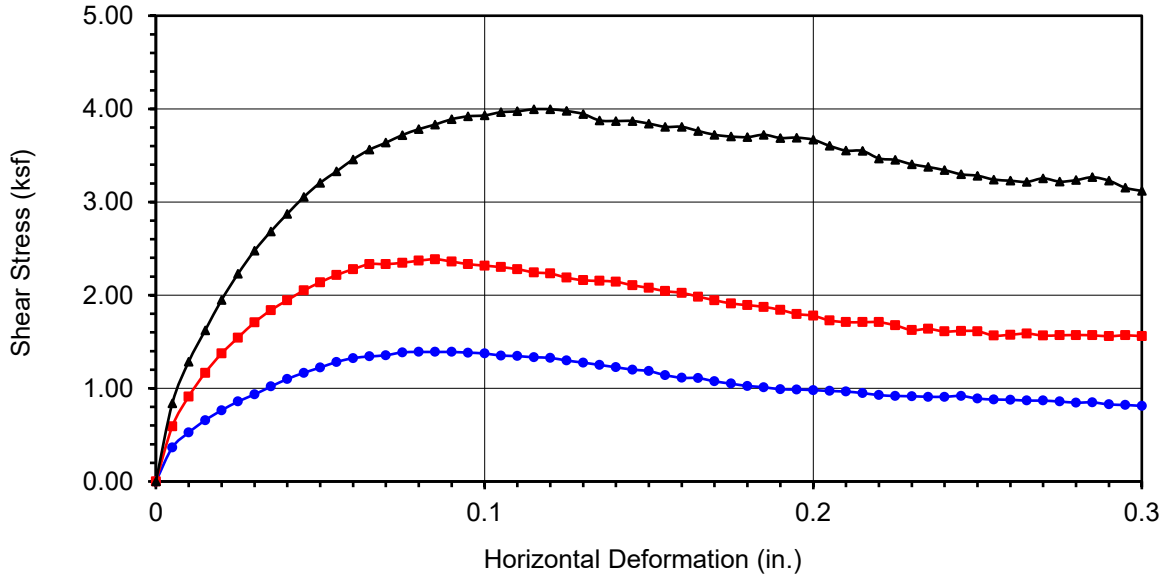
DIRECT SHEAR TEST

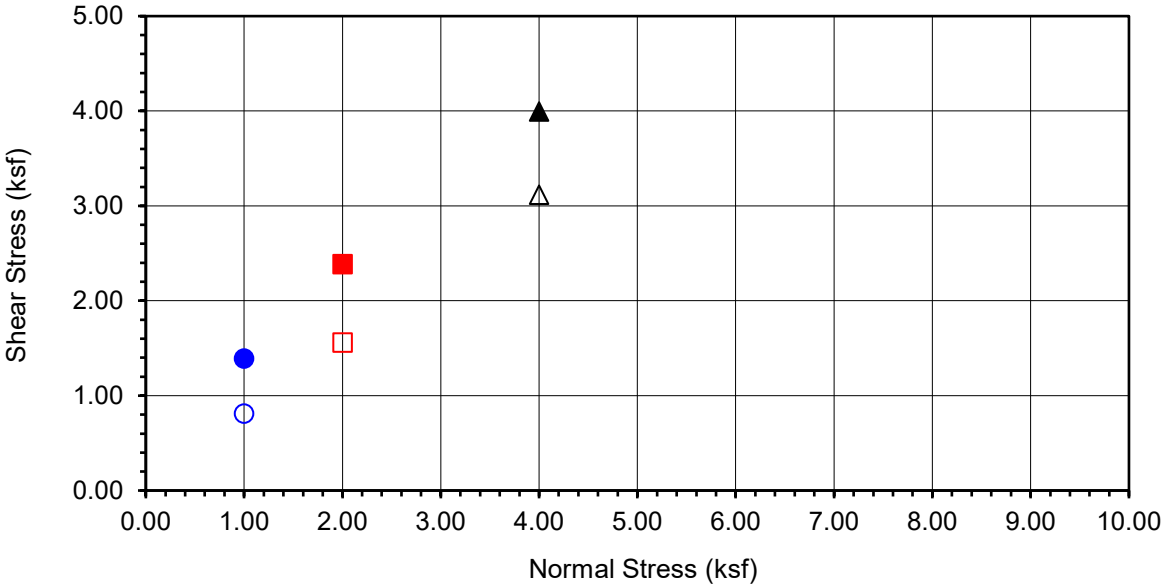
Consolidated Drained - ASTM D 3080

Project Name:	HG5 Riverside	Tested By:	G. Bathala	Date:	09/12/24
Project No.:	24174-01	Checked By:	J. Ward	Date:	09/17/24
Boring No.:	TP-2	Sample Type:	90% Remold		
Sample No.:	B-1	Depth (ft.):	N/A		

Soil Identification: Orangish brown silty sand (SM)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	200.22	197.47	199.65
Weight of Ring(gm):	45.21	42.40	44.32
Before Shearing			
Weight of Wet Sample+Cont.(gm):	177.00	177.00	177.00
Weight of Dry Sample+Cont.(gm):	165.27	165.27	165.27
Weight of Container(gm):	39.00	39.00	39.00
Vertical Rdg.(in): Initial	0.0000	0.2618	0.2519
Vertical Rdg.(in): Final	-0.0102	0.2755	0.2754
After Shearing			
Weight of Wet Sample+Cont.(gm):	226.62	215.42	221.94
Weight of Dry Sample+Cont.(gm):	207.19	196.27	203.37
Weight of Container(gm):	68.90	57.87	64.65
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**TP-2**
Sample No.	**B-1**
Depth (ft)	**N/A**
Sample Type: 90% Remold	
Soil Identification: Orangish brown silty sand (SM)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.390	■ 2.386	▲ 3.996
Shear Stress @ End of Test (ksf)	○ 0.811	□ 1.559	△ 3.119
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	9.29	9.29	9.29
Dry Density (pcf)	118.0	118.0	118.2
Saturation (%)	58.5	58.5	58.9
Soil Height Before Shearing (in.)	0.9898	0.9863	0.9765
Final Moisture Content (%)	14.1	13.8	13.4

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 24174-01

HG5 Riverside

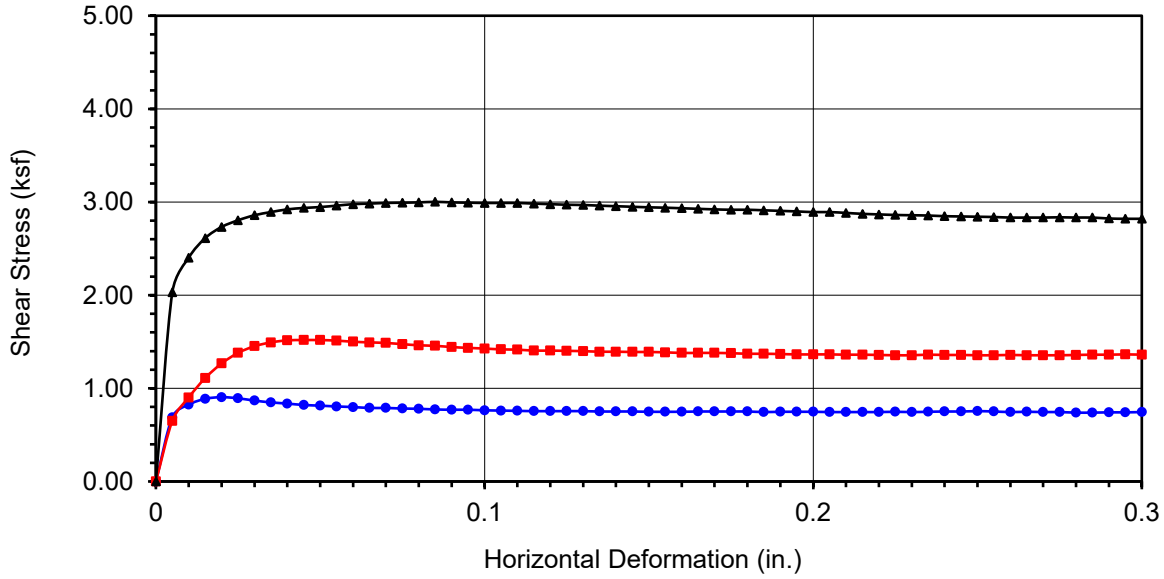
09-24

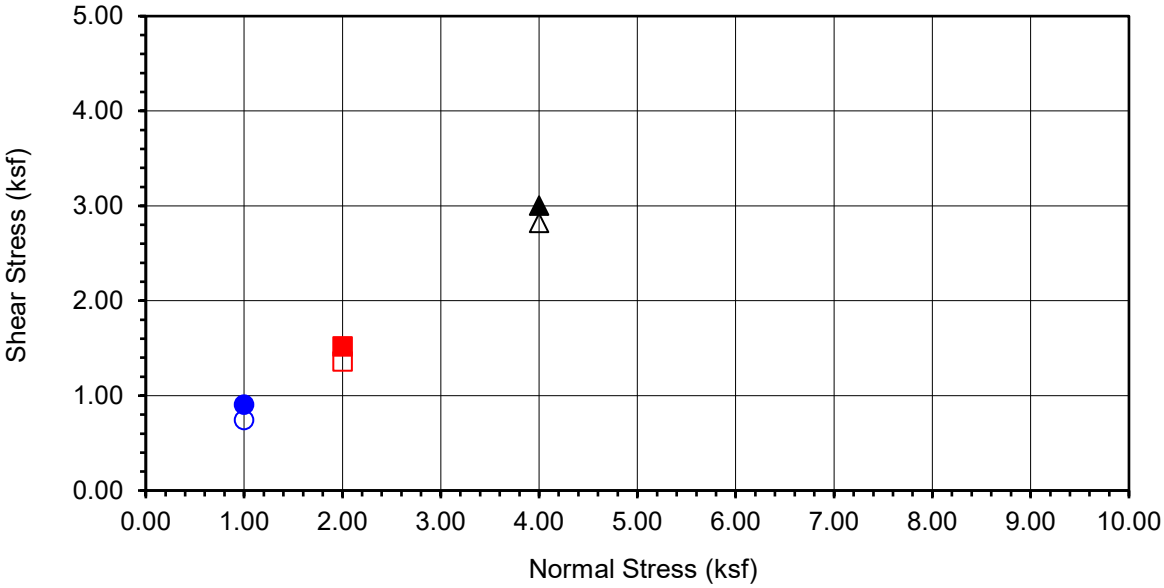
DIRECT SHEAR TEST

Consolidated Drained - ASTM D 3080

Project Name:	HG5 Riverside	Tested By:	G. Bathala	Date:	09/12/24
Project No.:	24174-01	Checked By:	J. Ward	Date:	09/17/24
Boring No.:	TP-10	Sample Type:	90% Remold		
Sample No.:	B-1	Depth (ft.):	N/A		
Soil Identification:	Light brown silty sand (SM)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	199.22	201.18	202.12
Weight of Ring(gm):	42.39	44.30	45.20
Before Shearing			
Weight of Wet Sample+Cont.(gm):	172.58	172.58	172.58
Weight of Dry Sample+Cont.(gm):	163.29	163.29	163.29
Weight of Container(gm):	60.37	60.37	60.37
Vertical Rdg.(in): Initial	0.0000	0.2774	0.2590
Vertical Rdg.(in): Final	-0.0084	0.2891	0.2733
After Shearing			
Weight of Wet Sample+Cont.(gm):	203.80	228.05	230.18
Weight of Dry Sample+Cont.(gm):	182.07	206.50	209.39
Weight of Container(gm):	40.03	64.79	67.12
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**TP-10**
Sample No.	**B-1**
Depth (ft)	**N/A**
Sample Type: 90% Remold	
Soil Identification: Light brown silty sand (SM)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.905	■ 1.518	▲ 3.002
Shear Stress @ End of Test (ksf)	○ 0.745	□ 1.361	△ 2.820
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	9.03	9.03	9.03
Dry Density (pcf)	119.6	119.7	119.7
Saturation (%)	59.6	59.7	59.7
Soil Height Before Shearing (in.)	0.9916	0.9883	0.9857
Final Moisture Content (%)	15.3	15.2	14.6

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 24174-01

HG5 Riverside

09-24

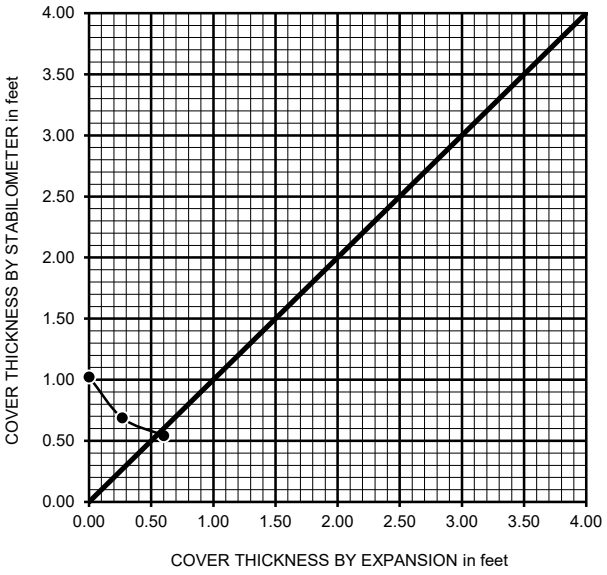
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	HG5 Riverside	PROJECT NUMBER:	24174-01
BORING NUMBER:	TP-11	DEPTH (FT.):	N/A
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Reddish brown silty, clayey sand (SC-SM)	DATE COMPLETED:	09/12/24

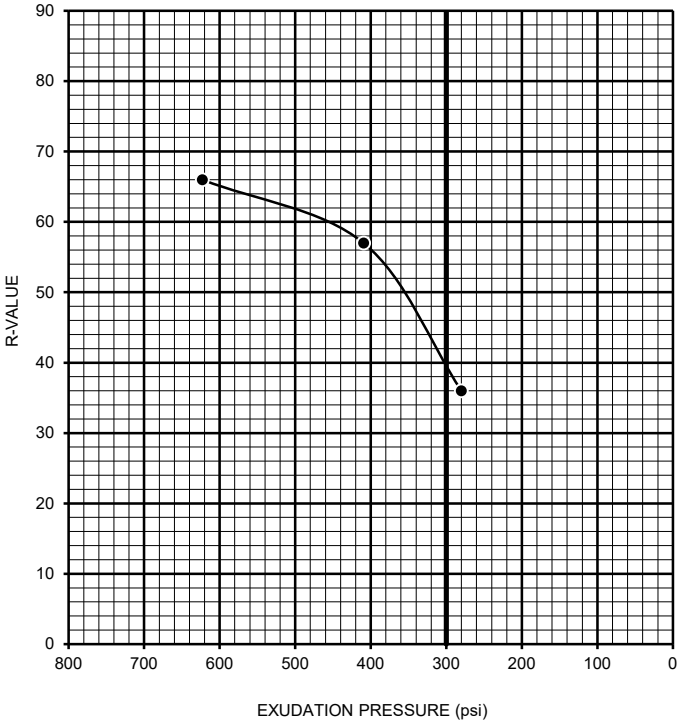
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.5	10.2	11.3
HEIGHT OF SAMPLE, Inches	2.40	2.47	2.55
DRY DENSITY, pcf	130.7	129.4	128.1
COMPACTOR PRESSURE, psi	250	150	70
EXUDATION PRESSURE, psi	623	410	280
EXPANSION, Inches x 10exp-4	18	8	0
STABILITY Ph 2,000 lbs (160 psi)	34	45	76
TURNS DISPLACEMENT	4.45	4.80	4.95
R-VALUE UNCORRECTED	68	57	36
R-VALUE CORRECTED	66	57	36

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.54	0.69	1.02
EXPANSION PRESSURE THICKNESS, ft.	0.60	0.27	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	66
R-VALUE BY EXUDATION:	40
EQUILIBRIUM R-VALUE:	40

Appendix D
General Earthwork and Grading Specifications for Rough Grading

General Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of “equipment” of work and the estimated quantities of daily earthwork

contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the
Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Over-excavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of the geotechnical consultant. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than
5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over

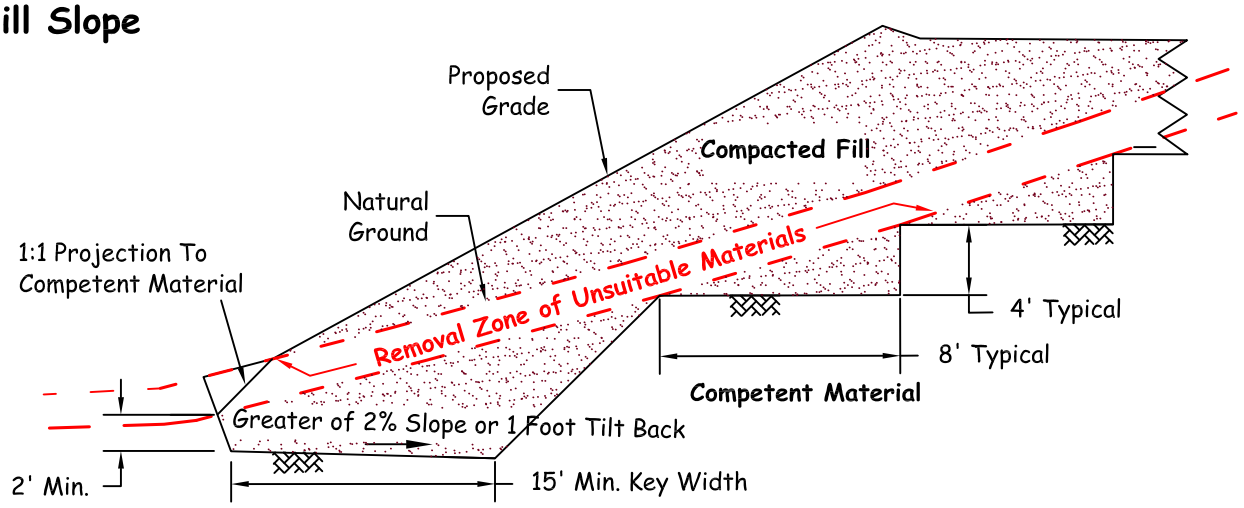
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

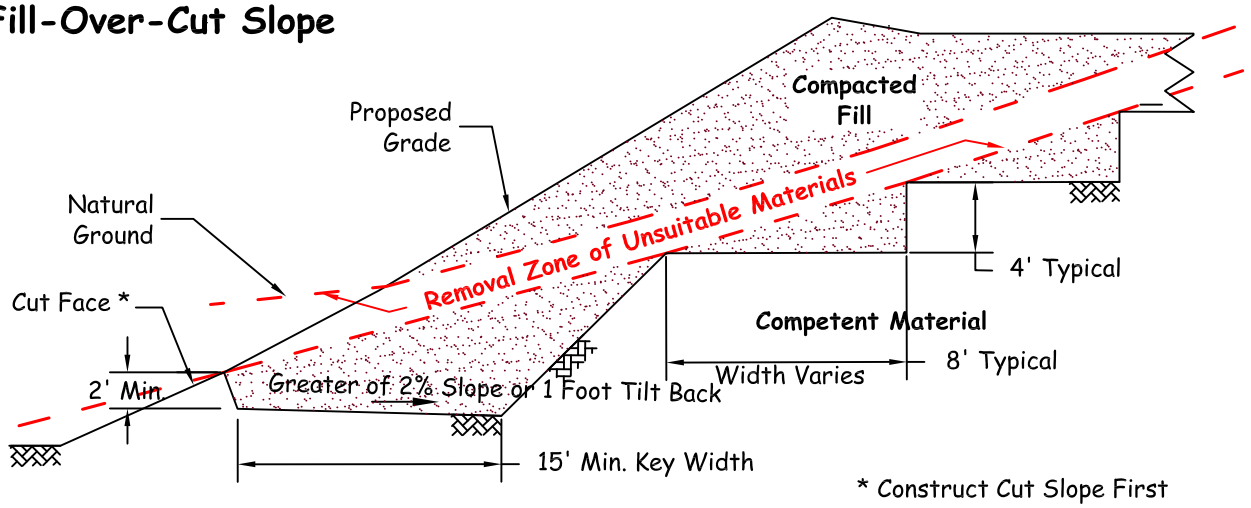
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

Fill Slope

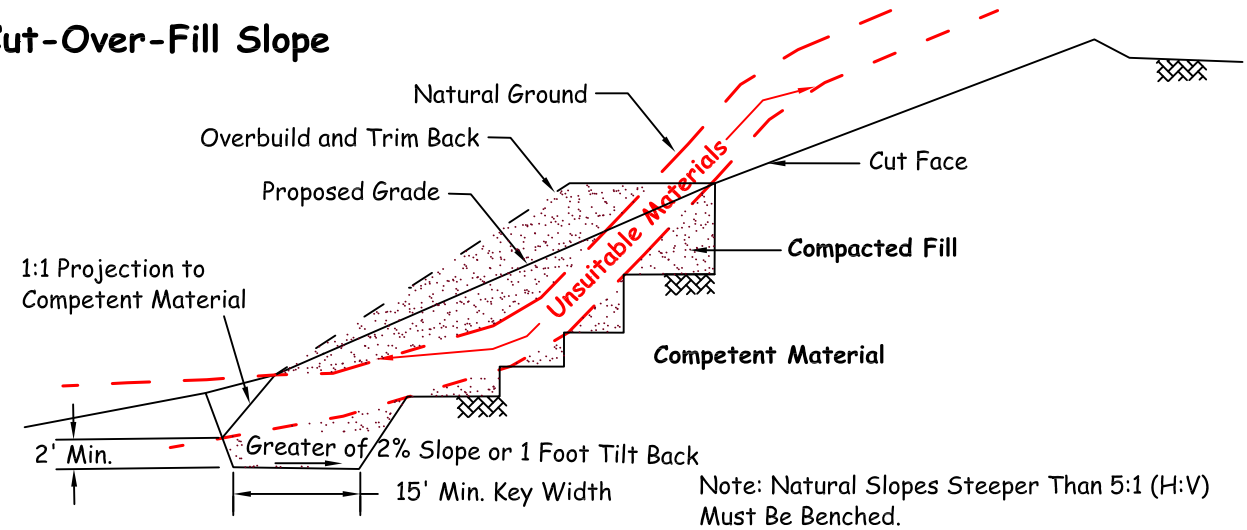


Fill-Over-Cut Slope



* Construct Cut Slope First

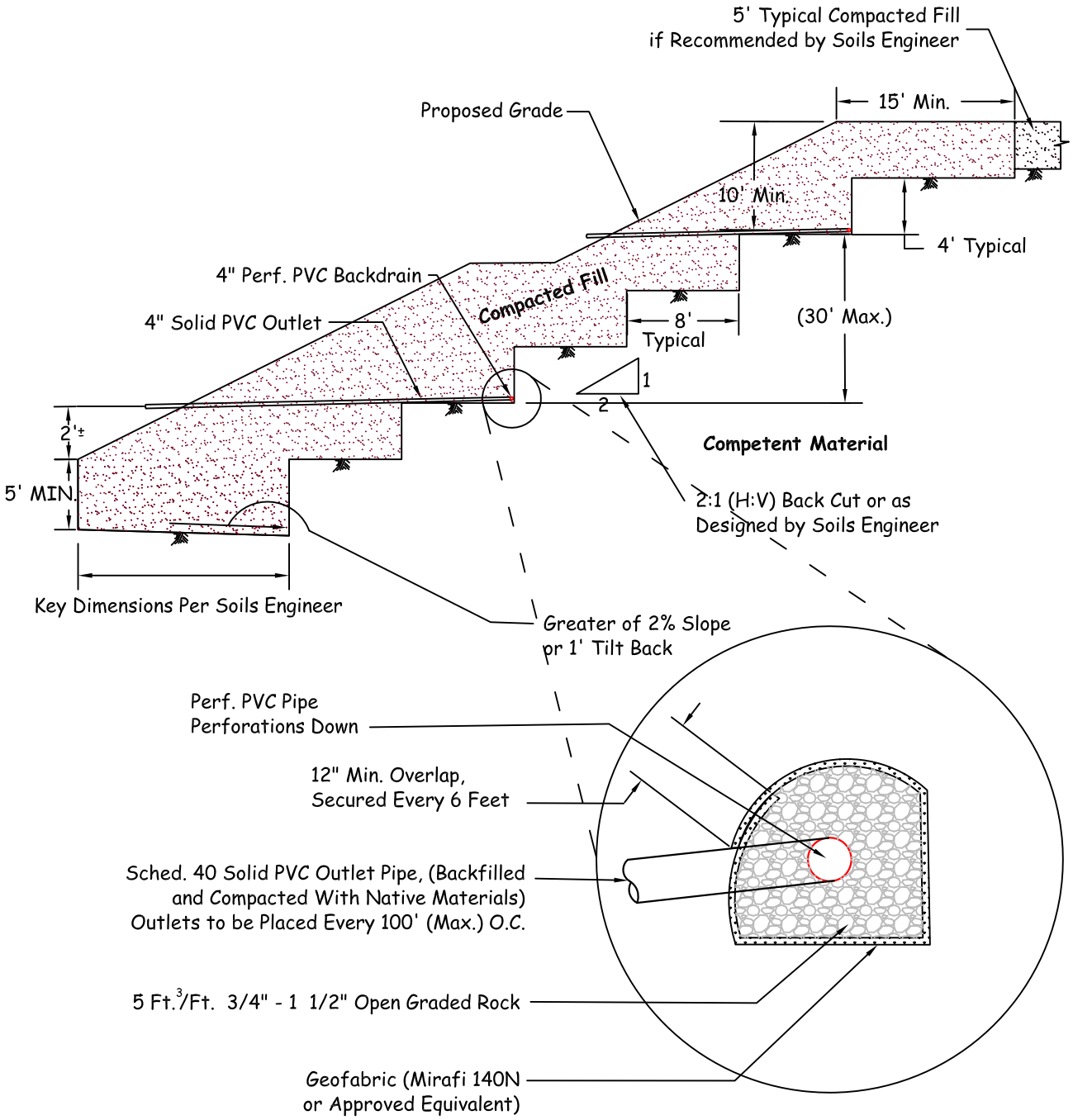
Cut-Over-Fill Slope



Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

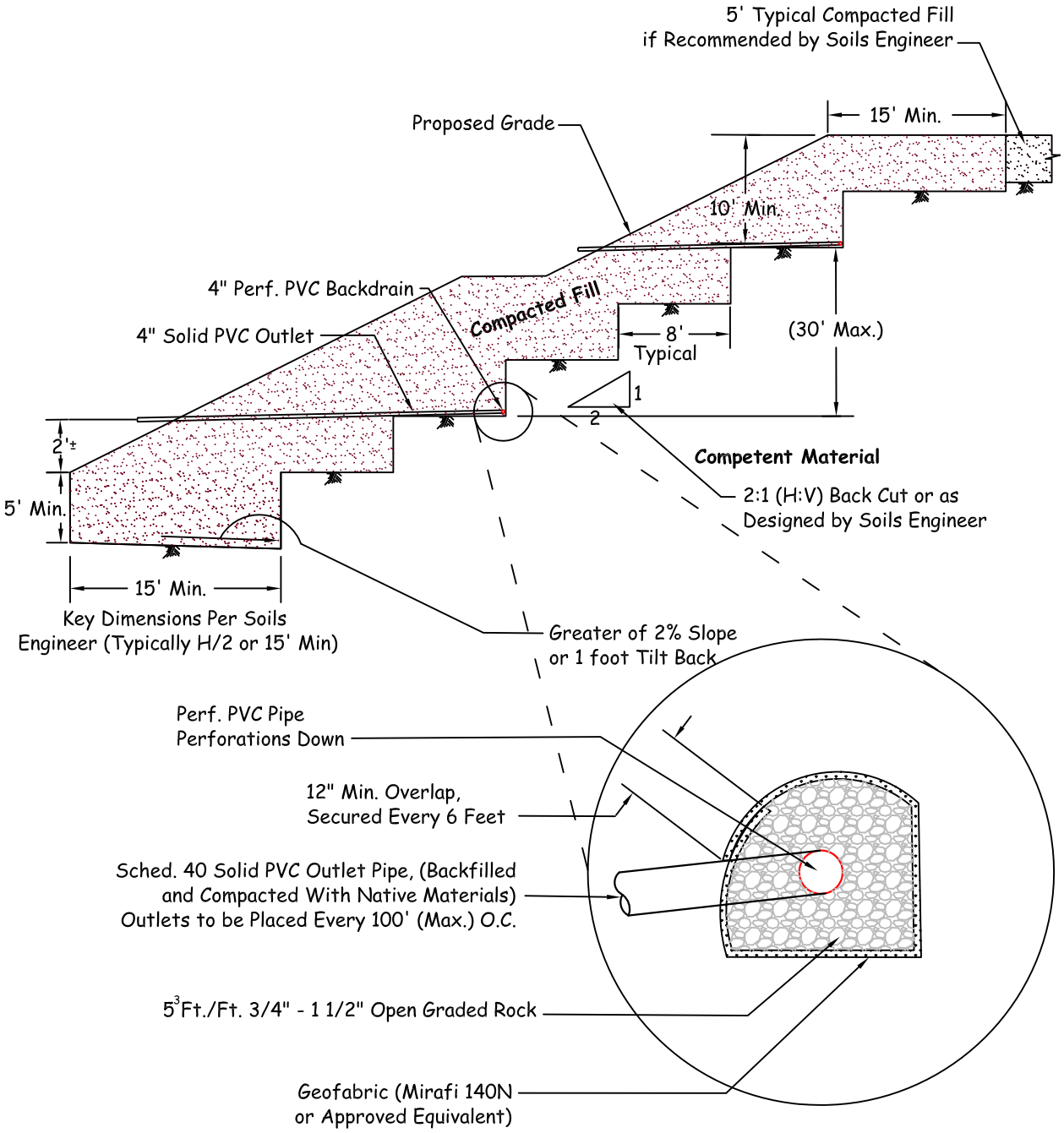
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KEYING AND BENCHING



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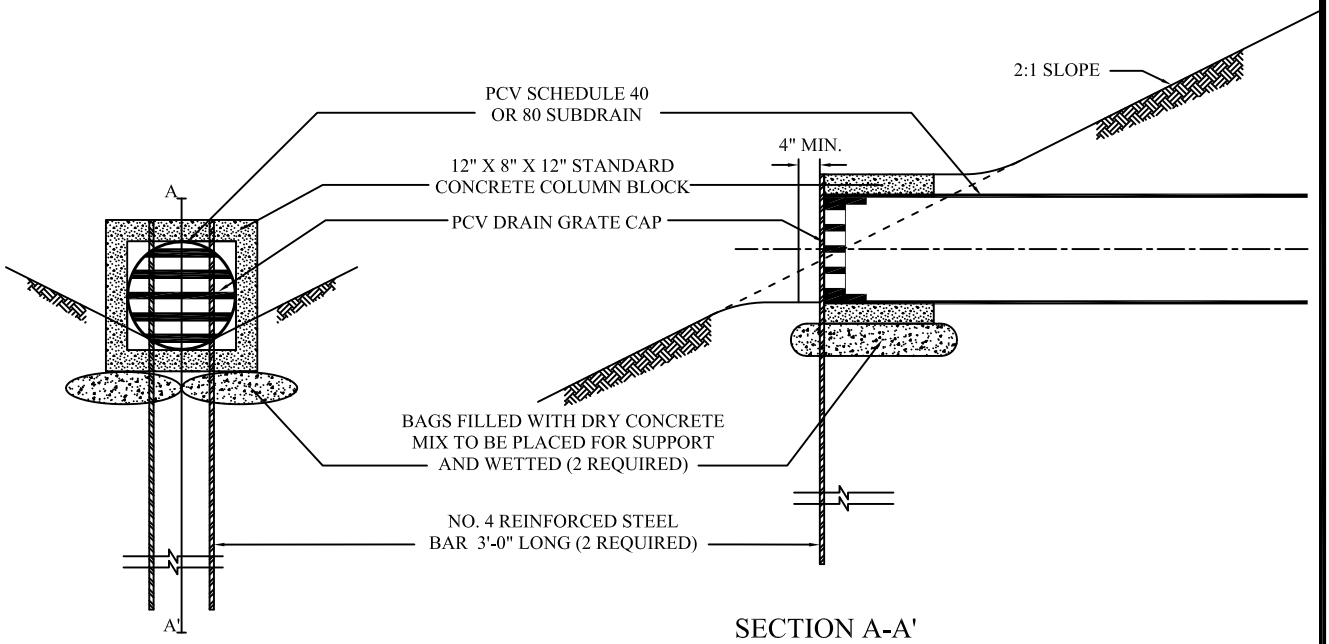
TYPICAL BUTTRESS DETAIL



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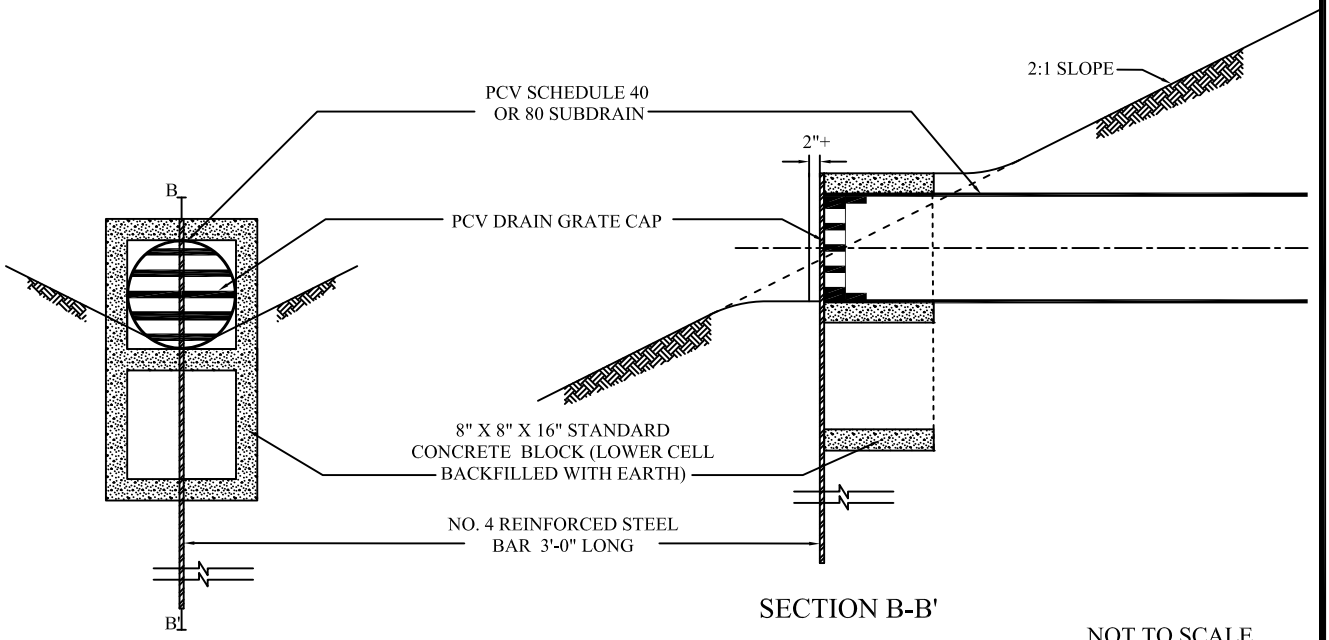
TYPICAL STABILIZATION FILL DETAIL

SUBDRAIN OUTLET MARKER -6" & 8" PIPE



SECTION A-A'

SUBDRAIN OUTLET MARKER -4" PIPE



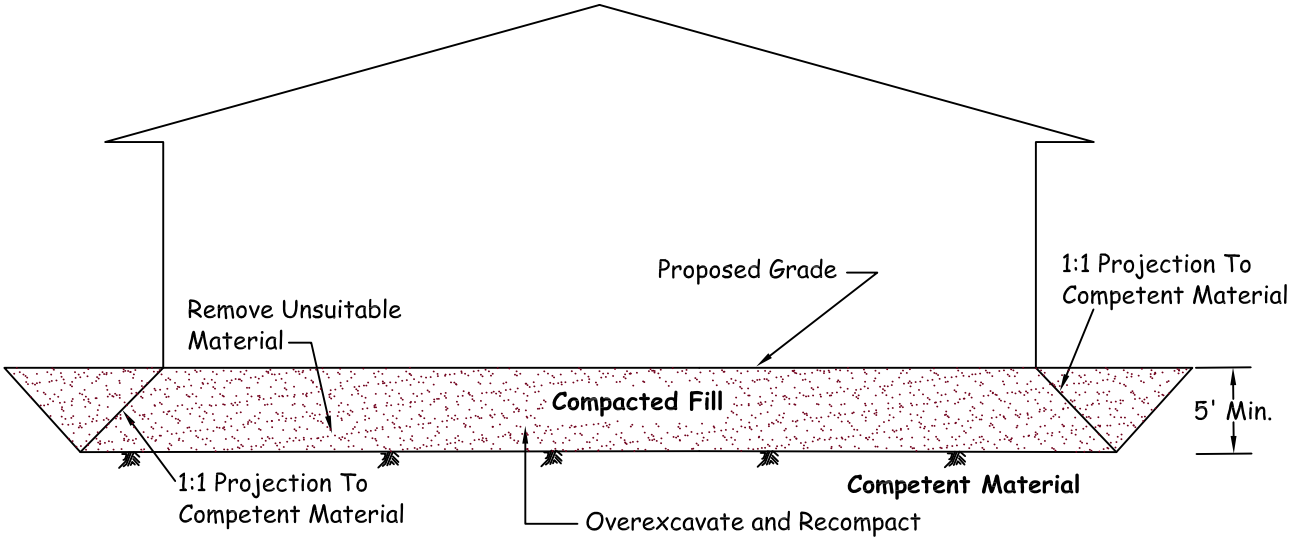
SECTION B-B'

NOT TO SCALE

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SUBDRAIN OUTLET MARKER DETAIL

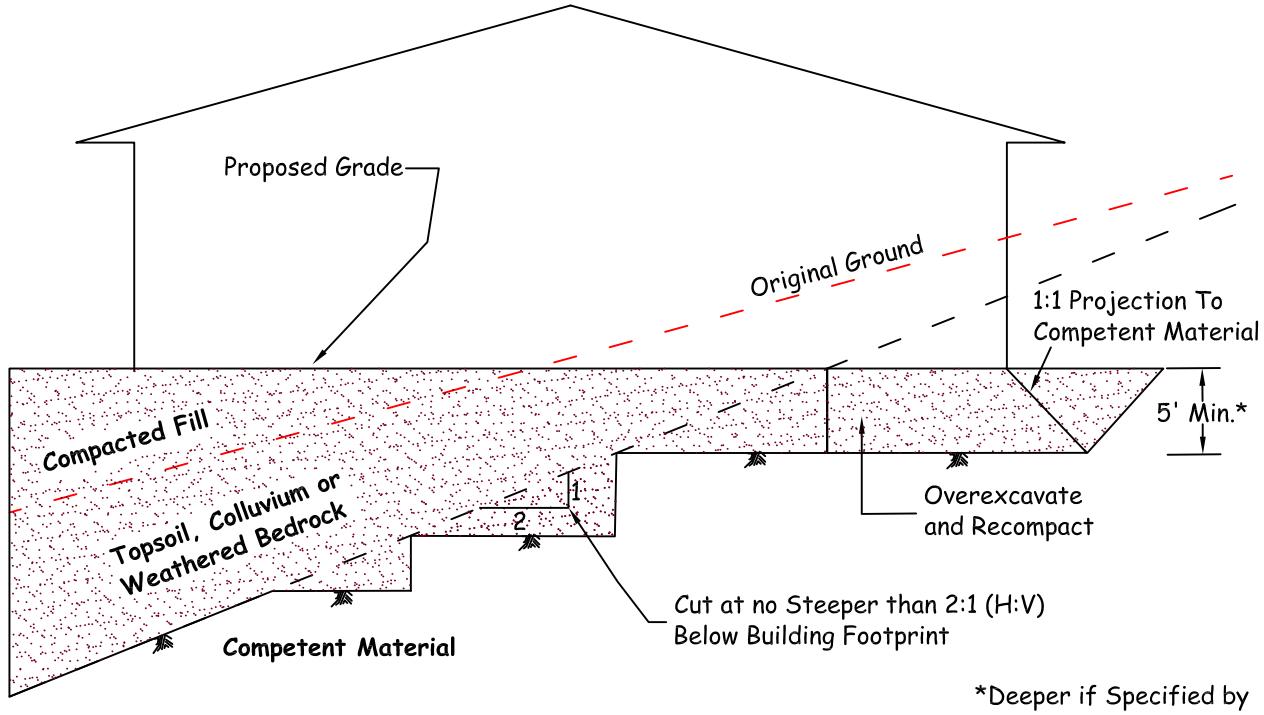
Cut Lot
(Exposing Unsuitable Soils at Design Grade)



Note 1: Removal Bottom Should be Graded With Minimum 2% Fall Towards Street or Other Suitable Area (as Determined by Soils Engineer) to Avoid Ponding Below Building

Note 2: Where Design Cut Lots are Excavated Entirely Into Competent Material, Overexcavation May Still be Required for Hard-Rock Conditions or for Materials With Variable Expansion Characteristics.

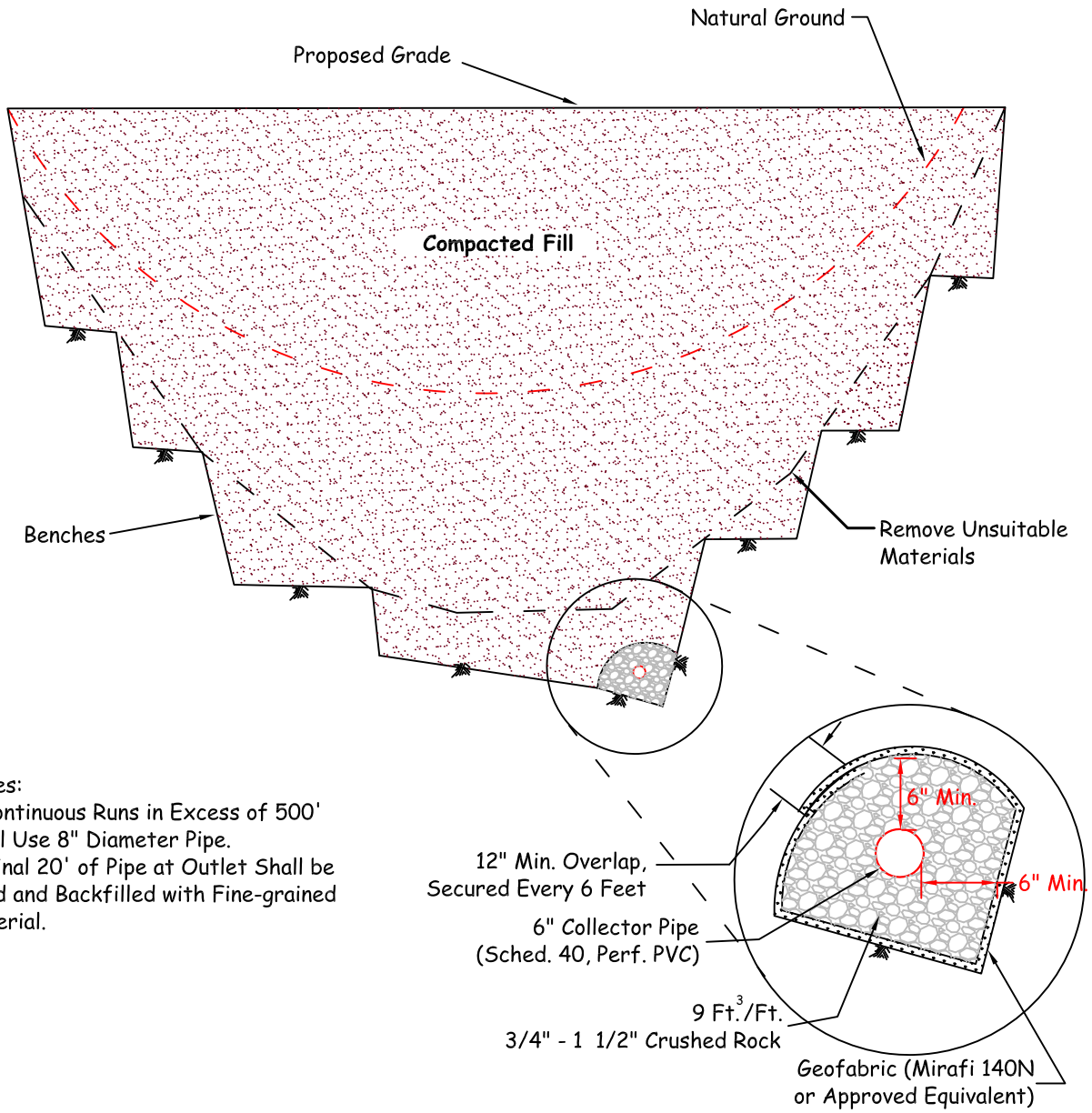
Cut/Fill Transition Lot



*Deeper if Specified by Soils Engineer

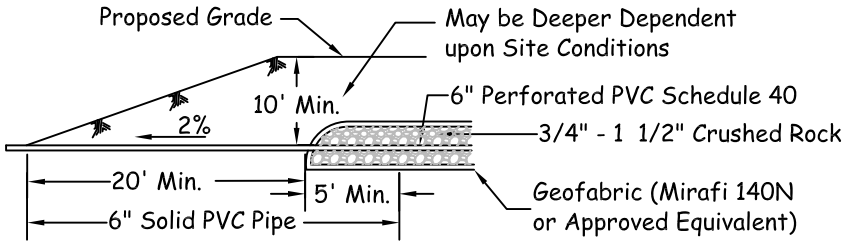
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CUT AND TRANSITION LOT OVEREXCAVATION DETAIL



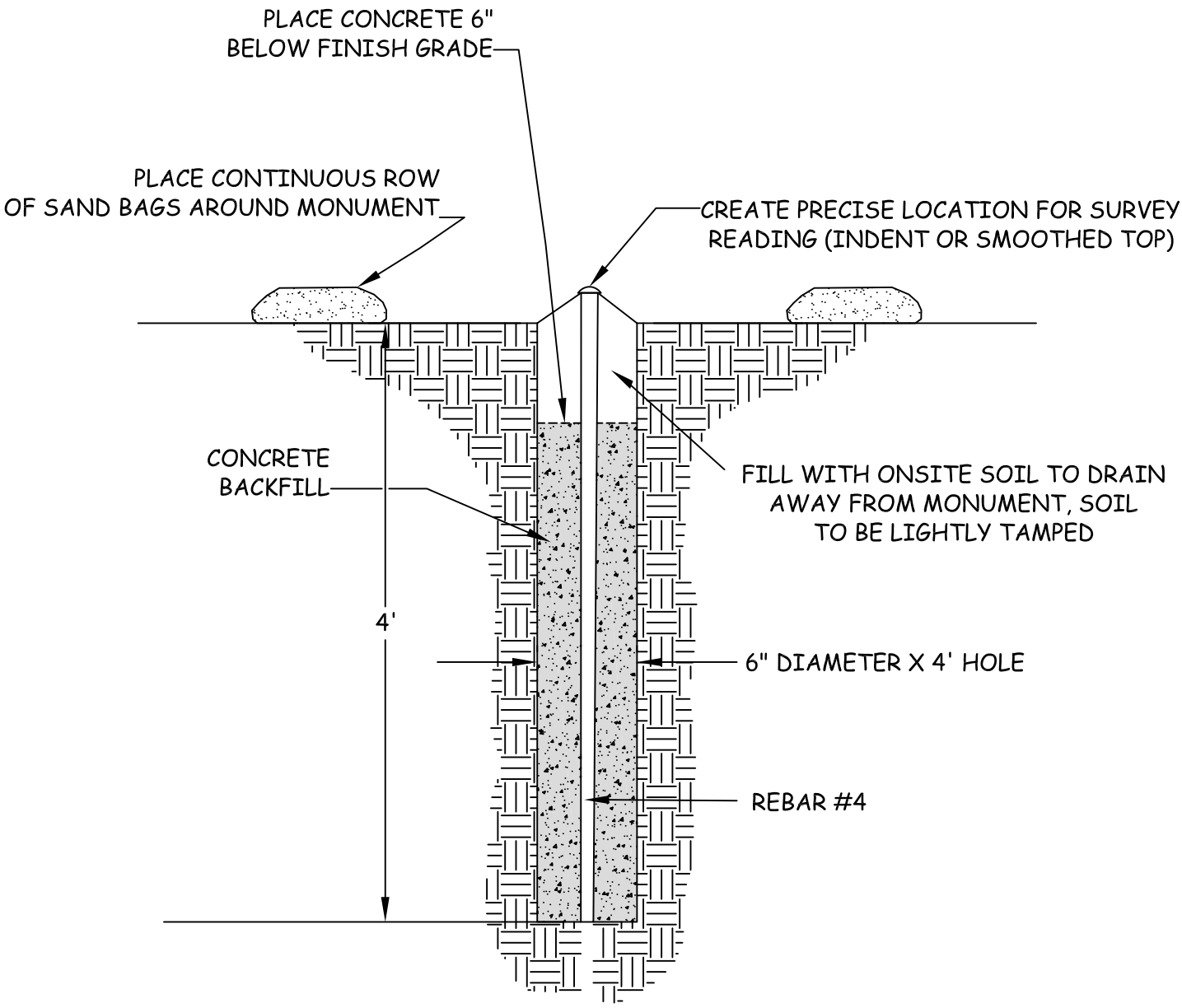
Notes:
1) Continuous Runs in Excess of 500' Shall Use 8" Diameter Pipe.
2) Final 20' of Pipe at Outlet Shall be Solid and Backfilled with Fine-grained Material.

Proposed Outlet Detail



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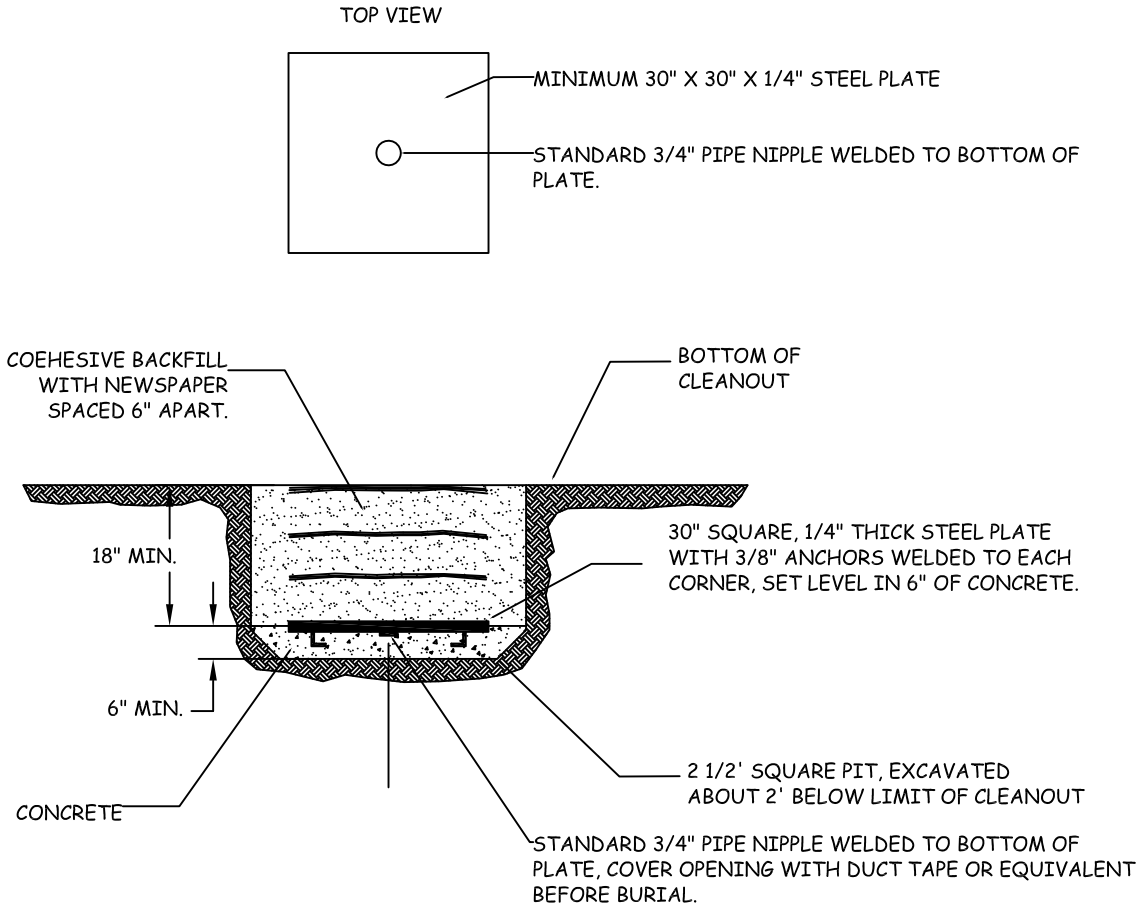
CANYON SUBDRAINS



NO CONSTRUCTION EQUIPMENT WITHIN 25 FEET
OF ANY INSTALLED SETTLEMENT MONUMENTS

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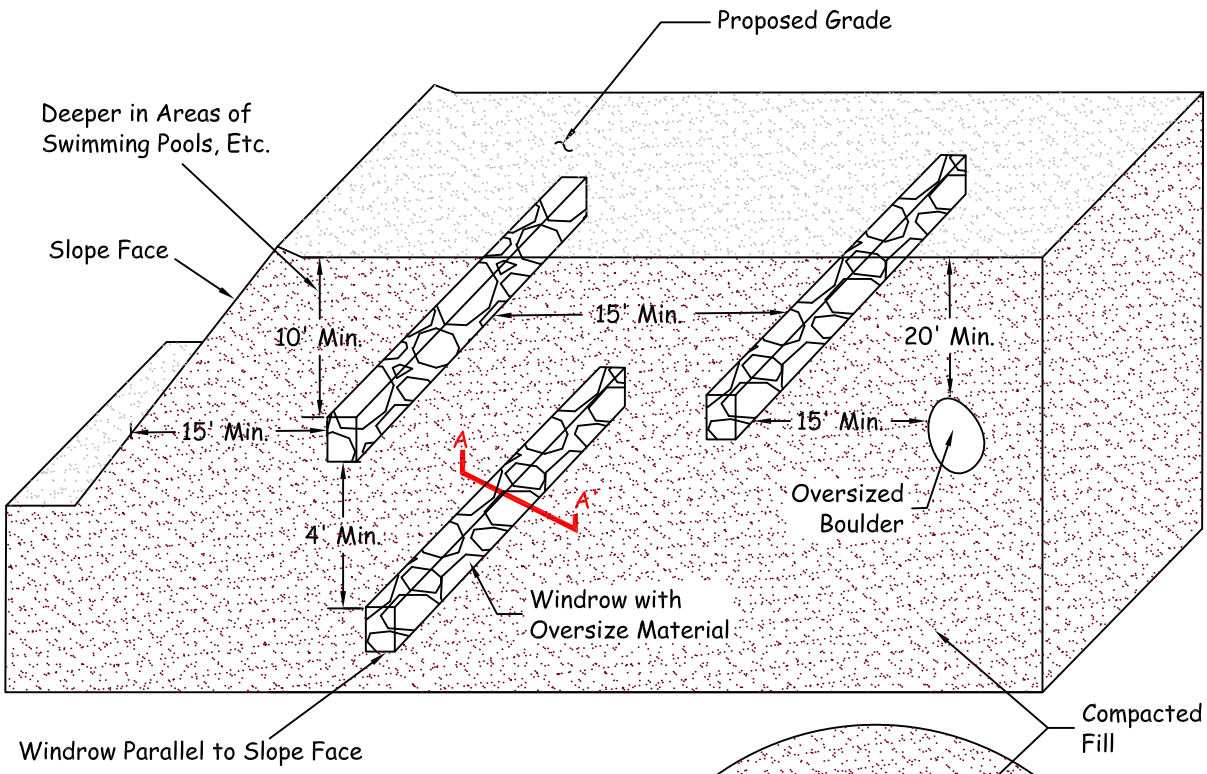
TYPICAL SURFACE SETTLEMENT MONUMENT

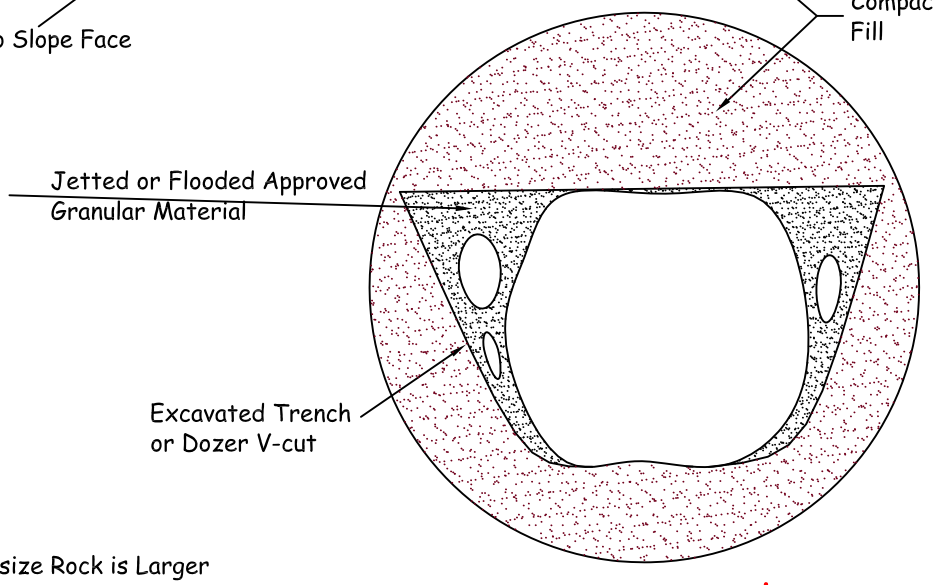


1. SURVEY FOR HORIZONTAL AND VERTICAL LOCATION TO NEAREST .01 INCH PRIOR TO BACKFILL USING KNOW LOCATIONS THAT WILL REMAIN INTACT DURING THE DURATION OF THE MONITORING PROGRAM. KNOW POINTS EXPLICITELY NOT ALLOWED ARE THOSE LOCATED ON FILL OR THAT WILL BE DESTROYED DURING GRADING.
2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE DURING GRADING, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.
3. DRILL TO RECOVER AND ATTACH RISER PIPE.

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TYPICAL SETTLEMENT PLATE AND RISER





Note: Oversize Rock is Larger
than 8" in Maximum Dimension.

Section A-A'

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OVERSIZE ROCK DISPOSAL DETAIL

LEGEND

TP-13	Approximate Location of Exploratory Test Pit by LGC Geotechnical
EX-14	Approximate Location of Excavator Test Pit by Others (AGS, 2017)
S-7 SL	Approximate Location of Seismic Refraction Line by LGC Geotechnical
afo	Older Artificial Fill by Others
Qal	Quaternary Alluvium
Qoa	Quaternary Older Alluvium
Kcgb	Cretaceous Granodiorite and Gabbro, Undifferentiated
	Approximate Location of Geologic Contact
6'+	Approximate Depth of Remedial Measures, in Feet



LGC Geotechnical, Inc.
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

Geotechnical Map

PROJECT NAME	Trumark - HG5 Riverside
PROJECT NO.	24174-01
ENG. / GEOL.	RLD / KTM
SCALE	1" = 100'
DATE	September 2024

SHEET 1 of 1